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2009 GRASP SYMPOSIUM PROGRAM

08:00 – 08:30  Registration

08:30 – 08:45  Opening Remarks Provost & Vice President Miller

08:45 – 09:15  Keynote Address
Paul H. Wooley, PhD, Director, Orthopedic Research Institute; Professor of Biology, WSU; KBA Eminent Scholar
Merging Aerospace and Orthopedic Science – Can a hip implant fly?
A perspective of cross-discipline research to show what might be required by graduates merging biology, medicine and engineering.

09:15 – 09:30  Refreshments and Poster Viewing in Gymnasium

09:30 – 10:30  Oral Session 1, Moderator: David Eichhorn
Lead Presenters: Ali Ahmady, Christina Bair, Lisa M. Booth, Kim Burkholter, Carrie Chambers, Jon Christensson

10:30 – 10:45  Break/Viewing Posters

10:45 – 12:05  Oral Session 2, Moderator: Ken Miller
Lead Presenters: Christina P. Coiner, Alisa Cotter, Karen Countryman-Roswurm, Daisquirrel Crumrine, Johann Dorfling, Natalie S. Grant, Shamsuzuha Habeeb, Linda Hoffmann

12:05 – 01:00  Lunch/Viewing Posters

01:00 – 02:30  Oral Session 3, Moderator: Stuart Lasine
Lead Presenters: Waseem Khan, Felecia Lee, Jodi Lightner, Lisa Lutz, Justin Lygrisse, Emily J. McDonald, Jessica A. Puyear, Nasser Safaie, Phillip R. Sechtem

02:30 – 02:45  Break/Viewing Posters

02:45 – 03:35  Oral Session 4, Moderator: Glyn Rimmington
Lead Presenters: Megan Simpson, Julinda Taylor, Renee L. Vardy, Joy H. Vetter, Kristen Waymire

03:35 – 04:15  Break/Viewing Posters

04:15 – 05:00  Awards Ceremony, Donald Beggs, President of WSU
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ORAL PRESENTATIONS
Identifying Users’ Characteristics Critical to Product Selection Using Rough Set Theory

Ali Ahmady

Industrial and Manufacturing Engineering Department

Abstract. A consumer’s purchase decision making process is very complex. It is obvious that the set of product functional features has a major role in the purchase decision. However, for a same product, users may have different assessments. So it seems that other factors than product functional characteristics play a role in decision making. Frequently, customers are segmented based on characteristics such as age, gender, geographic location, etc. Nevertheless, in many cases it has been seen that the customers in the same segment have different points-of-view for the same product. For example, some customers in a group may consider a product suitable while others don’t. Inconsistencies between customers can cause uncertainty for designers in producing the most satisfying product attributes. This paper presents a method to resolve this kind of uncertainty using Rough Set Theory. The input of this method is users’ evaluation data for a product with respect to a specific customer subjective feeling. The output is sets of the most influential users’ characteristics on their product selection preferences. By using reduced sets of users’ characteristics, designers are able to reclassify users and resolve inconsistencies.

1. Introduction

The customer purchasing decision process is a crucial part of companies’ success, while it is a “black box” for marketers. In fact, no one really knows how the human brain makes decisions. Some attempts have been made to model consumer purchase processes and document characteristics affecting consumer purchase behavior. Among the influential characteristics which marketers agree upon are psychological factors which include attitudes and perceptions [1]. Many factors alter consumers’ perceptions and attitudes such as cultural, social, and personal characteristics [2]. Personal characteristics (age, income, lifestyle, etc.) can influence user perception, for instance, to see a particular website as attractive. While consumers themselves don’t know exactly what impacts their purchasing process, marketers know that consumers buying decisions are under the influence of their cultural, social, and personal characteristics [1]. Figure 1 shows that consumer purchasing decisions affect user characteristics by manipulating customer attitudes. Knowledge of these factors helps marketers in designing more efficient market strategies, designers producing more satisfactory designs by adjusting product features to customer needs, and manufacturers to enhancing product quality via what the customer wants and ultimately helping society secure its resources more efficiently and effectively.

![Fig. 1. Linking between customers’ characteristics and their purchasing decisions.](image)

This study aims to identify those critical user characteristics that influence user perception using one of the recent developments in databases, Rough Set Theory. Rough Set Theory, a mathematical formalism developed by Z. Pawlak, can be considered a formal model which allows for discovering several sorts of information such as pertinent features or classification rules. Data size reduction (resulting in reduct sets), which is one the main objectives of rough set data analysis [3] ,will be used in the proposed approach to reduce the sets of users’ characteristics by eliminating those which don’t impact user perception. The resulting characteristics are critical for product selection.

2. Method and Results

In this study, to identify the critical user characteristics affecting customer perception and consequently on the purchasing decision, customer feelings are used as scales to measure user perception. If a product gives a particularly good sense to its user it leads to positive perception respect to that product. It is obvious that different users may have different perceptions of a product. Since the users evaluate the same product, it is assumed that the
source of those inconsistencies comes from user characteristics in which they differ even though product features are the same. If two users evaluate the same product differently and they have the same characteristics, some other discriminating factors may play a role in manipulating perception that have not been considered in the set of user characteristics. In such a case other discriminatory user characteristics should be searched until the users become discernible.

The first step in eliminating irrelevant user attributes is to construct the information system table which is an essential component of Rough Set Model. In this table, which is shown in Table 1, the rows represent the users (objects) and the columns show potential significant user attributes. This table also has one distinguished attribute called the decision attribute which is considered for user evaluations, and descriptors, which the values are denoting the different levels of characteristics of users. Here a very simple example is given to show the outcome of proposed approach. Suppose eight users are asked to evaluate a specific website in term of site attractiveness [4]. The attributes which might be significant in their website evaluation are age, education, internet skill and Centrality of Visual Product Aesthetic (CVPA)[4]. Those characteristics, which if removed them will not affect the decision making results are redundant and can be eliminate from the set of characteristics in Table 1. In order to obtain the reduct sets we need to construct a symmetric matrix called indiscernibility matrix and calculate the discernibility function [5]. The set of all prime implicants of discernibility function determines the set of all reducts of user characteristics [6]. For information system Table 1 three reduct sets \{c_2, c_4\}, \{c_1, c_2, c_4\}, and \{c_1, c_3, c_4\} are obtained. Either each of these three sets will influence the users’ decision process. If set one is considered as a reduced set of criteria which are \{c_2=\text{Age}, c_4=\text{CVPA}\}, these users’ characteristics play a major role in user decision process to perceive and select the website as attractive or not attractive based on the data available.

3. Conclusions

It is very important for companies to know which factors influence their product’s user perception rather than product features to design efficient and effective market strategies and also enhances product quality and customer satisfaction. It is known that the purchasing decision process is under influence of customer perceptions in which customer characteristics play a major role. This study proposed an approach to identify those users’ characteristics which are significant in manipulating user perceptions and purchase decision process consequently using reduct sets concept in Rough Set Theory. A very simple example about a website was given to show the input and output of the approach.

4. Acknowledgements

I would like to express the deepest appreciation to my committee members, especially Dr D. Malzahn, Dr S.H. Cheraghi, and Dr B. Chaparro that without their support this research would not have been possible.

Shoulder Muscle EMG Activity in Women During Push up on Varying Surfaces.

Christina Bair*, Brandi Buckley, Rayanne Pralle, Melanie Schroeter, Barbara Smith, Michael Jorgensen1

Abstract. The unstable surfaces of a BOSU® ball and Swiss ball typically have a greater impact on EMG muscle activity during a push up compared to a normal push up done on a flat stable surface. This study's purpose was to determine if performing a push up on a BOSU® ball and on an exercise bench influenced EMG muscle activity when compared to the activity of a push up on a stable surface in females. Eighteen females were recruited from a convenience sample of college students. The pectoralis major, rectus abdominus, and external oblique muscles showed the greatest EMG muscle activity. The posterior deltoid showed the lowest activity. Overall, the push up performed on the bench showed the greatest EMG muscle activity compared to the other types of push ups.

1. Introduction:

Unstable surfaces such as a Swiss ball and BOSU® ball are used in therapy to increase muscle activation during therapeutic exercise. The emerging use of the BOSU® ball in rehabilitation clinics makes this a relevant substitute for the Swiss ball. The BOSU® ball has more surface contact with the ground than a Swiss ball, making it a safer alternative during stability training, while simultaneously recruiting greater muscle activation. Electromyography (EMG) measures muscle activity. EMG studies that have looked at muscle activity during therapeutic exercise using varying surfaces included all male subjects or a mix of genders [2,4]. No studies that looked at upper body exercise, push ups, and/or EMG utilized only women as subjects. An EMG study consisting of females performing exercise on many surfaces can expand the literature that involves stability exercises for women. A push up is frequently used in upper extremity EMG studies. The purpose of this study was to determine if an increase in EMG muscle activity occurred while subjects performed a push up on a stable surface compared to an unstable surface. From this information, it may be possible to develop rehabilitation protocols that utilize stable versus unstable surfaces.

2. Experiment, Results, Discussion, and Significances

The sample was 18 women (18-28 years old) from WSU. The 7 muscles onto which EMG electrodes were placed were biceps, triceps, rectus abdominus, external oblique, pectoralis major, latissimus dorsi, and posterior deltoid. Placement of electrodes followed the locations shown in Konrad’s The ABCs of EMG [1]. Electrodes were placed on the right side to decrease heart beat interference. After electrode placement, maximal voluntary contractions (MVCs) were obtained for each muscle. A MVC is defined as maximal effort during a muscle contraction. Electrodes were placed on the right side to decrease heart beat interference. After electrode placement, maximal voluntary contractions (MVCs) were obtained for each muscle. A MVC is defined as maximal effort during a muscle contraction. These MVCs provided a comparison for the EMG activity of each muscle. The portrayal of this comparison consisted of percent of MVC.

An electrogoniometer placed on the subject’s left lateral elbow recorded relative elbow position during the push ups. Subjects were randomly assigned to 1 of 6 related push up orders, with no one order used more than 3 times. The 3 types of push ups included a standard style push up, bench push up with feet on the bench and hands placed on the floor, and a BOSU® ball push up with hand placement on the BOSU® and feet on the floor (Figure). The trunk was maintained in straight alignment throughout all push ups with the back flat and the pelvis in neutral [2,3]. The EMG started recording muscle activity when the subject was in the top 1 position of the push up. The subject lowered into the bottom (down) position and then returned to the start position (for this paper, called top 2 position) (Figure). Each position was held for 1 second. One second was allowed to assume the next position. A recording was used to verbally cue subjects to change position. Three repetitions for each push up were performed with a 1 minute rest in between trials.

Data were analyzed using SPSS v 13.0™. The 2-way analysis of variance looked for significant differences between the 3 push up positions and between the 3 push up types.
The largest number of significant changes occurred between push up positions and the 3 push up types in the posterior deltoid. The pectoralis major showed the fewest changes. The triceps had greater EMG muscle activity during the down position than the 2 top positions in all push ups. The pectoralis major, rectus abdominus, and external oblique muscles showed the greatest EMG muscle activity during the 3 types of push ups. Overall, muscles used during a push up performed on the bench showed the greatest EMG muscle activity. Most muscles in the top 2 position had greater EMG muscle activity than the same muscles in the top 1 position.

Unexpectedly, the greatest EMG muscle activity occurred in the rectus abdominus and the triceps muscles on the bench push up compared to the standard push up and the unstable push up, in contrast to Marshall et al’s findings [4]. The current study also found unexpected significant changes in latissimus dorsi activity between the standard and bench push up and between the bench and BOSU® for the 2 top positions. Previous researchers had difficulty obtaining data from this muscle [2].

As expected, pectoralis major had greater EMG muscle activity during a stable bench push up than during the BOSU® push up. The greatest EMG muscle activity occurred in the down position of each push up on all 3 surfaces. All muscles showed greater EMG muscle activity at the top 2 position than at the top 1 position. Researchers observed trembling of both arms of some subjects while holding the top 2 position. This might be due to muscle fatigue or residual muscle activation. The combination of using unstable surfaces with resistance exercises, such as a push up, may provide a greater challenge than performing a standard push up.

3. Conclusions

This study showed a significant increase in EMG muscle activity during the bench push up compared to the BOSU® pushup, contradicting the finding of previous research [4]. Female anatomy and physiology (including varying muscle bulk and strength), the use of a BOSU® instead of a Swiss ball, varying hand placement for each participant, and not incorporating manual resistance may have resulted in differences seen in this study as compared to other studies. In a physical therapy clinic, the current study’s findings support using a bench push up to elicit greater EMG muscle activity as part of a strength training program for female patients.

4. Acknowledgements

Researchers wish to thank Michele Reiman, DPT, for his guidance with MVCs and the 3 Graduate Assistants in the Industrial and Manufacturing Engineering Department. To all the women that participated in this study, we express our deepest gratitude and appreciation.


Figure. The push up done on 3 surfaces with 3 positions. Left:standard push up, top 1 position. Middle:Bench push up, down position. Right: BOSU push up, top 2 position
Commitment Communication and Length of Marriage: Scratching the seven-year Itch

Lisa M. Booth*

Elliott School of Communication, Fairmont College of Liberal Arts and Sciences

Abstract. Previous research indicates that marriage has been shown to be a relationship based in serious investment, which requires maintenance behaviors in order to remain satisfying. With this in mind I wanted to determine why the seven-year itch might exist. In the spring of 2008 I sampled 103 married couples from Wichita, KS and the surrounding area. They were selected through network sampling and asked to complete a survey regarding their marriage. The survey included the self/partner behavioral indicators of commitment scale and Rusbult’s commitment scale, which measured behavioral indicators and marriage satisfaction. I looked specifically at the perceived level of tangible reminders offered, the perceived level of creating a relationship together, the perceived integrity of the marriage and the overall satisfaction in the marriage. I hypothesized that as past research has shown, couples in the early years of marriage (0 to 6) will have high levels of behavioral indicators of commitment, followed by a drop in amount during the 7 to 23 year period, and a rise at the 24+ year mark. The results of the survey indicated that my hypothesis was correct. Future research might determine if this curvilinear pattern (being low during mid level marriages) could account for divorce during these years.

1. Introduction

According to Sabatelli (1999) “Most marriage-like relationships were ones in which partners were clearly highly attracted to their relationships and highly invested in their maintenance” (p. 181)[1]. One could assume from this that individuals involved in these relationships consider commitment communication a priority in their relationship. Research findings would indicate otherwise. Marriage has been shown to be a relationship based in serious investment, which requires maintenance behaviors in order to remain satisfying. According to Weigel and Ballard-Reisch (1999) “Maintenance behavior was highest in marriages between 0 to six years, dropped to a low in marriages 15 – 23 years, and rose again in marriages of 24+ years.”[2]

Research Questions and Hypothesis

RQ 1: Is there a relationship between the length of a marriage and the amount of behavioral indicators of commitment used?
RQ 2: Is there a relationship between the amount of behavioral indicators of commitment used and the level of relationship satisfaction?
H1: Couples in the early years of marriage (0 to 6) will have high levels of behavioral indicators of commitment, followed by a drop in amount during the 7 to 23 year period, and a rise at the 24+ year mark.

2. Experiment, Results, Discussion, and Significance

Participant Recruitment and Scales

COMM 803 Quantitative Research Class students recruited 103 married couples through network sampling throughout the Wichita and the surrounding area. Partners individually completed surveys composed of the self/partner behavioral indicators of commitment scale and Rusbult’s commitment scale. They included statements regarding the individual’s own commitment communication as well as their perception of their partner’s commitment communication. They also rated their current marital satisfaction.

Scale Examples

Commitment Communication
On a scale of 1 to 6, 1 being always and 6 being never, report for Self and Partner how often do you:
1) Do things together
2) Am honest with her/him

Martial Satisfaction
On a scale of 1 to 5, 1 being very dissatisfied and 5 being very satisfied:
1) How satisfied are you with your relationship?
2) How satisfied are you with your partner?

Data Analysis

To analyze the data a one way MANOVA was calculated using length of marriage (0-6 years, 7-23 years, and 24+ years) as the independent variable and the participants' response to factors addressing: the use of tangible reminders, creating a relationship future, integrity, and marital satisfaction as dependent variables. Wilks' indicated a difference between the response of the newly married (0-6 years) and long lasting marriages (24+ years) compared to the mid level marriages (7 to 23 years): Wilks’ = .788, F (3,103)=2.943, p<.005, a multivariate Univariate ANOVA results were interpreted using an alpha of 0.05. They revealed the newly married (1)(M=26.531, SD=1.016) and long lasting marriages (3)(M=29.950, SD=1.285) had a significant difference from mid level marriages (2)(M=29.723, SD=.838) in regards to tangible reminders F(3, 103)= 3.495, p<.05, = .068. This pattern followed with relationship future with 1(M=15.656, SD=.924), 2(M=19.957, SD=.762), and 3(M=17.250, SD=1.168) F(3, 103)=6.723, p<.05, = .123 and with integrity which showed 1(M=10.938, SD=.568), 2(M=13.000, SD=.469), and 3(M=11.900, SD=.719)F(3, 103)=3.974, p<.05, = .076. Finally marital satisfaction followed the pattern with 1(M=72.063, SD=2.227), 2(M=64.234, SD=1.838), and 3(M=70.100, SD=2.817) F(3, 103)=4.041, p<.05, = .078.

Results

The results showed that individuals involved in the early years of marriage (0 to 6 years) and long lasting marriages (24+ years) had higher levels of offering tangible reminders, creating a relationship future, integrity, and satisfaction. Meanwhile, those involved in mid level marriages (7 to 23 years) showed low levels of offering tangible reminders, creating a relationship future, integrity, and satisfaction. These results were similar to those of the previous research of Weigel and Ballard-Reisch in 1999.

3. Conclusions

In conclusion, the results of this study would lead one to believe that marriages are more likely to have high levels of commitment communication during the early and later years of the marriage than during the mid level marriage. More research needs to be done to determine the ramifications of the results. More research would need to be done to study if this curvilinear pattern (being low during mid level marriages) could account for the divorce rates during these years.

4. Acknowledgements.

I would like to thank the Communication 803 Quantitative Research students for their help in recruiting, distributing, and inputting data for the scales used in this research. I would also like to thank the instructor and my advisor for this paper Dr. Deborah Ballard-Reisch for all her help in determining the scales used, the data analysis procedure and overall commentary on the project.

Teacher Attitudes toward Implementation of a Comprehensive School Reform Model in Two Urban Middle Schools: Communication Disconnect

Kim Burkhalter, J.K. Campbell*, Bob Diepenbrock, Gina Marx
Faculty Mentors: Mara Alagic & Craig Elliot

Abstract. In an effort to significantly improve student achievement and meet the mandates of No Child Left Behind, more public schools are turning toward externally developed comprehensive school reform (CSR) providers. CSR models provide a top-down direction for designing and supporting the process of school reform; tangible and accessible support for school change presumably steeped in research and literally packaged and delivered to the school site. Recognizing the difficulty of successful implementation and scale-up, this qualitative study offers a framework for assessing initial implementation of externally provided CSR models. Drawing on the existing literature regarding CSR implementation and scale-up, the field study team developed a framework that includes qualitative assessment of teacher attitudes toward program implementation from a variety of perspectives. This study provides an indicator of teacher attitudes during initial implementation and a related literature review to help guide a school district’s formative assessment of implementation of a specific CSR model in two urban middle schools. This paper is focused on only one aspect of the findings: communication disconnect among relevant stakeholders.

1. Introduction

As public school districts continue to race against the timeline established by the federal No Child Left Behind Act of 2001 and the goal for all students to achieve academic proficiency by 2014, they face many challenges to meet assessment targets outlined by NCLB and state legislation [1]. Many districts experience restructuring as a result of failing to meet state assessment targets. Restructuring, as defined by NCLB, is a term reserved for schools that fail to make adequate yearly progress after implementing one full school year of corrective actions. The local educational agency (LEA) in charge of school oversight must allow students enrolled in a restructured building or school the option to transfer to another public facility served by the LEA, continue to make supplemental services available to children who remain in the school, and implement an alternative governance arrangement. Alternative governance must include, at a minimum, replacement of all or most of the school staff relevant to the failure to make adequate yearly progress and implementing an external federally approved comprehensive school reform model [3]. Questions guiding this field study focused on teacher attitudes about initial implementation of the CSR program.

2. Experiment, Results, Discussion, and Significance

Recognizing the difficulty of successful implementation and scale-up of comprehensive school reform and drawing on existing literature regarding CSR implementation and scale-up [3, 4], the field study team developed a framework that includes qualitative assessment of teacher attitudes toward program implementation from a variety of perspectives. The field study team’s task was to investigate teacher attitudes toward the professional development received through a CSR model; teacher attitudes toward implementation of the CSR model; teacher self-reporting about how implementation of the CSR model is impacting their own instructional practices; and what additional support, if any, might be necessary for effective implementation. The study was limited to two Title I urban middle schools, one newly restructured and one facing restructuring the following year. Primary strategies for data collection included a survey (N=26), classroom observations, document review, semi-structured interviews, and focus groups. Collected data were analyzed using the constant comparative method [6] until themes and categories emerged. Specifically, this study provided a template assessment of teacher attitudes during initial implementation of one comprehensive school reform model, allowing district leadership to identify implementation hurdles, and adjust and enhance program implementation to move more efficiently through the scale-up process.
3. Conclusion: Communication Disconnect

Research suggested scale-up, expanding a comprehensive reform model across a school or district, is a complex and multi-faceted process. There are many factors that constrain and facilitate successful scale-up, and evaluation over time is necessary with any CSR model implementation. A predominance of literature indicated little support for comprehensive school reform as a catalyst for improving the achievement of students, especially those students of poverty and/or from diverse cultural backgrounds. CSR models are difficult to replicate from one site to another and careful attention must be paid to contextualization, recognizing each school has a distinct culture and site specific needs to address. Restructuring, as defined by No Child Left Behind, may be a deterrent to implementation as some teachers won’t “buy-in” to the process/model; restructured schools often employ beginning teachers, many new teachers to the system may or may not be ready for an intensive comprehensive reform model; and many teachers indicate concern as to whether or not they will be at the same school the following year due to restructuring requirements [4, 5].

The theme of communication disconnect emerged at various levels among the stakeholders. Teachers and leadership teams expressed their lack of understanding regarding the implementation of the CSR initiative. In addition, they also lacked awareness of the district’s future plans regarding CSR. Teachers indicated the following, “We’re wondering where do we go with this next year? What is the plan? We have no idea.” They also said, “It’s not cohesive across the district and there is still a lot of misunderstanding and unknown variables about implementation.” While CSR site coordinators believed that communication between schools and CSR was open and going smoothly, teachers reported frustration with the lack of scheduled visits from CSR site coordinators. One teacher stated, “We have not had a lot of direct contact with our [CSR site coordinators].”

In an article, “Organizational Theory Applied to School Reform: A Critical Analysis,” Bonner, Koch and Langmeyer, [2] reported that the interconnections through communication across all stakeholders groups are critical within a system to reach desired outcomes of an effective implementation. However, building level participants in this study emphasized there was a lack of consistent communication among stakeholder groups. Researchers’ analysis of data supported a sense of disconnection among stakeholders implementing CSR model. This was apparent in comments made by classroom teachers, building administrators, and some leadership team members, but not evident in comments made by district administrators and CSR site coordinators. Throughout the research process, the lack of consistent communication continued to surface from teacher participants, while CSR site coordinators and district administrators suggested clear, established methods of communications were present. Teachers’ frustration regarding the lack of contact and inconsistent scheduling with CSR site coordinators, in addition to their attempts to “figuring out the process as they go,” was reiterated in comments during the data collection process. Furthermore, it was apparent in other themes of this study that the strategic plan (whether formal or informal) for communication across stakeholder groups was inefficient. For example, as previously indicated, teachers did not perceive support in the same way as district administration. Teachers indicated the lack of communication between groups caused additional and unnecessary work, as well as anxiety about program implementation.

These findings lead to the following emerging question for all stakeholders, and particularly for the school district: How can communication among all stakeholder groups be more direct and transparent, to share successes and plan how to constructively overcome frustrations?

Analysis of Differential Glycosylation Patterns of Human FSH

Carrie Chambers*, Bin Shuai, George Bousfield

*Department of Biological Sciences, College of Liberal Arts and Sciences

Abstract. Follicle stimulating hormone (FSH) is a glycoprotein hormone with two subunits, α and β, and is required for gamete development. Our data suggest that estrogen is responsible for inhibiting the glycosylation of FSHβ in reproductive-age women, thus producing a di-glycosylated FSH with higher biological activity than the tetra-glycosylated form. The difference in glycosylation of two subunits is suspected to be due to activity of different oligosaccharyltransferase (OST) isoforms. OSTs are responsible for the first step in N-glycosylation. Factors including signal peptide hydrophobicity of α and β may contribute to selective usage of OST, and hence modulate N-glycosylation. Therefore our hypothesis is that N-glycosylation of FSH subunits is regulated by the differential interactions between OST isoforms and the signal peptides of each subunit, and the differential interaction is modulated by hormones such as estrogen. To test our hypothesis, we will genetically engineer chimeric hFSH subunits by swapping the signal peptide sequences of α and β. Constructs with the chimeric sequences will be introduced into immortalized gonadotrope cell lines. FSH glycoforms expressed in the cell lines will be examined using Western Blot. If our hypothesis is correct, then we would expect to detect unglycosylated α subunit in the transfected cell lines. Different hormones such as estrogen will be used to treat the cell lines and the difference in FSH subunit glycosylation will be examined.

1. Introduction

The hormone FSH is partially responsible for the development of follicles, which in turn are responsible for the production of viable gametes at ovulation in women. FSH is composed of two subunits, alpha (α) and beta (β). Both subunits can be decorated with oligosaccharide branches at two residues. What is known as the tetraglycosylated glycoform is therefore the result. Another potential glycosylation pattern is that of a diglycosylated glyform, in which only the α-subunit carries the two oligosaccharide branches. Studies indicate that the tetraglycosylated form is biologically more potent than that of the diglycosylated glycoform. These two isoforms circulate in women at varying ratios through time. Studies have indicated that a shift in the ratio of glycoforms of FSH occurs as women age, and may suggest a potential avenue by which menopause and the cessation of reproductive viability occurs. Data suggests that activity of estradiol selectively inhibits FSHβ glycosylation, while having no apparent effect on the glycosylation patterns of FSHα. The result of decreased estradiol concentrations at menopause is an increased abundance of tetraglycosylated FSH, and therefore decreased biological action of the same amounts of the secreted hormone. The action of estradiol is the suspected mechanism by which inhibition or modulation of the activity of oligosaccharyltransferase (OST), occurs. OST is the enzyme responsible for the addition of 15-residue oligosaccharide branches onto the emerging polypeptide chain as it enters the mammalian ER and thereby responsible for glycosylation ratios. Studies have indicated that two isoforms of OST exist, and selective usage of each isoform is believed to be correlated to the hydrophobicity of the signal peptides of each of the FSH subunits. Therefore our hypothesis is that selective usage of OST isoforms is related to the signal peptide of each subunit and is modulated by activity of estradiol. To test our hypothesis, we will construct chimeras of each FSH subunit by swapping their signal peptides. These chimeras will be introduced into immortalized human gonadotrope cell lines and the cell lines will be treated with estradiol. If our hypothesis is correct, then we should detect a non-glycosylated α subunit, and a large amount of glycosylated β subunit. We should also be able to modify the amount of glycosylated α subunit by administering varying concentrations of estradiol.

2. Experiment, Results, Discussion, and Significance

Expression vectors containing hFSHα (hα/pSVL), hFSHβ (pKR8) and the mammalian expression vector pCI-neo have been purified using Qiagen midi plasmid kit. After treatment with chimeras, cells will be grown in a medium containing G418 to select for the cells that are transfected with the selection vector. Radioimmunoassay (RIA) will be used to identify antibiotic-resistant cells that actively express the hormone. Once a stable cell line has been identified, FSH-expressing LβT2 cells will be incubated in the presence and absence of 17-estradiol. After three days, the conditioned medium will be collected. FSH concentration will be measured by RIA using National Hormone and Pituitary Program kits. FSH and FSH will be purified by immunoaffinity chromatography and the
heterodimer fraction will be separated from unassociated subunit by Superdex 75 gel filtration. Di-glycosylated and tetra-glycosylated hFSH glycoform abundance will be determined by Western blot analysis. The signal peptide sequence was amplified with primers FSH SP-F and FSH SP-R using pKR8 as a DNA template, and the mature peptide sequence will be amplified with primers FSH-F and FSH-R using hα/pSVL as a DNA template. PCR products will be cloned into pGEM-T EASY vector followed by sequence confirmation. Restriction sites have been introduced into the primers for easy cloning. Following sequence conformation, each fragment will be digested from isolated pGEM-T EASY with complementary ends for the subcloning procedure. Signal peptide sequences will be ligated to opposite mature peptide sequences producing chimeric sequences. The chimeric sequence will be cloned into the pCI neo mammalian expression vector at EcoRI NheI, and SalI sites.

The chimeric constructs will be used to transfect CHO cells following standard procedures. Stable cell lines will be isolated based on G418 resistance. Proteins will be purified from the conditioned medium of the transfected cell lines and assayed for FSH expression by RIA. Once protein expression is confirmed, Core B will extract FSH subunits and analyze N-glycosylation patterns. Changes of N-glycosylation in response to hormone treatment will be examined. The project is now at the stage in which the chimeras are being constructed, where currently each fragment, being the signal peptides and mature peptides, need to be ligated together and then cloned into the pCI neo expression vector.

3. Conclusion

Currently, the project is in its juvenile stages, as construction of the chimeras is still underway. This knowledge will ideally provide insight into the avenue by which menopause occurs, and to a more broad extent, insight into reproductive ageing, as similar mechanisms may exist in other tissue types or other species.

4. Acknowledgments

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How Inflationary are Oil Price Shocks? A Regional Analysis

Jon Christensson*

Department of Economics. W. Frank Barton School of Business

Abstract. The impact of oil shocks is analyzed by estimating an augmented Phillips curve on a national, regional and city level in the United States. A significant pass-through to inflation (including all items) is recorded for all regions, while core inflation remains largely muted. The West region has experienced a much lower pass-through than other regions and a few reasons for this are; greater oil efficiency, lower inflation variability and a lower exchange rate pass-through in the West. Also noted is an increasing trend for pass-through to inflation since the late 1980’s, and the contrary was found for core inflation.

1. Introduction

Intuitively, when the oil price increases due to a negative supply shock, the input cost of firms increases. If workers are rational, they will adjust their inflationary expectation and demand higher wages leading to higher labor costs. This causes the aggregate supply curve to shift to the left and prices to increase. Hence, the oil price has implicitly passed on its price hike to the average price level in the economy.

There have been surprisingly few papers specifically investigating the oil price pass-through to inflation. The existing studies have largely noted a decline in the pass-through in recent times. A few reasons identified for this decline include globalization, more flexible labor markets, reduction in oil intensity, and a declining exchange rate pass-through. [1] [2] [3]

The main contribution of this paper is to investigate the pass-through on regional and disaggregated levels, and how it changes over time. More precisely, this paper measures the oil price pass-through to various consumer price categories on a national, regional and city level in the United States.

2. Experiment, Results, Discussion, and Significance

This paper follows the framework of Fuhrer [4], Hooker [5] and De Gregorio, Landerretche and Neilson [3], though with some differences which are discussed shortly. An estimation of an augmented Phillips curve is estimated and the general form is shown in equation (1).

\[ \pi_t = \alpha + \beta(L)\pi_t + \gamma(U_t - U^*_t) + \varphi(L)p^\text{oil}_t + \varepsilon_t \] (1)

\[ \pi_t \] is the seasonally adjusted inflation rate, \( U_t - UtN \) is the unemployment gap created by subtracting the NAIRU (Non-Accelerating Inflation Rate of Unemployment) from the actual seasonally adjusted unemployment rate, \( p^\text{oil}_t \) is the UK Brent oil price in U.S. dollars. The inflation rate and the unemployment data was collected from BLS while the oil price comes from IFS. The \( (L) \) implies a polynomial in the lag operator.

The paper will use four models. Model 1 will have a fixed lag structure and polynomial degree of 6 and 2, respectively. Model 2 will have a fixed lag structure and polynomial degree of 12 and 2, respectively. Model 3 will have a varying lag structure and polynomial degree. Model 4 computes a time-varying pass-through coefficient allowing for the varying lag structure and polynomial degree of model 3.

The reason for inclusion of the first two models is to be able to compare the pass-through across regions as well as across price categories. Two different lag structures are imposed as to not over/under fit the model which is a serious issue. This is the primary reason of the third model; by determining the optimal lag and polynomial structure, the issue of over/under fitting the model is side-stepped. The fourth model is put forth to analyze how the pass-through has changed over time since the late 1980’s.

It seems as if they impose a regular lag structure and fix this lag to four quarters due to comparability issues.

For most series the time period stretches from January 1987 to September 2008. Lastly, De Gregorio, Landerretche and Neilson [3] use the output gap, while Fuhrer [4] and Hooker [5] use the plain unemployment rate as a measure of economic activity. Due to the regional analysis in this paper the unemployment gap must be used as a proxy for economic activity.

From equation (1) the pass-through coefficient is derived and shown below in equation (2).

$$\theta = \frac{\sum_{i=1}^{L} \omega_i}{1 - \sum_{i=1}^{L} \beta_i}$$  \hspace{1cm} (2)

where the summation goes from $i$ to $L$ (in this case will be either 6 in model (1), 12 in model (2) and varying in model (3) and (4)).

On a national level, previous studies found that after the 1980, the pass-through to the general price inflation was around three percent, which underestates the findings of this paper where the estimated pass-through in model 1 and 2 is 2.6% and 5.7% respectively [3]. In other words, if the oil price increases by 1%, the inflation is expected to increases by 0.03% (0.026-0.057% according to the current findings). Hooker [5] claims that a doubling of the oil price leads to approximately a 1% direct increase in inflation. Interestingly, the core consumer prices seems to have been unaffected by changes in the oil price in both lag specifications. Not surprisingly, one sees the largest pass-through rates in energy, transportation, commodity and nondurables prices that in one way or another include either gasoline or some form of oil directly.

At a regional level, the Northeast has the highest pass-through to consumer prices including all items and also, on average, the most price categories with higher pass-through. The most striking result is the Western region which experiences the smallest pass-through in almost every price category. Hence, an oil price shock would, on average, influence the inflation in the West less than it would have in other parts of the US.

At a city level there is no clear consensus as of where the highest pass-through is. However, yet again the West region has, on average, the lowest pass-through and least significant categories.

Model 3 gives comparable results and the main important observation is the lower pass-through in the West.

Model 4 reveals an increasing trend of pass-through to inflation (including all items) on a national and regional level, while a negative trend is recorded for the core inflation.

The most striking finding is the lower pass-through in the West. One possible explanation to the lower pass-through is a decline in oil intensity. The West uses less oil to produce the same amount of GDP as other regions. A second explanation is the fact that the West has a smaller exchange rate pass-through and thirdly, that the standard deviations of many price series are lower in the West compared to other regions.

For future research it may be beneficial to investigate how the various regions’ economic structure impacts the oil price pass-through.

3. Conclusions

This paper differentiates itself from recent literature by focusing on the oil price pass-through on a regional level, as well as on a disaggregated level. A general Phillips curve is estimated on a national, regional, and city level. A significant pass-through is recorded in regular inflation and other price categories that directly incorporate oil, while the core inflation remains muted. The most striking result can be seen in the West where almost all significant price categories have a lower pass-through compared to the other regions. A few explanations to this are higher oil use efficiency, lower inflation variation and a lower exchange rate pass-through in the West. A rolling pass-through coefficient was also computed where the oil price pass-through to inflation has had an increasing trend since the late 1980’s, contradicting previous research. However, the core inflation has seen a negative trend which is in line with other research.

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Potential Relationships Between Learning Styles and Memory Strategies

Christina P. Coiner*, Julie Scherz

Department of Communication Sciences and Disorders, College of Health Professions

Abstract. Memory strategies are often taught by speech-language pathologists to individuals with memory impairments. Information about the relationship between memory strategies and individual differences could provide better direction for treatment approaches. This study explored the relationship between memory strategies and sensory modality strengths. Forty “typical” adults completed various memory tasks and learning style assessments and reported memory strategies. No significant relationship between sensory modality strength and memory strategies used to complete the various memory tasks was found. Individuals used a variety of memory strategies unrelated to their sensory modality strength and the type of memory task. Speech-language pathologists should be aware of their clients’ individual differences and be prepared to teach an assortment of strategies to clients with memory impairments.

1. Introduction

Memory strategies are often taught to individuals by Speech-language pathologists or other professionals to assist with memory deficits. Because memory is highly individualized, it would be helpful to understand the strategies people use based on their individual differences. One such difference that has been explored at length is individual learning style. Many learning style theories exist, but basic sensory modality preference is one that has been demonstrated in research. Learning style theories concerned with sensory modality strength often cite vision, hearing, and kinesthetic senses as the basis for our memory. Although the connection between sensory modalities and memory has been made, no known research has examined the relationship between sensory modality strength and the use of strategies for memory in retrieval and recall tasks. No known study has examined the relationship between modality strength or individual differences in adults and their preferred memory strategies.

2. Experiment, Results, Discussion, and Significance

Participants
Forty participants, ages 21 to 88, individually participated in a series of visual and verbal memory, memory strategy and learning modality assessments. Five men and five women participated in each of four age groups. Participants with uncorrected vision or hearing deficits, any self-reported neurological problems, less than a high school education, and non-native English speakers were excluded from the study.

Method
Participants were administered a number of assessments. Assessments of memory included: letter and categorical fluency (Test of Verbal Conceptualization and Fluency (TVCF)) [1], recall and recognition memory (Rey Auditory and Verbal Learning Test (RAVLT)) [2], immediate and delayed story retelling (Arizona Battery for Communication Disorders of Dementia (ABCD)) [3], visual memory (Detroit Tests of Learning Aptitude (DTLA-4)) [4]. After each memory test, participants were asked to report any strategies used to complete the task. After completion of all memory tasks, participants were provided with a short listing of possible memory strategies as well as an open-ended portion to report any other strategies. This listing was created from the strategy survey used by Saczynski et. al [5] to examine self-report of strategies used in multiple memory assessments. Participants’ sensory modality strengths were assessed using the Swassing-Barbe Modality Index (SBMI) [6]. Lastly, participants were asked to complete the Visual Aural Read/Write Kinesthetic (VARK) Questionnaire [7]. Upon completion of the tests, participants’ sensory modality strengths were discussed, any questions were answered and participants were debriefed.

Results
Chi-square tests of independence were performed to examine the relationship between sensory modality strength as determined by the SBMI (Group 1: Auditory; Group 2: Visual; Group 3: Kinesthetic; Group 4: Kinesthetic and Visual; Group 5: Auditory, Kinesthetic and Visual) and strategies reportedly used to complete memory tasks. The chi-square tests indicated no significant association at the p < .05 level.
between SBMI sensory modality strengths and reported strategies used to complete the categorical fluency task, $\chi^2$ (12, n = 40) = 11.93, p = .45; the letter naming task, $\chi^2$ (24, n = 40) = 30.16, p = .18; the RAVLT, $\chi^2$ (32, n = 40) = 31.91, p = .47; design sequences, $\chi^2$ (16, n = 40) = 12.28, p = .73; and the story retell immediate and delayed, $\chi^2$ (32, n = 40) = 40.17, p = .15.

Participants reported different memory strategies for memory tasks unrelated to the nature of the memory tasks (Table 1). For example, although the categorical fluency task is primarily a semantic and auditory task, participants reported use of semantic, auditory and visual strategies.

Table: 1
Reported memory strategies and combinations of strategies for each memory task ranked in order of highest to lowest use by participants

<table>
<thead>
<tr>
<th>Memory Task &amp; Nature of Task</th>
<th>Reported Memory Strategies</th>
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| A chi-square test for independence was performed to examine the relationship between sensory modality strength as determined by the SBMI and sensory modality strength as determined by the VARK. The chi-square test for independence did not indicate a significant association between the SBMI and the VARK, $\chi^2$ (12, n = 40) = 9.48, p = .66.

3. Conclusions

Based on the findings from this study, individual sensory modality strength and the strategies used to complete memory tasks appear to be unrelated. Typical adults use a variety of memory strategies and combinations of memory strategies independent of the type of sensory modality strength they possess and the nature of the memory task. As a professional working with individuals with memory impairments, it may be necessary to teach many different memory strategies for clients to use to complete various memory tasks.

Sensory modality strength and learning styles as a whole are difficult to assess. The two sensory modality strength assessments used in this study, the SBMI and the VARK, do not provide the same sensory modality strength information. There was no relationship between sensory modality strengths as determined by the VARK and the SBMI. Although information about how a person learns best is helpful, it may be best to provide information in a variety of modalities for any given individual.

4. Acknowledgements

I would like to acknowledge my thesis committee for all of their support and Dr. Parham and Dr. DiLollo for their assistance with this project. Also, I appreciate all of the individuals who participated in my research as participants or by providing me with eligible participants.

Bad for Business: Luther Against the Papacy

Alisa Cotter*

Abstract. This paper analyzes Martin Luther’s criticism of increasingly corrupt church practices, including, the papacy’s granting of indulgences, the promotion of pilgrimage, the preservation and exploitation of relics, the cult of saints, and the belief in saintly intercession. I will examine how Luther’s critiques of these practices were expressed in the religious propaganda that circulated during this period by looking at the interplay between image and text found in the polemical pamphlet, the *Passional Christi und Antichristi*, which was jointly produced by Martin Luther and the artist Lucas Cranach the Elder in 1521. The *Passional* presents thirteen pairs of contrasting images which comment upon events in the life of Christ and compare them to the perceived abuses of the papacy. These visual dialogues illustrate the extent and nature of the opposition to the papacy during the Protestant Reformation.

1. Introduction

Scholars who write on the Reformation have almost exclusively focused on Martin Luther’s attitude against the church’s abuse of indulgences. However, there are additional doctrines that Luther adamantly spoke out against throughout his life. Luther’s stance against all these practices, is especially evident in the polemical pamphlet known as the *Passional Christi und Antichristi* which circulated widely around Wittenberg during the early part of the sixteenth century [1]. This pamphlet, authored by Martin Luther and produced in the workshop of Lucas Cranach is composed of contrasting images, one set showing familiar scenes from the life of Jesus, while the other shows the pope acting in ways that are in stark contradiction to the life and teachings of Jesus, thus characterizing the pope as the antichrist. Little attention has been given to this pamphlet and the way in which it conveyed important anti-papal sentiments.

2. Experiment, Results, Discussion, and Significance

While contemporaries of Martin Luther were focusing primarily on the devotion paid to images, Luther sought to reform other doctrines which were not supported by Scripture and which he believed, were leading Christians away from a foundational faith in Christ. For instance, Luther spoke out against what he believed to be a perilous veneration of the saints and the unfounded belief in saintly intercession. The cult of the Christian saints and martyrs, to Luther, had begun to more closely resemble the polytheistic religions of the Graeco-Roman world. Luther believed that the veneration paid to a saint’s relics was inherently dangerous to true believers, because it caused the faithful to stray from a focus on Christ. He believed the same was also true concerning belief in the intercession of the saints, calling it “a dangerous and offensive way of worship, because people are so easily accustomed to turning from Christ; they quickly learn to put more confidence in the saints than in Christ himself.” [2]

The plates of the *Passional Christi und Antichristi* that I have selected to discuss here are #1-6, which comment on the pope’s abuse of authority, #19-20, which illustrate the church’s greed, and #23-24, which highlight the church’s promotion of the sale of indulgences. Plates 1 and 2 illustrate a pope claiming authority over the emperor in contrast to Jesus, who denounces any role as king over an earthly kingdom. While Jesus is shown running from those attempting to proclaim him as king, the pope is shown proudly wearing a crown on his head. It is Jesus’ proclamation in Luke 22:26 that exemplifies the message being represented in these plates, namely the concept of greatness that Jesus wishes his apostles to model after his death. Although Jesus is the leader of his followers he occupies a place as their equal at the Last Supper. The pope, on the other hand (as will be especially seen in the other plates), has gone to great lengths in order to secure his authority and aura of superiority over the rest of mankind.

Plates 3 and 4 of the *Passional Christi und Antichristi* illustrate the document, known during the Middle Ages as the *Donation of Constantine*. In plate 3, Christ is shown being crowned with thorns and mocked by the soldiers prior to his crucifixion. In contrast, plate 4 shows a pope being crowned as a king and honored by those in attendance. The *Donation of Constantine* is based upon a legend believed to have originated in the fifth century which helped to promote Constantine’s image as a devout believer in the teachings of Christianity. By the eighth
this legend had developed further to include this emperor’s alleged donation of a substantial amount of authority to the office of the bishop in addition to numerous allotments of land and property [3].

Plates 5 and 6 of the Passional Christi und Antichristi demonstrate the magnitude of error with which the papacy came to be viewed throughout the Middle Ages. Plate 5 shows Jesus washing the feet of his disciples prior to the Last Supper, whereas, in plate 6, an emperor has knelt to kiss the foot of the pope. These plates are understood to illustrate the Dictatus Papae, believed to have been written by Gregory VII (1073-85 C.E.) at the end of the eleventh century [4]. The Dictatus Papae expresses the complete, unquestionable authority of the pope. Luther was appalled by the aura of superiority with which the pope exhibited. Gregory’s affirmation of papal authority was upheld by Boniface VIII (1294-1303 C.E) in his papal bull, Unum Sanctam (1302) and was confirmed at three of the twelve sessions of the Fifth Lateran Council (1512-17 C.E.) [5].

Plates 19 and 20 illustrate the church’s greed and abuse of authority. Plate 19 depicts Christ ordering his followers to rid themselves of all their worldly possessions. In the text accompanying this image reference is made to Matthew 10:8-10, in which Jesus commands, “Freely you have received, freely give. Do not take along any gold or silver or copper in your belts; take no bag for the journey, or extra tunic, or sandals or a staff; for the worker is worth his keep.” However, in plate 20, a pope has commanded that bishops should not be placed in a town so small that the position would be of little gain or benefit.

Plates 23 and 24 describe the abuses involved in the selling of indulgences and highlight the perceived corruption of the church’s marketing of indulgences. In plate 23, Christ is shown driving the moneylenders from the temple and overturning the merchandise tables. In the text below the image, John 2:15 is given, which states, “So he [Jesus] made a whip out of cords, and drove all from the temple area, both sheep and cattle; he scattered the coins of the money changers and overturned their tables.” On the right, in plate 24, however, a pope is shown selling indulgences on a table inside a church.

3. Conclusions

In conclusion, it is clear that during the Middle Ages the papacy, according to Luther, had allowed itself to become increasing corrupt. This is most certainly because they had been able to generate a great deal of income for themselves from the pilgrims that flooded into the city of Rome and other pilgrimage destinations scattered throughout Europe. In addition to promoting the cult of the Christian saints and martyrs the papacy had seemingly encouraged idolatry by emphasizing both, the primacy of holy relics, and the intercessory powers of the saints and martyrs. No longer did the pious need to hold complete faith in Christ when many different saints could be called upon in times of need and distress. Martin Luther’s ideas of church reform found expression in the polemical pamphlet the Passional Christi und Antichristi. This pamphlet mixed together a perfect combination of text and picture which aided it in its popularity.

4. Acknowledgements

I would like to thank Dr. Lasine in the Department of Religion for his comments and help with editing. I would also like to thank Dr. LeZotte in the Art History Department for her help beginning this project and helping me at various stages along the way.

Risk Factors and Interventions with Sexually Exploited HRTY

Karen Countryman-Roswurm* and Dr. Brien Bolin

School of Social Work in Conjunction with Center for Community Support and Research, College of Liberal Arts and Science

Abstract. This evaluative study sought to answer the questions: “What are the precursors and/or risk factors that make certain youth more likely to become involved in domestic teen sexual exploitation (TSE)? And, if such high risk youth receive a cognitive-behavioral/psycho-educational peer group intervention, will their vulnerability decrease due to an increase in protective factors? This study reports findings of a group design in which a pre-test/post-test was given to 23 Homeless, Runaway, and Throwaway Youth (HRTY) who attended 10 sessions of a psycho-educational therapy group. Associations between risk factors and vulnerability to sexual exploitation and/or relationship violence, improvements in measures (including knowledge about healthy relationships, leaving an abusive relationship, reported improvement in relationships, etc. as well as with the Rosenberg Self-Esteem Scale) are reported. This study supports the use of psycho-educational peer group therapy in building protective factors, thus increasing resiliency.

1. Introduction

Teen sexual exploitation (TSE) is the most hidden form of child abuse in the United States today [1]. It is the modern form of slavery which is “now tied with the illegal arms trade as the second-largest and second-fastest-growing criminal enterprise in the world—both of them trailing only the illicit drug trade” [2]. Flowers reports that “it is estimated that there are well over one million teenagers active as prostitutes” [3]. Davis emphasizes this problem by stating that “Every year, an estimated two million juvenile prostitutes between the ages of five and fifteen in the United States enter the sex market” [4]. These numbers speak to the magnitude of this social problem.

The terms teen, youth, and child may be used interchangeably and includes ages 13-21. TSE refers to coerced or forced sexual acts in exchange for survival needs; a transaction in which the body of a youth is treated as a commodity. Relationship violence includes verbal, emotional, physical, and sexual abuse. HRTY refers to unaccompanied youth without adequate stable housing, regardless of their reasoning for leaving home.

Risk Factors

Teen relationship violence (TRV) is explained by The National Center for Victims of Crime (NCVC) as “abusive and violent behavior in teen dating relationships” which reflects “the perpetrator’s desire to control and dominate the victim” [5]. TSE is a hidden form of TRV where a dating partner grooms, manipulates, and forces the youth into exploitation. Girls involved in TSE often report to believe that the one who acts as their pimp is their boyfriend [1].

In addition to TRV, studies demonstrate that being a HRTY is what puts one at greatest risk for TSE [3, 4, 7]. Flowers states “most teenagers who sell sexual favors are runaways” [7]. Halcón and Lifson report, “over one fifth reported a history of survival sex or receiving money, drugs, clothing, shelter, or food for sex” [8]. The number of HRTY experiencing these tragedies have been estimated to be over one million, but “despite their large numbers, HRTY are an understudied and undercounted population” [9]. Thus, many HRTY often lack appropriate care.

Sexually exploited youth have histories of abuse, neglect, and trauma. As Halcón and Lifson explain, “Risk behaviors in adolescents tend to cluster, meaning that young people engaged in risk behaviors are often engaged in more than one” [8]. The risk factors which lead to youths’ risky behaviors are also clustered. These factors affect the early life experiences and perpetuate the cycle of victimization in the lives of youth. Out of 40 qualitative interviews with HRTY in a study by Tyler and Johnson, “90% had experienced physical abuse and one third had experienced sexual abuse” [10]. Flowers adds that “many have been victims or witnesses to physical and emotional abuse, neglect, or domestic violence” and in fact, “studies show that sexual abuse, in particular, is a significant predictor of adolescent girl prostitution” [7].

Methods

The subjects include teens ages 14-21. The sample consisted of 23 participants who were involved with a local Street Outreach Program (SOP). Fifty-six and one half percent of the participants within this study were female,
34.8% identified as male, and 8.7% reported their gender/sex as other. The mean age of subjects was 16.04 and the race of participants comprised of 39.1 percent Caucasian, 21.7% African American, 8.7% Hispanic, 13% Native American and 17.4% Bi-Racial. All subjects attended/participated SOP groups voluntarily. Two groups were utilized in this study: one containing males and females and another group containing only females.

The data for this research was gathered through a pre/post-test which, other than the Rosenberg Self-Esteem Scale [12], were original items developed by the authors. The primary author facilitated the 10 group/weekly interventions. The independent variables within this study are the risk factors and the intervention group. The dependent variables are TSE and the marked reduced risk due to the group intervention.

Findings established some of the indicators of high-risk youth including: 87.0% of youth reported that their parents were not married, 60.9% had been in SRS custody, and 69.6% had stayed in a shelter and/or group home. Furthermore, 60.9 percent of youth reported being pushed, shoved, or grabbed in anger by a caregiver, 82.6% reported that someone caring for them has slapped them in the face or head, 56.5% had thought about harming themselves, 73.9% had used alcohol, and 69.6% reported to have used drugs.

In relation to whether risk/vulnerability had decreased, and supporting research on applicable interventions [13,14,15], 56.5-69.6% reported group had taught them skills which improved relationships with self, peers, family, and partners. 82.4% reported group to be “very helpful” in identifying the signs of healthy versus unhealthy relationships, 70.6% in helping set boundaries, 88.2% in understanding what to do if in abusive relationship and/or being sexually exploited, and 70.6% in how to help themselves or someone else who is being abused and/or sexually exploited. 82.4% reported feeling less likely to become involved in an abusive relationship, 70.6% felt less likely to become involved in sexual exploitation, 11.8% reported that they had left an abusive relationship, and 23.5% of the young people reported that because of group, they no longer exchanged sex for food, drugs, or money.

**Conclusion**

Behind percent is a human face, and more important than means and standard deviations, is a young life hungry for opportunities of exploration and growth. 2 youth reported that they had left an abusive relationship because of group. 4 youth reported that because of group, they had stopped exchanging sex for food, drugs, or money. This change, which demonstrates the resiliency of this population, should be celebrated. It is change which extends its influence to future generations of children may have been born into homes fraught with violence.

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Speech-Language Pathologists’ Self-Assessment of Knowledge Regarding Medications to Treat Behaviors Associated with Autism Spectrum Disorder

Daiquirie Crumrine*1, Trisha Self1, and LaDonna S. Hale2

1Department of Communication Sciences and Disorders and 2Department of Physician Assistant, College of Health Professions

Abstract. Children with Autism Spectrum Disorder (ASD) are often prescribed medications to help control self-injurious behaviors, aggression, compulsive behaviors, and hyperactivity. Speech-Language Pathologists (SLPs) should be familiar with medication-related behavior changes and side effects. The purpose of this study was to evaluate SLPs’ self-assessment of knowledge regarding medications prescribed to children with ASD. SLPs registered with the Kansas Speech-Language Hearing Association were provided a link to an online survey. The response rate was 13%, (n = 56). Overall, 88% of respondents felt they had a good understanding of ASD characteristics; but only 15% felt they had a good understanding of ASD medications. Only 14% were satisfied with their medication knowledge, 79% wanted to be more knowledgeable, and 60% felt they knew where to locate medication information. SLPs that completed continuing education were more likely to be satisfied with their knowledge regarding ASD characteristics than with ASD medications.

1. Introduction

Autism Spectrum Disorder (ASD) is one of the fastest growing developmental disabilities in the United States occurring in 1 in 150 births. In 2006, approximately 194,000 students ranging from 6 through 21 years of age were identified as having ASD and receiving special education services [1]. Many children with ASD exhibit distinctive behavior patterns such as: hyperactivity, inattentiveness, impulsivity, aggression, irritability, self-injury, obsessive compulsiveness, and anxiety. These behaviors often inhibit their ability to participate in educational, social, and family activities.

A study of national Medicaid data from 2001 revealed that 56% of children with ASD were prescribed at least one psychoactive medication per year and 20% of those children used ≥ 3 concurrent psychoactive medications [2]. In a 2002 analysis of a large national insurance database, approximately 70% of the children diagnosed with ASD, ages 8 to 21 years, received at least one psychoactive medication annually [3]. The medications prescribed to help alleviate challenging behaviors in children with ASD often have side effect profiles that include neurological, cognitive, behavioral, and cardiovascular. The side effects of these medications range from mild to life-threatening.

SLPs are likely to observe, recognize, and manage medication-related behavior changes and side effects, as well as assist in decision making regarding optimal treatment for children with ASD. Therefore, they are vital members of the child’s team and should be as knowledgeable as possible regarding the medications associated with treatment of ASD.

2. Methods, Results, Discussion, Significance

Methods: A cross-sectional survey was conducted with all 435 SLPs registered with the Kansas Speech-Language Hearing Association (KSHA). The participants were provided with a link to the 22 item online survey via e-mail addresses that were obtained through the KSHA membership directory. The overall survey response rate was 13%.

Data Analysis and IRB Approval: Statistical significance was set at \( p < .05 \). Descriptive data were reported using means ± standard deviation or percentages as appropriate. Frequency data were compared using the Chi square test. Respondents marking “strongly agree” or “agree” were considered to be satisfied with their knowledge. This project was approved by the WSU IRB.

Results, Respondent Characteristics: Of the 56 SLPs surveyed, 55% practice in a public school setting; 20% reported having no individuals with ASD on their caseload and 56% reported having between 1 – 20% on their caseload. In addition, 82% felt they were likely to provide services to individuals with ASD in the future. Thirty-six percent of SLPs who did provide treatment to individuals with ASD indicated that some of those individuals were taking medications to treat behaviors associated with ASD.
Results, Self-assessment of Knowledge Regarding Characteristics of ASD: More SLPs were satisfied with their knowledge regarding characteristics of ASD as compared to medication knowledge. SLPs who completed continuing education (CE) or workshops on ASD characteristics were more likely to be satisfied with their knowledge as compared to those who had not, 90% vs. 71% [$X^2 (2, N = 55) = 7.17, p = .028$]. Completion of prior academic coursework on ASD characteristics did not significantly affect self-assessment of knowledge in this area $X^2 (2, N = 56) = 4.34, p = .114$. Respondents with a higher percentage of ASD patients on their caseload were no more likely to have higher satisfaction with their knowledge of characteristics, $X^2 (6, N = 55) = 9.14, p = .166$.

Results, Self-assessment of Knowledge Regarding Medications Associated with ASD: SLPs who completed CE or workshops on the medications used to treat behaviors associated with ASD were more likely to be satisfied with their knowledge as compared to those who had not, 50% vs. 7% [$X^2 (2, N = 54) = 15.81, p < .001$]. SLPs who completed academic coursework on the medications used to treat behaviors associated with ASD were more likely to be satisfied with their knowledge as compared to those who had not completed such coursework, 75% vs. 10% [$X^2 (2, N = 55) = 12.72, p = .002$]. Respondents with a higher percentage of ASD patients on their caseload were no more likely to have higher rates of satisfaction with their medication knowledge, $X^2 (6, N = 55) = 6.64, p = .355$.

Discussion: Participation in CE and academic coursework were both associated with higher self-assessment of knowledge regarding ASD medications. Participation in CE, but not academic coursework, was associated with higher self-assessment of knowledge in regards to the characteristics associated with ASD; however, this may not be an important finding due to the fact that overall self-assessment was very high. As expected, self-assessment of knowledge was much higher for ASD characteristics than for medication, especially in SLPs who lacked prior CE or academic coursework. SLPs' self-assessment of knowledge regarding medication was very low; however, 60% reported knowing where to locate medical information if needed. An important limitation of this study is the low response rate, 13%, which indicates that these results may not be representative of all Kansas SLPs.

Clinical Significance: SLPs providing treatment to individuals with ASD should have a general knowledge of the most commonly prescribed medications, an understanding of why the medications were prescribed, and how they may improve the quality of life for the individual and family. SLPs should also have an understanding of the medications’ most common and more serious side effects. This study revealed a need to provide CE for SLPs to increase their knowledge related to medications used in the treatment of ASD.

3. Conclusion

Self-assessment of knowledge regarding ASD medications was low; however, prior CE was correlated with higher self-assessment of knowledge. Thus, providing CE for SLPs may increase medication knowledge.

References:
Statistical Presentation of the Flight Environment of the Propellers on Commuter Aircraft

Johann Dorfling*, Linda K. Kliment, Kamran Rokhsaz

Department of Aerospace Engineering, College of Engineering

Abstract. Data obtained from digital flight data recorders installed on a fleet of 27 Beech 1900D airliners are used to assess the actual operational environment of propellers on commuter aircraft. The data consists of 910 complete flights and 589 flight hours. The short duration takeoff rotation is identified as the most severe phase of operation with regard to vibratory loads on the propeller blades resulting from a tilted inflow angle. Also, normal accelerations data, which reflect the turbulence experienced in flight, is converted to the resulting change in the propeller inflow angle. Increasing altitude shows a significant reduction in the frequency and magnitude of the inflow angle variation caused by gusts. The information is presented in statistical formats that could enable the FAA, manufacturers and operators to better understand and control those factors that influence the structural integrity of these components.

1. Introduction

The Wright brothers were the first to build and use an effective aerial propeller – a component without which their historical flight at Kitty Hawk on December 17, 1903 would never have taken place [1]. More than a century later, propellers are still widely used on a variety of aircraft as they offer unmatched propulsive efficiency over their jet counterparts. Turboprops are from 10% to 30% more fuel efficient than turbofan aircraft, thus it is hardly surprising that turboprop commuter airline manufacturers reported record sales in 2007 [2, 3, 4]. Propeller driven aircraft are not yet capable of the same cruising speeds as turbofan or jet propelled aircraft. However, in the commuter airline role, which is characterized by shorter flight distances, the speed advantage of jets is a moot point. Thus it makes more economic sense for an airline to operate turboprop aircraft in the commuter role.

With the increasing number of turboprops operated by airlines, it is becoming important to study the operational environment of these aircraft to aid in the improvement of regulations, and ultimately the safety of these aircraft. A previous study focused on operational loads of the Beech 1900D, with no particular emphasis on the propeller usage [5]. The objective of this study is to define and describe the operational environment of the composite propellers on the Beech 1900D.

2. Method of Analysis and Results

2.1 Propeller Inflow Angle

The propeller inflow angle, $\psi$, results from the angle of attack, wing upwash angle, and engine nacelle tilt angle. These angles are shown schematically in Figure 1. Aircraft angle of attack, $\alpha$, is the angle between the zero lift line of the aircraft and the direction of the airflow approaching the aircraft; upwash angle, $\varepsilon_{\text{upwash}}$, arises from the curvature of the streamlines upstream of a lifting system; the nacelle tilt angle, $\psi_{\text{tilt}}$, is the angle of the propeller shaft relative to the aircraft zero lift line. Detailed geometric information of the Beech 1900D was not available, and thus this angle was not included in the derivation of the inflow angle.

2.2 Takeoff Rotation

Aircraft operational data was separated into two broad categories – flight and ground operations. These categories were further divided into various phases of operation. One of these phases was the takeoff roll and was identified using the airspeed data. When the recorded airspeed exceeded 50 knots with an increasing trend, a takeoff roll was assumed. During the takeoff roll the aircraft pitch attitude was averaged. A change of more than two degrees from this average value was called the point of takeoff rotation, and within the 10 seconds following this point the aircraft would become airborne.
Figure 2 shows the normal probability density of the inflow angle at liftoff for various wing flap positions. The most commonly used takeoff flap setting (i.e. approach flaps) resulted in a mean inflow angle of six degrees. The airspeed at the point of liftoff was the lowest at which the aircraft would be flown for the remainder of the flight. Upwash angle decreased with increasing airspeed, thus the maximum upwash angle was realized at this point. Coupled with a high angle of attack, the resultant inflow angle was also the maximum experienced during a flight. Consequently the propellers became subject to the largest once-per-revolution (1P) vibratory loads at liftoff.

2.3 Atmospheric Turbulence

The turbulence that an aircraft experiences in flight is recorded in the normal accelerations data. However, loads caused by maneuvers are also captured. In order to separate the gust loads from maneuver loads, a method developed by the University of Dayton Research Institute was used. Details of this method can be found in Reference 5.

From the separated gust loads the derived gust velocity was calculated using an estimate of the aircraft lift-curve slope [5]. The derived gust velocity is in the vertical direction, thus the change in inflow angle, $\Delta\psi$, due to a gust is simply the arctangent of the ratio of the gust velocity to the true airspeed of the aircraft. This quantity was obtained for the climb, cruise and descent phases of flight and was grouped into the altitude band in which it occurred. This data was then converted to the cumulative occurrences per 1000 hours. The results presented in Figure 3 are the cumulative occurrences per 1000 hours of $\Delta\psi$ during the cruise phase of flight. As can clearly be seen in this figure, the frequency as well as magnitude of gusts experienced decreased significantly with increasing altitude. Very rarely, fewer than once per hour, did $\Delta\psi$ exceed 2.5 degrees. Since the angle of attack during cruise is relatively small, the total inflow angle likely did not exceed the inflow experienced during the takeoff rotation. This reinforces the claim that the most demanding phase of operation for the propellers was the takeoff rotation.

3. Conclusions

Flight data from a fleet of Beech 1900Ds was analyzed to determine the operational environment of propellers on commuter aircraft. Results pertaining to the inflow angle during the short duration takeoff rotation were presented. It was shown that the largest inflow angle is experienced during takeoff rotation, resulting in the largest vibratory loads on the propeller. Effect of atmospheric turbulence was shown to decrease with increasing altitude. The results were presented in statistical formats to enable interested parties to better understand and control the factors that influence the structural integrity of propellers.

Parental Involvement in a Rural Consolidated School District

Natalie Grant, Kathleen Patterson, Lance Stout, Robin Surland

Department of Educational Leadership, College of Education

Abstract. The rural consolidated school district of Ingleside in South Central Kansas faces unique challenges in managing communication and providing opportunities for parental involvement and shared decision making. The lack of attachment to the school district was a deterrent for families as they held on to the identity of their home community. As students transition from the five elementary or K-8 schools in their diverse communities, into one consolidated high school, there have been unaddressed and emerging needs. The research team studied how the Ingleside District could better understand the needs and perceptions of parents and students as related to their involvement and to the overall decision-making processes. The researchers found that the Ingleside District has challenges in truly helping parents, teachers, and students join together as a unified consolidated school district. These challenges include developing transparent mechanisms and processes for engaging and inviting parents to participate. Through a new sense of unity, the school district and the community can create the capacity to face hard decisions still ahead of them.

1. Introduction

Rural consolidated school districts, like Ingleside, face unique challenges in managing communication and creating opportunities for parents to become and remain involved in school activities and decision making. This study has assisted a rural district in defining parental involvement and engagement. Secondly, this study identified perceptions of the Ingleside District parents from among the district’s diverse communities. The study identified barriers to parental involvement as well as solicited strategies to improve involvement and facilitate collaborative decision making.

The Ingleside School District is comprised of several communities consisting of multiple religious, socioeconomic, and cultural backgrounds. Students transition from the community elementary and middle schools into one consolidated high school. In this transition, Ingleside District leaders have seen a decrease in parent participation and speculate that parents fear a loss of identity with their hometown. Ingleside District parents may feel a lack of involvement due to but are not limited to: 1) Recent and previous consolidation efforts of the district; 2) Lack of communication among the individual communities in the district; 3) Lack of connectedness between the smaller communities of the district; and 4) Questions as to whether input is truly valued by decision makers.

Barriers to parental involvement become increasingly complex as students become more independent; as transportation issues override the interest or ability to participate in activities; and as parent’s emotional distance begins to match the district’s geographical distance.

2. Experiment, Results, Discussion, and Significance

Information was gathered from district leaders, school staff, and parents. The methodology for the research was predominately qualitative. Strategies for data collection included interviews, focus groups, archival document review, individual surveys, and observations. Random sampling was used to identify participants and the data collection processes were sensitive to cultural differences and community attachment issues. The study used an overarching framework of parental involvement developed by Epstein (1995), that identified parenting, communicating, volunteering, learning at home, decision making, and collaborating with the community as the main features of understanding parental involvement. By joining community attachment theory (Boyd & Bright, 2007) to Epstein’s thinking, the research team was able to broaden the scope of the framework to address the issues at hand. The three questions that emerged to guide the information gathering and the research process include the following: 1) What are the explicit and implicit expectations that district leaders have for parents? 2) What role does attachment to the school district, as a community, play in parental involvement? 3) How does the process of decision making in the district affect parent attitudes and perceptions?
Results. The research team found that the Ingleside District leadership has communication challenges with the flow between the school and the separate communities and in developing an awareness of the need to make special accommodations to reach all district members. An example of this challenge is email communication between the school district and parents. The schools in the district send out a daily email bulletin to parents. However, the district has no knowledge, at this time, as to which parents receive email and which do not. At this time, there is not a bi-directionality in the information flow between the district and the parents. Secondly, the researchers found that although the district is consolidated with regard to the high school, the parents do not share the notion of a single identity with that school; they still see themselves as members of their individual communities.

Discussion. Parental involvement in schools is a topic that is frequently discussed in the K-12 education world. Research has shown that indeed parent and family involvement typically declines as students transition to high school (Dornbush & Glasgow, 1996; Simon, 2004). However, in the Ingleside District, leaders believe the decline is more than typical. Our research has shown that the district, parents, and teachers all have their own perceptions of how to define parental involvement as well as in identifying the best practices of engaging parents from diverse communities. Overall, the population in each community is declining and continues to do so. This is coupled with a fear of identity-loss to the home community by the parents if they join into one district identity. This dynamic, more than parental involvement per se, is what the district must address. There is a need for the district to build unity through symbolic activities, ongoing decision making which intentionally includes parents, through stronger communication efforts that support and appreciate the diverse communities. For example, in the past, the district has used innovative team building decision-making activities using the Implication Wheel process. This kind of activity could mark the beginning of an ongoing dialogue rather than a one-time event. The ultimate challenge will be for the district to give voice to individuals in the communities; to empower groups to create dialogue; and share decision making from the onset of issues.

Significance. While parental involvement has been a focus of much discussion, the impact on rural communities receives less attention in educational research. The interactions that exist between the parents and the school must be positive and empowering building levels of accountability and trust (Epstein, 2008). This study demonstrates that the district needs to work to create a sense of district unity; to improve communication channels; to strengthen bi-directional information flow; and to build connections among the parents from different communities. The pressing issue that the district must face is the declining population and the resultant economic pressures this causes. By facing the issues collaboratively at the onset, the researchers believe that the district and community can unite with creative and novel solutions to their challenges. This not only assists the district of study, but also carries implications for other rural districts regarding their parental involvement policies and practices.

3. Conclusions

This research sought to examine the parental involvement level of one rural school district and assist in the development of transparent processes for parents to become more involved in district activities and decision making. Going beyond the acknowledgement of differences of the barriers, the district and parents will begin to honor its diversity and create accommodations that maximize the communities’ strongest resources-their people.

4. Acknowledgements

The research team would like to thank the Ingleside School District officials, staff, and especially the parents who have shared their feelings and perceptions. We also thank Dr. Jo Bennett, research advisor and the Educational Leadership Department.

Crack Arrest Capabilities in Adhesively Bonded Skin and Stiffener

Shamsuzuha Habeeb*, K.S. Raju

Department of Aerospace Engineering, College of Engineering

Abstract. The crack arrest capabilities and the load bearing characteristic of a stiffened and unstiffened panel subjected to uniform remote displacement field is examined in this paper. A four stringer stiffened wide panel is analyzed for a center crack, propagating towards the adjacent stringers. The linear elastic analyses indicated a decrease in stress intensity factor when the crack approaches the stiffener. The non-linear analysis with crack across the skin-stringer assembly indicated a reduction in strength relative to an unstiffened panel.

Introduction:

The continual need for light weight, large scale metallic structure has brought about a new set of problems related to fracture. In aircrafts weight is a critical problem, and can be addressed by using a thin skin and stringers. Stringers are usually joined to the skin using rivets or by adhesive bonding. Crack growth in stiffened panels joined by rivets has been studied extensively [1,2] when compared to stiffened panels joined by adhesive. Fracture analyses were conducted on a (adhesively bonded) stiffened panels using Franc2dl code with crack tip opening displacement (CTOA) fracture criteria. Comparisons of the stress intensity factor (SIF) and the load-crack extension on stiffened and unstiffened panels were made.

Analysis, Results, Discussions:

The stiffened panel is constructed entirely of aluminum alloy 2024-T3. A quarter symmetry model of the structural configuration considered is shown in the Fig.1. The 0.032in thick panel (skin) is 60 inches long and 40 inches wide with an initial center crack which is 5 inches long. The skin is stiffened by 4 longitudinal stiffeners which are 2 inches wide and have a thickness of 0.04 inches. A half symmetry model is analyzed using Franc2dl. A remote displacement field is applied to simulate tensile loading. The application of a displacement field ensures that the behavior of the panel beyond the peak value can be predicted. The adhesive bond between the skin and stringer is modeled using linear elastic constraint equations which utilize the relative displacements between the bonded parts and the adhesive shear modulus.

A linear elastic static analysis is performed and the stress intensity factor is calculated for both the stiffened and the unstiffened panels for various crack lengths keeping the same loading condition. Fracture occurs when the stress intensity factor reaches a critical value. A graph of SIF vs. crack length for both the panels is plotted in Fig.3. It can be seen that the stress intensity factor for an unstiffened panel keeps increasing with the increase in the crack length, but in stiffened panel the stress intensity factor decreases as the crack grows, increasing the load carrying capability of the panel. In this case, the crack propagates underneath the stringer. The SIF obtained using this analysis is inaccurate due to the negligence of plastic yielding of the stringer and the disbond growth that may initiate and propagate.

In the second analysis, the plastic deformation of the panel and stringer was included by conducting a non-linear analysis. However, the adhesive behavior was still linear elastic due to the limitations of the program. The CTOA (crack tip opening angle) criterion [3] was used to model crack extension under the prescribed loading. Unlike the previous case, due to the remeshing algorithm which is built into the program, both stiffener and skin had to be cracked when the crack length extended into the stiffened region. A graph of far-field stress versus the crack length shown in Fig.4 indicates that the load carrying capacity of the panel in case of stiffened panels is higher than the unstiffened panel until the crack touches the boundary of the stringer. When the crack grows into the stiffener region, the far-filed stress required to grow the crack is reduced which is opposite to what is indicated by the first analysis.

A cohesive zone model [4] would be more suitable for the current problem as it could address the crack growth in individual components (skin, stiffener and adhesive bond) without resorting to remeshing at each load step.
Conclusion:

Due to the limitations of Franc2dl with respect to automatic re-meshing, particularly in bonded layers the results depicted for crack lengths past the stringer boundary are questionable. Cohesive zone model (CZM) is a more practical method to overcome this problem; it represents the mechanical processes in the fracture process zone in front of the crack.

References:
Multivariate Isotonic Regression and Its Algorithms

Linda Hoffmann*,
Mentor: Dr. Xiaomi Hu
Department of Mathematics & Statistics, College of Liberal Arts & Sciences

Abstract. We use regression functions, which are the means of random variables, to interpret statistical inference. Often an order is imposed on the values of the regression function. Thus, we refer to the regression as an order restricted regression or an isotonic regression. In this paper we explain how to calculate multivariate isotonic regression. However, we investigate the case for a particular restriction on our elements. We impose relations between elements of the same row but not between rows. The technique is to decompose our multivariate model into univariate models so that prior knowledge about the simpler case can be used. Finally, we propose an algorithm to calculate multivariate isotonic regression. This algorithm could then be converted into a computer program.

1. Introduction

Regression models predict occurrences in the world in which we live. Often, we have prior knowledge about the unknown parameter space. For example, if we measure the amount of knowledge in mathematics of 7th, 8th and 9th graders, we can expect the quantity to increase before we actually collect data. Therefore, the methods used to do statistical inference are different than those for the ordinary case. With the prior knowledge of ordering, we can talk about order restricted statistical inference and more efficient results will be obtained.

2. Experiment, Results, Discussion, and Significance

2.1. Multivariate Isotonic Regression

The multivariate regression model is \( Y(x) \sim \mathcal{N}(\mu(x), \Sigma) \) with \( x \in \{x_1, \ldots, x_q\} \) being a predictor variable. Our index set is \( \Omega = \{i = 1, \ldots, q\} \) on which we put the quasi order «, which means it has the characteristics of reflexivity and transitivity \cite{1}. The value of the regression function at \( x_i \) is \( \mu(x_i) \in \mathbb{R}^p \). If we collect all those values, we can express \( \mu(x) = (\mu(x_1), \ldots, \mu(x_q)) \) as a matrix. Now, the restriction is put between the columns of \( \mu(x) \). If for instance \( 3«1 \), then \( \mu(x_3) < \mu(x_1) \). This matrix \( \mu(x) \) can be called isotonic \cite{1}.

**Lemma 2.1** The collection of all possible isotonic \( X \) will give us \( C \), a convex cone in \( \mathbb{R}^{p \times q} \).

Additionally, our columns relate if the difference of the two columns belong to a particular set \( D \), a convex cone \cite{1}.

Further, we may add that being in \( D \) means that each component of the difference of the two vectors is larger, smaller, equal to zero, or any real number. For the univariate order there exists only four different cases, which the next lemma reflects.

**Lemma 2.2** Let \( r(\cdot) \) be a mapping from \( \{1, \ldots, p\} \) to \{ "≥", "≤", "≤" and "≥", "≤" or "≥" \}. For \( x, y \) in \( \mathbb{R}^p \), define \( x < y \) if \( x r(i) y \) for all \( i = 1, \ldots, p \). Then \( < \) is a quasi order in \( \mathbb{R}^p \).

**Lemma 2.3** Let \( \mathcal{C}_i \) be the univariate isotonic cone with respect to a quasi order « in \( \Omega \) and the quasi order \( r(\cdot) \) as defined in **Lemma 2.2** in \( \mathbb{R}^p \). Let \( C \) be the multivariate isotonic cone with respect to « and \( < \) in \( \mathbb{R}^p \). Then \( X = (X_{(1)}, \ldots, X_{(p)}) \) in \( C \) if and only if \( X_{(i)} \) in \( \mathcal{C}_i \) for all \( i = 1, \ldots, p \).
Consider the problem of the age a child starts to walk, eat, and talk. An experiment with different treatments can be conducted:

\[
\begin{pmatrix}
\text{control group} & \text{group #1} & \cdots & \text{group # q} \\
\text{walk} & x_{11} & \geq & \cdots & x_{1q} \\
\text{eat} & x_{21} & \geq & \cdots & x_{2q} \\
\text{talk} & x_{31} & \geq & \cdots & x_{3q}
\end{pmatrix} : C_1, C_2, C_3
\]

As we see, we will have orderings between elements on the rows but not necessarily between different rows. Our goal is to find an estimate of a multivariate regression function under order restrictions. This function can be displayed as a matrix \( X \in \mathbb{R}^{\times q} \). It can be shown that the projection \( X^* = P_{\langle ; , \rangle}(X|C) \) is our multivariate isotonic regression or projection of \( X \) onto \( C \) induced by the inner product \( \langle ; , \rangle \) as specifically defined. Further, \( X^* \) exists and is unique in \( C \) such that \( ||X-X^*|| = \inf \{||X-Y||:Y \in C\} \). Therefore, we can compute \( P_{\langle ; , \rangle}(X|C) \).

The best estimation of an unrestricted parameter is given by the Maximum Likelihood Estimator (MLE). Thus, the MLE for \( \mu \) in the model described in the beginning is \( \overline{Y} \). Under the restriction that \( \mu \in C \), we need to project \( \overline{Y} \) onto \( C \). So, the projection onto the restricted isotonic cone gives us the restricted MLE of the multivariate regression function. Thus, this projection is often referred to as multivariate isotonic regression.

2.2 Algorithms for the multivariate isotonic regression

By Lemma 2.3 we can decompose \( C \) into \( C_1, \ldots, C_p \). This means that the multivariate isotonic regression can be found row by row. Then, the proposed algorithm needs three assumptions.

I. The inner product for the multivariate regression model is defined as

\[
\langle X, Y \rangle = \sum_{i=1}^{q} X_i Y_i, \text{for } X, Y \in \mathbb{R}^{\times q}.
\]

II. Our matrix is decomposable, such that

\[
C = \left\{ X = (X_1, \ldots, X_p) \in \mathbb{R}^{\times q} : X_i \in C_i \text{ for all } k = 1, \ldots, p \right\}
\]

III. Let \( C = C(k) \) then \( P_{\langle ; , \rangle}(X|C(k)) \) exists and is unique. This projection is computable [2].

Suppose \( Y = (Y_1, \ldots, Y_q) = (Y_{ij}^{(1)}, \ldots, Y_{ij}^{(p)}) \) is the matrix for which the projection needs to be computed. First, we initialize \( Y = \mu^{[0]} \), \( n = 0 \). Then we need to update \( \mu^{[n]} \rightarrow \mu^{[n+1]} \). The limit of the sequence \( \mu^{[n]} \) will give us \( P(Y|C) \).

After each row has been updated, we need to compute \( d = \max \{|\mu_{ij}^{[n+1]} - \mu_{ij}^{[n+1]}| : i = 1, \ldots, p; j = 1, \ldots, q \} \). We will use \( d \) as a measurement tool for when to stop the algorithm. If \( d > \delta_0 \), then we update each row of \( \mu_{ij}^{[n+1]} \); otherwise we stop and state that \( Y^* = \mu_{ij}^{[n+1]} \).

3. Conclusions

Multivariate isotonic regression was explained along with its concepts and its applications. Further, we studied a particular convex cone \( C \), which under the general assumption was decomposable into its univariate isotonic cones. Finally, an algorithm was introduced to solve multivariate isotonic regression.

4. Acknowledgements

I want to thank my advisor Dr. Xiaomi Hu for all his time guiding me through the process of writing this Master thesis paper. He patiently explained to me many questions I had and I would come up to his office every day if necessary. Without the job offer as a GTA by Dr. Ken Miller, I would not have started a Master program. Thanks.

Dielectric Properties of MWCNTs Reinforced Polyacrylonitrile (PAN) Nanofibers at Varying Temperatures

Khan, Waseem*. Ceylan, M.*, and Asmatulu, R*.

Mechanical Engineering Department, College of Engineering

Abstract: Electrospinning is one of the easiest and straightforward processes of fabricating nanofibers. In this study, MWCNTs in the range of 0%, 1% and 2% up to 15% were added into polymeric solution containing PAN and dimethylformamide, and morphology and dielectric properties of electrospun nanocomposite fibers at elevated temperature were studied. Dielectric properties were measured in the temperature range between 23 and 90 °C and it was found that the dielectric constant increased with increasing the carbon nanotubes content. This may be due to conductivity and polarization effects of the nanocomposite fibers.

1. Introduction
Electrospinning utilizes a high electric field on the surface of a polymeric solution to overcome the surface tension and produce a very slim charged jet. A Polymeric solution is held by its surface tension at the tip of the capillary tube. When a charge is applied, mutual charged repulsion induces longitudinal stresses. As the intensity of the electrostatic field is increased beyond a certain limit, the hemispherical surface of the solution at the tip of the capillary elongates to form a structure called a Taylor cone [1]. The jet first extends in a straight path for some distance, called jet length [2], and then instability occurs and the jet bends and follows a looping path. The electrostatic field elongates the jet thousands of times and the jet becomes very slim. Finally, the solvent evaporates, and fine submicron fibers are collected on a collector placed at some distance from the capillary as shown in Figure 1.

Figure 1: Schematic of Electrospinning Process

The dielectric constant $\varepsilon_r$ can be obtained from the measured capacitance $C$ with the help of the electrodes area $A$, the layer thickness $d$, and the vacuum dielectric constant $\varepsilon_0$ by using the following equation [3].

$$\varepsilon_r = \frac{C \cdot d}{A \cdot \varepsilon_0}$$

2. Experimental
2.1 Materials
Polyacrylonitrile (PAN) having molecular Weight 150,000g/mole was purchased from sigma Aldrich. Different wt % (0%, 1% and 2% up to 15%) of MWCNTs were dissolved in Dimethylformamide (DMF) and Sonicated for 30 minutes. Then PAN was added, and the solution was constantly stirred at 40 °C for 12h. MWCNTs were purchased from Fisher Scientific having diameter of 140 (+/- 30) nm and a length of 7 (+/- 2) microns.

2.2 Methods
Electrospun fibers were collected on a grounded screen, and dried in an oven at 60 °C for 8 hrs to remove all the residual solvent. A Scanning electron microscope (JEOL Model JSM -6460LV) was used to find out the fiber diameter and morphology. Figure 2 shows the nanocomposite electrospun fibers at various conditions. The dried nanofiber composites were sandwiched between two parallel metal plates forming a parallel plate capacitor. These
fibers were heated in a small furnace, and the capacitance was measured using a TENMA 72-370 CRL Meter. A K-type thermocouple thermometer IDEAL 61-312 was used to measure the temperature of nano-composite within the range of 23°C to 90°C.

Figure 2(a): SEM image showing 1% MWCNTs nanocomposite fibers obtained using PAN dissolved in DMF (90:10) at 1 ml/hr, 28 KV, and 25 cm distance

Figure 2(b): SEM image showing 15% MWCNTs nanocomposite fibers obtained using PAN dissolved in DMF (90:10) at 3.5 ml/hr, 25 KV, and 25 cm distance

3. Results and Discussions

Figure 3 shows a curve of dielectric constant vs MWCNTs content. Carbon nanotubes have better mechanical, thermal and electrical properties and therefore, the dielectric properties increases with the addition of MWCNTs.

Figure 3: Dielectric constant (PAN) VS MWCNTs (%).

Figure 4: Dielectric constant of PAN with different wt % of MWCNTs VS Temperature.

Figure 4 shows that as the temperature increases the dielectric constant increases. The increase in temperature increases the mobility of charge carriers, and this helps in increasing the dielectric constant. The mobility of charge carriers helps in faster conduction. The addition of MWCNTs increases the dipole moments and charge carriers concentration. This leads to an increase in the polarizability of the nano-composite, and therefore, the dielectric constant increases.

4. Conclusion

The PAN Nano-fibers with different Percentages of MWCNTs were prepared by an Electrospinning technique and dielectric constants were measured with varying temperature from 23 to 90°C. As the concentration of MWCNTs and temperature increase, the dielectric constant of polar polymer increases. PAN is a polar polymer and in polar polymer, the orientation polarization is additional to electronic and atomic polarization, which helps in faster conduction. As the temperature increases, the polarizability increases and the mobility of the charge carriers increases as well, and this helps in increasing the dielectric constant.

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Assessing the Career Aspirations, Family Structure and Ability to Succeed Among African-American Males

Felecia Lee*, Rhonda Lewis-Moss

Department of Psychology, College of Liberal Arts and Sciences

Abstract. The purpose of the evaluation was to compare the career aspirations, family structure, and ability to succeed of African American males to other groups. Four hundred and seventy three males were surveyed at the baseline and 491 surveyed at the follow-up. The results revealed that African-Americans were more likely to aspire to be athletes than other ethnic groups. Thirty five percent of African American males reported living with their fathers compared to 68% of other ethnic groups. African American males aspired to attend college before and after the intervention. The follow-up revealed that young men stated that they had more people to look up to and the amount of exposure to the program affected whether the heroes influenced their goals.

Introduction

The outlook for success for African-American males is bleak. For instance, African-American males are at a significant risk for poorer academic performance, school absenteeism, lower graduation rates and increased violent behavior. African-American males are more likely to drop out of high school than their white counterparts (18% compared to 14%, respectively) (Urban League, 2007), and are more likely to be suspended and expelled at schools (Noguera, 2008). In fact, more African-American males view sports or music as a more promising route to upward mobility than academic pursuits (Noguera, 2008). Not only do African-American males lead the nation in homicide (as victims and perpetrators), they are also incarcerated and convicted at higher rates (Noguera, 2008). According to the 2007 “State of Black America Portrait of Black Male” report, Black males under 25 years of age are 15 times more likely to die by homicide than their white counterparts (Urban League, 2007). There are risk factors as well as protective factors associated with the academic success of African American young men. One of those protective factors is having a positive male role model. This factor was the main aim of the Real Men, Real Heroes project which provided elementary, middle, and high school African-American male students with systematic exposure and interaction with positive African American adult male role models.

Experiment, Results, Discussion, and Significance

Participants and Setting

The participants in this study were 473 male adolescents ages 8-15 at baseline and 490 participants at the follow up. Our sample includes third, fifth, seventh and ninth grade males. The mean age for the participants in the baseline was 11 years old and the average grade was sixth. The mean age for the participants in the follow up sample was 12 and the average age was 7th. In the baseline data there were 212 African American participants (45%), 106 Caucasian (22%), 43 Asian American (9%), 32 Hispanic (7%), 19 Native American (4%) and 61 biracial (13%). The sample was very similar concerning the follow up. There were 235 African American participants (48%), 101 Caucasian (20.6%), 42 Asian American (9%), 43 Hispanic (9%), 7 Native American (1%) and 58 biracial (12%) (Four participants did not answer ) (.8%). Participants were surveyed from schools in Wichita, Kansas school district USD 259.

Procedure

The Institutional Review Board at Wichita State University approved this study. The schools that participated in the study were selected with the help of the assistant superintendent of high schools. Schools with the highest percentage of African American students were selected. There were three elementary schools, two middle schools and one high school. At the elementary schools and middle schools, the Behavioral Community Research and Action Team at Wichita State University administered the surveys. Intercom announcements were made for all 3rd, 5th and 7th grade male students. Surveys were administered to the students in either the classroom, auditorium, or cafeteria. The surveys were read aloud for the third-grade participants. At the high school, the guidance counselor administered the surveys. The Behavioral Community Research and Action Team returned to these same schools and repeated these survey procedures to gather the follow-up results.
Intervention
Trading cards that displayed the pictures and occupations of local heroes/role models were distributed to all elementary and middle schools in Wichita Kansas. These occupations ranged from pastors to principals to athletic directors. These same men were displayed throughout the community in television ads, bus signs, and billboards. They also attended events at the schools and within the community to provide exposure to the young men. For the high school students instead of issuing trading cards, they were provided with a weblog in which the young men were provided with the opportunity to express their views on a variety of issues including what makes someone a real man.

Measures
A survey was developed to ascertain information from the young men. The survey included 17 items in the baseline and 24 items in the follow-up. It was created by Drs. Rhonda Lewis-Moss and Jim Snyder. The survey consisted of questions concerning role models, activities that they like to participate in outside of school as well as future career and educational goals and in the follow-up how much exposed to the Real Men, Real Heroes campaign and intervention

Results
The results revealed that only 35 percent of African American young men live with their fathers while 68 percent of non African American males live with their fathers. Before and following the intervention a high percentage of African American males desired to become professional athletes (30 percent and 27.1 percent, respectively). Before and after the intervention African American males also aspired to attend college as much as any other racial group (74 percent at both times). Following the intervention an exposure variable was created to determine whether the amount of exposure that the young men received affected if they felt that the Heroes had changed their future goals and aspirations. The results showed that there was a statistical difference between the groups that received low, medium and high exposure, $\chi^2 (2, N=392)=30.97, p<.001$. The results also revealed that following the intervention young men stated that they had more individuals to look up to in their community, 72 percent before the intervention and 83 percent following the intervention.

Conclusions
Taken together, it is important to understand the opinions of young people in order to design effective interventions and to determine their thoughts and perceptions about their career aspirations, lifestyles and future aspirations. Although the suture academic outlook of African American males appears bleak, there are protective factors that are associated with the academic success of African-American males and positive outcomes. Interventions and programs that are developed must be tailored to fit the unique situation of young African-American males. Success is a possible outcome for African-American males. It seems that they desire success in academics as well as in their future professional careers. They just may not know how or know what to do to get there. With the assistance of effective interventions that provide mentoring and positive role models for African-American males, improvement in academic outcomes and other positive outcomes is attainable.

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Postmodern Places

Jodi Lightner*

School of Art and Design, College of Fine Arts

Abstract. Art is able to communicate and transport the viewer to a different place in their mind’s eye. The representation of places also connects the artist and viewer in a shared experience and understanding of space. The challenge for postmodern painters is to understand how an experienced place can be represented effectively. They must consider the objects and structures that occupy the place, as well as the purpose for the environment, the experience, and how that experience relates to self and others. With many contemporary artists utilizing installation and three-dimensional formats to create a dialog about place, two-dimensional artists must consider stepping away from traditional formats and contrive alternative ways to represent place. Examination of contemporary two-dimensional works has shown the popularity of four distinct artistic elements that address place: linearity and mark making, process, associations, and altered perspective and representation.

1. Introduction

“A house is a relatively simple building. It is a place for many reasons. It provides shelter; its hierarchy of spaces answers social needs; it is a field of care, a repository of memories and dreams” [1]. As individuals we all have a place called house. Our memories of our childhood homes, as well as the goals and the dreams for the future, are carried into our present dwelling. It’s the memories, as well as the present living, that make the place of house significant. This is the experience of place. It is not limited to our house, but extends to all spheres of our interactions. Yi-Fu Tuan defines experience as the modes for which we construct our reality [2]. Gaston Bachelard writes that our experience of the location is created into meaning when we make a place our own by connecting to it in a physical, emotional or spiritual manner [3]. Therefore place is where connections within physical locations have occurred, which are meaningful enough for us to incorporate into our personal history. Artists interested in depicting this connection to place have a challenge to represent the physical world and the experience of phenomenology. Throughout art history, place was documented through direct observation and emphasized an accuracy of reporting. In contemporary art, place is no longer simply a recording of objects as objects, but a translation of the artist’s experience in the given place. As a two-dimensional artist, I am interested in knowing how an experienced place is visually represented in contemporary, two-dimensional art. Examining current practices of painting and drawing will provide the answers to how artists in a postmodern or post-postmodern practice communicate a sense of place.

2. Experiment, Results, Discussion, and Significance

I used a sampling of international and national two-dimensional artists active in today’s art scene who indicate place as key concept through personal statements or articles written about their work. Four elements of communicating place on a two-dimensional picture plane emerged through my research: linearity and mark making, process, association, and altered perspective and representation.

The use of linear marks and specific mark making were the most common elements used when depicting place. These elements were found most commonly when the work included modes of drawing. The lines or marks, whether gestural or calculated, indicated atmosphere, emotion, or form. Subject matter and intent determined the characteristics of those marks. Experiences of architectural places tended to be geometric and calculated while places of experience tended more toward the expressive and gestural marks. Key examples of the use of line are found in Julie Mehretu’s work. Her drawings and paintings are based on cities, monuments, systems, and infrastructures that are man made and then depicted as vistas of memorial experience, the experience of day-to-day life (Fig. 1). Her focus mirrors that of other artists who are interested in presenting place as more than just the buildings that exist there, but of the transitions that occur through the use of expressive lines or marks.

The process of making the work is another popular element in depicting place. An artist can come to understand or re-experience location by utilizing a predetermined process. Tracing the floor and everything found there, Ingrid Calame discovers stain by stain the identity of a place and the memories of those who witnessed and created the
marks. In recently tracing the skid marks on the Indianapolis Motor Speedway, she continued her endeavor to
document and present a portrait of a cultural site through its ground level marks (Fig. 2). The work goes through
many stages before the final paintings are completed, and in tracing and retracing the stains, her portrait emerges.

Associations with objects or other events give artists another approach to incorporate place into their work. Objects
are frequently used as symbols or metaphors for the experience of the place and portray the artist’s emotions about a
particular place by associating it with another component. Toba Khedoori pushes this element to the extreme by
removing all tangible evidence of the environment from her works and relying solely on isolated objects to carry the
message (Fig. 3). By isolating a given object, such as chairs, from their natural interior environment and leaves them
floating on the picture plane, giving viewers a chance to bring their own memories and associations to the meaning
of the work.

Another element consistently detected is altered perspective and representation. As stated by artist Guillermo
Kuitca, his work, “Transports viewers from interiors to exteriors, shaking up perspective and pushing beyond the
confines of their expectations…[and] changing our orientation to the social spaces we inhabit”[4]. The subject of his
current work is the interiors of famous opera houses and concert halls in the world. However, instead of depicting
the scene from the concert-goer’s vantage, he reverses the perspective and uses the performer’s view from the stage
instead [Fig. 4].

3. Conclusions

The findings of my research indicated that there are some prevalent elements connecting the works of two-
dimensional artists who are focused on place and the experience of place. Those main elements include linearity and
mark making, process, association, and altered perspective and representation.

[1] Yi-Fu Tuan, Space and Place The Perspective of Experience, University of Minnesota, Minneapolis, 1977, p.164.

Fig. 1. Julie Mehretu, Untitled, 2001, ink and acrylic on canvas, 60” x 84”

Fig. 2. Ingrid Calame, From #258 Drawing (Tracings from the Indianapolis
Motor Speedway and the L.A. River), 2007, enamel paint on aluminum,
72” x 120”

Fig. 3. Toba Khedoori, Untitled (Seats) detail, 1996, oil and wax on paper, 11’6” x 25’

Fig. 4. Guillermo Kuitca, Carnegie Hall, 2002, mixed media on paper, 15 1/8” x 12 5/8”
Student’s Preparedness in the 21st Century: 
A Suburban District’s Perspectives

Larry Callis, Dale Herl, Lisa L. Lutz*, Mark Watkins 
Faculty: Glyn Rimmington

Department of Educational Leadership, College of Education

Abstract. Secondary students are graduating into a world that is increasingly interconnected, interdependent and culturally diverse. This dynamic environment requires a level of intercultural and information literacy that is presently recognized by some school district leaders and teachers in a mid-western suburban school district as a necessity for its graduates. This study focused on district stakeholder perspectives about: the current intercultural and information literacy of graduates; what is needed for future graduates; and requirements for instituting curricular changes to prepare its students for the 21st century. A qualitative methodology comprising focus groups, interviews, an online survey of key stakeholders and a document review were conducted. Critical social, social exchange and constructivist learning theories, underpinned by a constructionist epistemology, informed this study. The results should serve as an aid for awareness and planning in the school district in relation to curricular and instructional issues.

1. Introduction

Preparedness of high school graduates for the 21st Century, characterized by an increasingly interconnected, interdependent and diverse world, has become a national focus and priority. The realization that our graduates are in global competition for education and employment makes the augmentation of curricula all the more urgent [1]. Education and employment both increasingly involve interactions with people of other cultures [2]. The purpose of the study was to gather the perspectives of stakeholders in a mid-western suburban school district concerning preparedness of graduates for success in an increasingly interconnected, interdependent, culturally diverse society. Stakeholders included teachers, students, parents, community members, business leaders, administrators, and a member of the district’s Board of Education. District leadership was interested in infusing authentic global learning experiences into the curriculum to better prepare students for the 21st Century. District-wide integration of global learning opportunities would require the development of a shared vision among all stakeholders [3]. By implication, each stakeholder would need to be convinced that achieving systemic change would be possible with strong support in terms of infrastructure, professional development and curriculum redevelopment. Relevant global learning experiences have aided the development of cultural and intercultural competence [4]. Global learning involves interpersonal interactions between people in different parts of the world with the aid of modern communication technology [5].

2. Experiment, Results, Discussion, and Significance

Recognizing the difficulty of successful implementation of authentic global learning, the field study team developed a framework that includes qualitative assessment of stakeholder perspectives toward current graduate preparedness for the 21st Century and the need to be prepared any differently than what is already occurring. The field study team’s assignment was to explore stakeholder perspectives toward current graduates’ preparedness to function in 21st Century society; perspectives about the necessary attributes of graduates to function in 21st Century society; and stakeholder perspectives about how to move from the current state of preparedness to having attributes required to function in the 21st Century. The study was limited to high school teachers and students, parents, business and community members, district administrators, and a member of the district’s Board of Education. Principal methods for data collection included an online survey (N=72), semi-structured interviews and focus groups (N=36), and document review. Collected data were analyzed using the constant comparative method [6] until themes and categories emerged. Specifically, this study provided an appraisal of stakeholder perspectives, allowing district leadership to identifying potential barriers in establishing a shared vision and open dialogue around curricula and instructional delivery methods for the integrations of authentic experiences for preparing students to function in 21st Century society. Without the investment of all stakeholders, designing and delivering a new curriculum will remain
a challenge. Whether in suburban, rural or urban settings, the very consciousness of global interconnectedness, interdependence and cultural diversity will determine educational system structures, mindsets and practices worldwide [7]. There is evidence of differences in perspectives among stakeholder groups. Knowing these perspectives will aid the district in upcoming planning and decisions for professional development and curricula.

3. Conclusions

Research indicated, to move forward, dialogue among stakeholders is essential. For instance, dialogue will be needed to construct a shared vision and to devise strategies, plans and processes to prepare 21st Century graduates. Voloshinov has stated, “…any true understanding is dialogic in nature. Understanding is to utterance what one line of dialogue is to the next…” [8]. Consideration for such dialogue could be given to existing collaborative structures and how they might be used to nurture local and global communication. Existing global synergies could provide models for sharing the district’s vision of what an education for preparing students to function in an interconnected, interdependent, and culturally diverse society. These synergies may include broadening language learning through immersion at an early age. This awareness can lead to new instructional practices that support the cultivation of adaptive intercultural competence [9]. Furthermore, these instructional practices may improve awareness of global interdependence and cultural differences in the education system.

Detection and Quantification of Ketamine HCl in Alcohol/Water Matrices using ESI-MS\textsuperscript{n} and LC-ESI-MS

Justin Lygrisse*, Martin Lapp, Kelsey Witherspoon and Michael Van Stipdonk

Department of Chemistry

Abstract. Drug facilitated date rape continues to be a problem around the world. Ketamine HCl (KT) has gained popularity since it is nearly odorless, tasteless, and colorless when dissolved in water/alcohol and a typical street dose (300-400mg) only costs $20-$25. A street dose of KT will send the victim into a dissociative state within 10-15 minutes and can cause temporary amnesia. Drug detection is paramount in the prosecution of drug facilitated date rape cases. Currently, detection of KT relies on urine or blood analysis. In this study we have developed a method for detecting and quantifying KT in a variety of different alcohols and mixed drinks.

Mass spectrometry (MS) was used to identify the presence of KT in the alcohol matrices. Liquid chromatography (LC) was used to separate the KT from the rest of the alcohol matrix. Quantification of KT was carried out both by MS and LC/UV absorbance using a series of external standards and plotting the concentration versus the signal intensity. Interestingly, it is possible to distinguish not only between different types of alcohol but also different brands of similar alcohol. KT was clearly visible in the spectrum of KT spiked drinks and did not show any interference from the alcohol matrix. Detection limits were found to be in the 100 picoM range and samples were stable for up to 7 days. This method has proven to be robust and a viable way to quantify KT in alcoholic beverages for up to 1 week with very low limits of detection.

Introduction

The department of justice reports that between 2001 and 2005 the annual rate of sexual assault on women was about 1 out of 2000\textsuperscript{[1]}. Included in this category is drug-facilitated sexual assault. KT is a drug that is highly incapacitating, and has been implicated as a date rape drug\textsuperscript{[2,4]}. The primary method of delivery for KT, when consumed involuntarily, is the consumption of alcoholic beverages spiked with the drug. KT symptoms are described as a dissociation of perception from sensation, which results in insensitivity to pain, feelings of alternate consciousness, well being, amnesia, out body experiences, etc\textsuperscript{[2,3,5]}. These symptoms are particularly detrimental to the victims of sexual assault as they may not recall or realize the extent of the crime committed. Detection of the drug is paramount for the prosecution of drug-facilitated date rape cases, but KT is metabolized rapidly by the body into norketamine and dehydronorketamine. Methods have been developed for detection limits as low as 5ng/ml of these metabolites in urine\textsuperscript{[6-7]}. However, because urine analysis needs be completed within two days of use, there is a significant need for alternative methods to detect KT that have a higher tolerance for delayed testing\textsuperscript{[8-9]}. In this study, we have developed analytical methods using LC-MS\textsuperscript{n} for identification and quantification of KT when found in a variety of different alcohols and have shown a minimum stability of KT analysis of 1 week.

Experiment, Results, Discussion, and Significance

Initially, KT was studied in water by collecting ESI-MS\textsuperscript{n} spectra of the stock standard solution. The dominant peak in the spectrum is at 238.1m/z which correspond to the KT [M+H]\textsuperscript{+} ion. Upon CID of KT, the dominant ion is a loss of 18 mass units. There is also a second ion with a loss of 31 mass units. This CID profile of KT was used to positively identify KT in the alcohol samples. The matrices of distilled alcohols, mixers used in mixed drinks, and mixed drinks were then determined by collecting positive and negative mode ESI-MS spectra.

The spectra were collected with no sample work up. The alcohols used were whiskey, gin, rum, vermouth, tequila, and vodka. Other beverages tested were cola, tonic water, and lemon juice. The mixed drinks used were whiskey and cola, gin and tonic water, vodka and lemon juice, and vermouth and gin. The spectra show a distinct matrix for each alcohol and mixed drink making it possible to distinguish not only between different types of alcoholic drinks but also distinguish different brands from one another.

Once the matrices of the alcohol were collected, the alcohol samples were then spiked with KT. The spectra show the presence of the 238m/z ketamine ion in the matrix of the alcoholic beverages. ESI-MS/MS spectra were collected on the KT peak and the CID spectra confirmed the presence of ketamine. ESI-MS results show a direct correlation between signal intensity and the concentration of the KT added to the solution making it possible to construct a calibration curve by plotting signal intensity versus concentration. The concentration of the samples calculated from the calibration curve had less than a 2% error. As well, 10mL of the stock standard solution was
mixed 1:1 with the different alcohols and mixed drinks and was allowed to stand in a glass cup. After 20 minutes, the alcohol/KT solution was discarded and the residue was allowed to air dry overnight. A cotton swab was used to swab the inside of the cup and was placed in 1mL of 1:1 ethanol:water solution and shaken for 15 minutes. KT was present in the extract, allowing the analysis of residue on a bottle or glass.

Detection limits were determined by running a series of dilute spiked alcohol samples as well as a series of dilute standards. Detection of ketamine was shown down to 100 picomolar concentrations in all of the alcoholic beverages studied as well as for the standard solutions. Stability studies were also conducted under ambient benchtop conditions. Typically samples obtained and sent to a forensics lab will be analyzed in 48 hours or less. Standards and samples were stable for 7 days with less than a 1% decrease in molarity under bench top conditions.

Using an isocratic LC system, KT was successfully separated from the alcohol matrices. KT eluted at roughly 3.8 minutes and showed no interference from the alcohols and mixed drinks used. A calibration curve was constructed by plotting absorbance at 268nm versus concentration of known standards and was used to quantify samples of known concentration. The concentration of the samples calculated from the calibration curve had less than a 2% error.

Conclusions
ESI mass spectra were collected directly from samples of distilled liquor as well as from samples of mixers used to make up mixed drinks. The ESI mass spectra derived from the range of samples are distinct, thus demonstrating the ability to use ESI-MS to distinguish between different types of alcoholic beverages and even different brands of the same type of liquor. KT spiked alcohol samples show that KT is distinguishable from the alcohol matrix in all of the alcohols, mixers, and mixed drinks used. Quantification is possible using ESI-MS. KT can also be detected in the 100 picomolar range for all samples and is stable for at least 7 days under benchtop conditions. Using an isocratic LC system, KT was successfully separated from the alcohol matrices and quantified using absorbance at 268nm. In general, our study shows that ESI-MS and LC can be used to separate, detect and quantify KT at levels much lower than a normal dose given by a spiked drink, and do so with minimal sample preparation.

Acknowledgements
This work is supported in part for this work by a grant from the National Science Foundation (CAREER-0239800), a First Award from the Kansas Technology Enterprise Corporation/Kansas NSF EPSCoR program and Wichita State University. Funds for the purchase of the LCQ-Deca instrument were provided by the Kansas NSF EPSCoR program and the Wichita State University College of Liberal Arts and Sciences. JL acknowledges the Fairmount College of Liberal Arts and Sciences and the Chemistry Department at WSU for additional support of this research.

References
A Survey of Pharmacist Participation in Trauma Resuscitation

Emily J. McDonald*, Lahna R. Elliott*, and LaDonna S. Hale

Department of Physician Assistant, College of Health Professions

Abstract. Pharmacists are increasingly being used on hospital medical response teams. An estimated one in five US level I and II trauma centers offer pharmacy services during trauma resuscitation, however, these services are not well described in the literature. The purpose of this study was to gain insight into the roles and responsibilities of pharmacists participating in trauma resuscitation and the characteristics and implementation of this pharmacy service. A previous national survey of trauma directors identified 57 facilities that use pharmacists during trauma resuscitation. A new survey was mailed to the pharmacy department at each of these facilities. An online survey was offered to all initial non-responders. The results of this survey provided detailed descriptive data regarding pharmacist participation in trauma resuscitation. This information may serve as a resource for trauma centers considering expansion of pharmacy services into the trauma setting.

1. Introduction

The roles/responsibilities of the hospital pharmacist have evolved from entering orders and dispensing medications from a remote location to working alongside other healthcare professionals to play an active role in patient care. Consistent with this trend toward expanding pharmacy practice there has been a movement toward the establishment of emergency medicine based pharmacy services. Many benefits have been associated with utilization of pharmacists in these areas including decreased drug costs, decreased adverse drug reactions, decreased medication errors, and overall improved outcomes and quality of life.[1,2] Trauma response teams generally consist of medical professionals from various disciplines who converge upon the trauma patient in order to provide quick and efficient patient care during a very critical period of time. Each team member performs specific tasks in order to stabilize, diagnose, and provide treatment for the patient based on their individual expertise. The organized approach of trauma teams has been shown to reduce mortality and improve patient outcomes.[3] Pharmacists can provide additional expertise which may further benefit effectiveness of the trauma team.

An estimated one in five US level I and II trauma centers offer pharmacy services during trauma resuscitation, however, the roles/responsibilities and characteristics of this clinical pharmacy service are not well described in the literature.[4]

The purpose of this study was to gain insight into the roles and responsibilities of pharmacists participating in trauma resuscitation and the characteristics and implementation of this pharmacy service.

2. Methods, Results, Significance

Methods: A previous national survey of trauma directors identified 57 facilities using pharmacists during trauma resuscitation.[4] This study attempted to survey one pharmacist at each facility. A paper survey was mailed to each pharmacy department. An online survey was offered to all non-responders. Only those surveys indicating that pharmacists did provide trauma resuscitation services beyond cardiac arrests were included for analysis. Contact was achieved with 27 (47%) facilities; six were excluded stating they did not attend trauma resuscitations; 21 surveys were analyzed.

The survey consisted of 49 items. The first 21 items focused on characteristics of the facility and trauma pharmacy service; 15 focused on the frequency of responsibilities performed; five inquired about implementation; three items asked the respondent’s opinion regarding the value, advantages and disadvantages of pharmacist participation in trauma resuscitation; and five obtained respondent characteristics.

Results: The mean number of certified beds at each facility was 452 ± 257, range 155 to 1,040; with 67 ± 41 intensive care unit beds and 51 ± 38 ED beds. Fifty-two percent of respondents were male with 13.0 ± 10.2 years total pharmacist experience and 8.4 ± 7.0 years experience at their current facility. The majority of respondents, 86%, attended trauma resuscitations themselves with 7.7 ± 7.3 years of such experience.

Relying on respondent estimations, the mean number of trauma alerts attended by pharmacists each month was 41 ± 40, range 0.5 to 150. Ten (48%) facilities provide
24 hour coverage. The mean hours of operation were 18.0 ± 6.3 hours during weekdays and 14.4 ± 10.2 hours during weekends. It was most common that the typical 3rd shift hours were not covered. The majority of facilities used a pager system to notify the responding pharmacist of the incoming trauma (76%) and/or overhead paging (43%). Fifty-two percent had a pharmacist dedicated to the ED; at these 11 facilities, the ED pharmacist was designated as the trauma resuscitations pharmacist. Over 85% stated they usually or always perform the following during trauma resuscitation: prepare medications, ensure IV compatibility, calculate and correct dosages, and provide drug information.

<table>
<thead>
<tr>
<th>Role/Responsibility</th>
<th>Always or Usually</th>
<th>Rarely or Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare meds or IV fluids</td>
<td>20(95.2)</td>
<td>1(4.8)</td>
</tr>
<tr>
<td>2. Ensure intravenous compatibility</td>
<td>19(90.5)</td>
<td>2(9.5)</td>
</tr>
<tr>
<td>3. Calculate medication dosages</td>
<td>18(85.7)</td>
<td>3(14.3)</td>
</tr>
<tr>
<td>4. Provide drug info</td>
<td>18(85.7)</td>
<td>3(14.3)</td>
</tr>
<tr>
<td>5. Dosage corrections</td>
<td>17(81.0)</td>
<td>4(19.0)</td>
</tr>
<tr>
<td>6. Formulary substitutions</td>
<td>16(76.2)</td>
<td>5(23.8)</td>
</tr>
<tr>
<td>7. Identify meds brought in with patient</td>
<td>15(71.4)</td>
<td>6(28.6)</td>
</tr>
<tr>
<td>8. Suggest therapeutic recommendations</td>
<td>15(71.4)</td>
<td>6(28.6)</td>
</tr>
<tr>
<td>9. Suggest initiation of medications</td>
<td>15(71.4)</td>
<td>6(28.6)</td>
</tr>
<tr>
<td>10. Assist with accurate charging</td>
<td>14(66.7)</td>
<td>7(33.3)</td>
</tr>
<tr>
<td>11. Provide meds in areas remote to ED</td>
<td>14(66.7)</td>
<td>7(33.3)</td>
</tr>
<tr>
<td>12. Assist with accurate documentation</td>
<td>12(57.1)</td>
<td>9(42.9)</td>
</tr>
<tr>
<td>13. Program infusion pumps</td>
<td>6(28.6)</td>
<td>14(66.7)</td>
</tr>
<tr>
<td>14. Administer meds or IV fluids</td>
<td>2(9.5)</td>
<td>19(90.5)</td>
</tr>
<tr>
<td>15. Manipulate the patient physically</td>
<td>1(4.8)</td>
<td>20(95.2)</td>
</tr>
</tbody>
</table>

Data are reported as number (percent).

When asked how responding to traumas affects pharmacist workflow, 57% of respondents reported that other pharmacists cover the duties of the responding pharmacist; 38%) reported that the trauma pharmacist must “catch-up” because no coverage is provided; and 24% reported that workflow is not affected because the pharmacist is devoted specifically to that duty. Fourteen (67%) respondents stated that pharmacists bring medications beyond what is available in the trauma bay.

Answer trends were noted in the open-ended questions. Regarding advantages, three major themes emerged: pharmaceutical expertise of the pharmacist, freeing nurses’ time, and focused attention towards medication safety and improved patient outcomes. All respondents stated that they felt these services were valued by others. Regarding disadvantages, two themes emerged: workflow disruption and the crowded environment of the trauma bay. Six pharmacists specifically stated there were no disadvantages.

When asked who drove the development of these services, 43% stated pharmacy; 19%) stated pharmacy and ED/trauma personnel; and 14%) stated ED/trauma personnel. When asked who opposed the idea, 43% stated that no one opposed the idea; one respondent each listed ED staff, ED nurses, patient safety committee, and code committee.

When asked what obstacles were faced during implementation, 52% stated they faced no opposition. Other pharmacists discussed a variety of barriers such as gaining acceptance by some physicians and some nursing staff; unwillingness or uneasiness of some pharmacists to fulfill this new role; and concerns about pharmacy staff availability and cost.

When asked what improvements they would like to make to their current services, two themes emerged: improved/enhanced pharmacist training in handling of traumas and increasing the hours of trauma coverage provided by their facility.

Significance: Further research is warranted to evaluate the opinions of other trauma response team members regarding advantages/disadvantages of pharmacist participation in trauma resuscitations. Direct measures of clinical benefits as well as cost-benefit analysis and workflow studies would also be beneficial.

3. Conclusion

The results of this survey provide detailed descriptive data regarding pharmacist participation in trauma resuscitation. This information may serve as a resource for trauma centers considering expansion of pharmacy services into the trauma setting.

4. Acknowledgments

We thank Gina M. Berg-Copas, PhD, for her help in methodology development and survey design.

References
Depositional and Structural History of the Sedgwick Basin, South Central Kansas in Relation to Petroleum Entrapment

Jessica A. Puyear*, S. J. Mazzullo

Department of Geology, Fairmount College of Liberal Arts and Sciences

Abstract. The Sedgwick Basin is an important hydrocarbon-producing area in Kansas. Subsurface structural and isopach (thickness) maps and cross-sections illustrate the depositional and tectonic history of the area. It has undergone several episodes of compression followed by tensional deformation during the Paleozoic, which formed anticlinal and fault-bounded structures that were conducive to hydrocarbon accumulation. Also, there were several episodes of sea-level fall and attending subaerial exposure that produced unconformities and reservoir porosity. Approximately 110 million barrels of oil and 118 MCF of natural gas have been produced over the last 92 years in the area. The structural and stratigraphic mechanisms important in hydrocarbon entrapment and future potential in this area are assessed.

Introduction

The Sedgwick Basin was an embayment of the epicontinental Permian sea. It was bound by the southern Nemaha uplift to the east and the southern Central Kansas Uplift to the west (Fig. 1). This is an important area of petroleum production and was intensely drilled in the early 20th century into the late 1950s.

The purpose of this study is to conduct a detailed investigation of subsurface geology in the eastern Sedgwick Basin in order to: (1) describe the geology of the area; (2) identify reservoir ages and types; (3) model the depositional and structural history of the area; (4) relate the geologic history of the area to petroleum entrapment.

Methodology

Subsurface mapping is the main focus of this project. Many wells did not penetrate deeper than the Mississippian, which results in less control on maps of older formations. Collecting information from scout cards and well logs is essential to begin the mapping process. Careful correlation of available logs provided a basis for the maps that were generated. Hydrocarbon entrapment can be effected by the structure and thickness of a unit. After correlation, structural and thickness maps were created on these horizons to evaluate specific attributes of the area that would result in entrapment of hydrocarbons.

Regional as well as local cross sections were produced to understand the depositional history. They aided in the recognition of the structural and stratigraphic controls of petroleum accumulation in the area. A core sample of the #31 Lathrop well in the northeast part of the study area was examined to further study the lithology of the formations found in the Sedgwick Basin.

Results

The area mapped dips regionally to the southwest and is interrupted by minor uplifts. There are two large structures in the area; the Elbing anticline and the Valley Center anticline (Fig. 3) [1]. Hydrocarbons appear to have accumulated on the crest of these structures in multiple horizons. Each horizon has unique characteristics that enable them to hold hydrocarbons.

The main reservoirs are the Burgess sandstone, rocks underlying the Mississippian unconformity including the Warsaw Limestone and rocks of the Osagian stage, Hunton limestone/dolomite, and Viola dolomite.

Pennsylvanian

The Burgess sand overlies the Mississippian unconformity and is generally thought to be remnants of erosion [2]. The thickest parts of the sand body were deposited in Mississippian lows. The Burgess is a
conglomeratic sand consisting of poorly sorted quartz grains and chert fragments [2].

**Mississippian**

Limestone and chert of Mississippian age lie below an erosional unconformity representing a drop in relative sea level. Hydrocarbons appear to have accumulated in buried hills as well as along the flanks of the Elbing anticline where Mississippian rocks pinch out over the crest of the structure.

**Silurian**

The Hunton Group of Silurian age consists of either limestone or dolomite in the study area. This unit mainly produces in areas where the Mississippian is eroded, as it is the next reservoir quality rock underlying the Mississippian.

**Ordovician**

The main Ordovician reservoir rock in the area is the Viola. The Viola is typically a dolomite in the study area, and also produces from structural highs particularly where the Mississippian sees significant erosion.

**Discussion**

The tectonic compression occurred during Mississippian time, when the large scale anticlines were formed (Fig. 2). Following compression, a relaxation occurred which caused normal faulting on the flanks of these large anticlines. As the Mississippian was uplifted, the crest of the Elbing anticline was subaerially exposed, subjecting the Mississippian to complete erosion. The Mississippian also was eroded on the crest of the Valley Center anticline as well.

The source rock for the area is the Woodford shale in Oklahoma [3]. Hydrocarbons migrated up dip into the Sedgwick Basin and have mostly been trapped in structural anticlines throughout the study area. Stratigraphic trapping has occurred in the Burgess sandstone.

This is an area that was extensively drilled in the early 1900s at the height of petroleum exploration in Kansas. According to the Kansas Geological Survey, about 5,000 wells have been drilled in the study area, over half of those being productive.

Since this area has not been reviewed in recent years, the application of new technologies can be advantageous for reviewing old fields and traps. With the use of Geographix software, cross sections and maps can be produced. Providing a modern view on an old area will be beneficial for understanding the history of the Sedgwick basin. This study is being done to place the entrapment of hydrocarbons in context with the structural and depositional history of the basin. There has yet to be a full study on the Sedgwick Basin, this study intends to initiate further basin analysis.

**Conclusions**

The structural maps, isopach maps, cross sections, and core examination have: 1) provided several regionally extensive subsurface maps within the basin that describe the regional geology and also identify reservoir ages and types; (2) identified the structural and stratigraphic mechanisms for petroleum entrapment; and (3) demonstrated how tectonic activity has influenced the trapping of petroleum. This study provides a better understanding of the basin geology and its productive nature.

**Acknowledgements**

I would like to thank Murfin Drilling Company, Inc. for their assistance on this project through providing software, scout cards, and their support.

A Bayesian Approach for Verifying Process Improvement

Nasser Safaie*

Department of Industrial and Manufacturing Engineering, College of Engineering

Abstract. This research is an effort to introduce the Bayesian approach as a tool for evaluating process adjustments aimed at causing a shift to the process average. This is usually encountered in scenarios where the process is found to be stable and centered away from the design target. A number of changes is proposed and tested as part of the improvement efforts. As such, it is desired to evaluate the effect of these changes as soon as possible and take appropriate actions. Using simulated data, the performance of the proposed approach is measured in terms of the number of measurements (iterations) needed to estimate the true average. The results indicate that the Bayesian approach can be used to verify process improvement.

1. Introduction

Control charts were introduced by Dr. Shewhart in 1920’s and involve two phases [1]. In phase I, a set of historical data is analyzed to assess stability and identify special causes. If no special causes are present, the in-control process parameters are estimated and control limits are established. In phase II, the data are sequentially collected over time to assess whether the performance has changed from the estimated value. However, there are some scenarios where the process is found to be centered away from the desired target and changes are made to improve its performance. As such, it would be desirable to quantify the effect of the proposed changes before a full scale implementation. Under these conditions, users of the traditional Shewhart control chart have one of two options; either to assume complete ignorance of the new process parameters (i.e., repeat phase I), or utilize the target as standard value for phase II. The first requires accumulating a new set of date which may be time-consuming, while the second may result in a reject decision short of providing an estimate of the true parameter. The purpose of this paper is to evaluate the Bayesian approach as a third alternative. In this method, earlier practical experience can be taken into account explicitly to help the practitioner adjust the parameters and transfer faster to phase II application of the Shewhart chart.

2. Theoretical Modeling

During the transition period, it can be assumed that \( P(\theta) \) represents the prior with mean \( \theta_o \) and standard deviation \( \theta_0 \). If \( y \) denotes a process measurement with unbiased mean and standard deviation (gage repeatability) \( \sigma_g \), then, according to Box and Tiao [2], the posterior \( P(\theta|y) \) will follow the normal with mean \( \mu_1 \) and standard deviation \( \sigma_1 \) given by:

\[
\mu_1 = \frac{1}{(w_0 + w_1)}(w_0\mu_o + w_1y), \quad \text{and} \quad \sigma_1 = \frac{1}{\sigma_g^2} = w_0 + w_1
\]

Where,

\[
w_0 = \frac{1}{\sigma_0^2} \quad \text{and} \quad w_1 = \frac{1}{\sigma_g^2}
\]

As pointed out in [2], this is an appealing result, since the reciprocal of the variance is a measure of information which determines the weight to be attached to a given observation. The variance of the posterior distribution is the reciprocal of the sum of the two measures of information \( w_0 \) and \( w_1 \) reflecting the fact that the two sources of information are pooled together.

As an illustration, suppose a process improvement team is considering two levels of performance. The current stable level, \( L_0 \) where the prior is approximated by \( N(800, 50^2) \), and the second level \( L_1 \), represents an improved level which is anticipated to be \( N(950, 50^2) \). Process changes will be made during the transition period and individual observations collected sequentially. The measuring instrument is known to produce data with \( \sigma_g = 10 \). Here the uncertainty of the measurement is assumed constant but the process average for the prior of \( L_1 \) is closer to the design target than that of \( L_0 \). No change is anticipated in the process variance. Table 1 shows posterior distributions after the first observed value of \( y = 950 \). As can be seen after the first observation, the two beliefs \( L_0 \) and \( L_1 \) about the process average as represented by their posterior distributions are much closer together. The two priors are
influential in deciding the posterior distributions. As measurements accumulate, these two posteriors are expected to converge to the true process average. This would define the measure of performance of the Bayesian approach.

### Table 1. Prior and posterior distributions of \( \mu \) for Levels \( L_0 \) and \( L_1 \).

<table>
<thead>
<tr>
<th>Prior distribution</th>
<th>Likelihood from data</th>
<th>Posterior distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L_1 )</td>
<td>( \mu \sim N(950,50^2) )</td>
<td>( \mu \sim N(946,9.8^2) )</td>
</tr>
<tr>
<td>( L_0 )</td>
<td>( \mu \sim N(800,50^2) )</td>
<td>( \mu \sim N(940,9.8^2) )</td>
</tr>
</tbody>
</table>

3. Performance Analysis

To assess performance, simulated data from four different distributions are generated using Microsoft Excel. Each represents 100 measurements obtained following a specified shift in the process average. Figure 1 shows the number of iterations required for the two prior distributions (\( L_0 \) and \( L_1 \)) to converge to the true process mean.

<table>
<thead>
<tr>
<th>No shift for mean</th>
<th>1 sigma shift for mean</th>
<th>2 sigma shift for mean</th>
<th>3 sigma shift for mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of iterations</td>
<td>7</td>
<td>18</td>
<td>7</td>
</tr>
</tbody>
</table>

Fig.1. The plots for performance of detecting a shift in using updating the posterior distribution along with the number of observations in which two priors plots meet each other.

4. Conclusions

This paper presented a Bayesian approach for evaluating efforts to shift the process average closer to the target. This would involve testing a number of proposed changes and quantifying their effect. During these transition periods one or more aspects of the Shewhart model are violated, adding difficulties in estimating the new process average. The Bayesian approach is found to make a good bridge between the two options available for users of the traditional Shewhart control charts. The results obtained using simulated data indicate that this approach makes it easier to transition from phase I to phase II.

5. Acknowledgement

I am sincerely grateful to my advisor Dr. Weheba for his sustained guidance during the course of my research and his helpful input for preparing this paper.

References

A Preliminary Exploration of Patient Satisfaction and Recall Based on Recursive Frame Analysis Methods

Phillip R. Sechtem*, Julie Scherz & Anthony DiLollo

Abstract. Created by Bradford Keeney, Recursive Frame Analysis allows for in-depth analysis of communicative events. Specifically, RFA has been applied to “therapeutic talk” involving various types of clinical scenarios. The goal of this study was to employ RFA to analyze actual video recorded physician-patient interactions to determine the relationship between various RFA constructs and patient measures of satisfaction and recall. We hypothesized that there would be a direct correlation between the number of frames and measures of patient satisfaction and recall. Preliminary findings suggest that RFA can be a useful tool for analyzing these relationships.

1. Introduction

Medical interactions have been the subject of much interest. Research has focused on the quality and success of medical visits, discourse, and other communicative factors [1; 2; 3]. The bottom-line in conducting this research has been to decrease health care errors, costs, and suffering. A component of high quality health care includes patient satisfaction and recall and a key component needed for adequate satisfaction and recall is effective “therapeutic talk”. A procedure called “Recursive Frame Analysis” (RFA) may be useful in analyzing therapeutic talk. RFA was created by Bradford Keeney [4]. It is a method used for systematic analysis of the ebb and flow of interactions. It allows for identification and visualization of the communicative event in terms of establishing, maintaining, and shifting topics. Specifically, the context and content of the interaction, and all other embedded subjects can be easily viewed and analyzed. RFA has been used to analyze narratives, conversations, and other forms of discourse in therapy. It has been described as a way to “get closer to the talk” because it allows for “sequential analysis which helps researchers and therapists to note their perceptions of semantic shifts in conversation” [5]. RFA has been used in therapy involving parents’ conversations about their children’s heart murmurs [6], describing family therapist-supervisor talk behind the one-way mirror in therapy sessions [7], analysis of divorce mediator-disputants discourse in child custody dispute resolution [8], and systemic family therapy discourse [9]. When applying RFA to medical scenarios, consider the following description of physician-patient interactions: Medical visits are events that occur in the contexts of offices and examination rooms during which an expected script is traditionally followed. Within the context of the visit, doctors and patients convey and interpret messages framed by words and meanings thereby creating more contexts within the overall event. The content is fluid and ever changing with new interpretations and meanings surfacing occasionally while prior interpretations and meanings are submerged. Adding to the flow, texture, and volume of the interaction, interpretations and meanings can be, and usually are, recycled and readdressed during the dynamic interaction. In this way, medical visits can be viewed as continual and shifting communicative transformations. In terms of RFA, some operational definitions based on the work of Keeney [4] and Chenail [5] were needed to identify key components characterized in this study. The term “event” refers to doctor-patient medical visits. The term “Recursive” refers to the evolving topography of the event. “Context” refers to groups of frames that convey messages and allow for interpretations of messages and meanings. “Frames” comprise the smallest units of meaning within a given context which may include letters, words, phrases, and sentences as well as obvious nonverbal communicative responses (i.e., head nod up/down for “yes”). The term “gallery” refers to classes or “chunks” of frames based on commonalities in the discourse. In this study three types of galleries were identified. They included “primary galleries,” “subordinate galleries,” and “peripheral galleries”. Primary galleries are those that contain the established primary purpose of the medical visit (event). Within the primary galleries are subordinate or embedded galleries. The subordinate galleries contain frames of exchanges that establish topics directly related to the primary gallery. Peripheral galleries contain exchanges of frames that establish topics not directly related to the primary purpose of the visit even though they may be relevant to the event. The purpose of this study was to conduct a series of tests to explore the relationship between the number of frames within the primary, peripheral, and subordinate galleries to measures of patient satisfaction and recall of actual physician-patient interactions. We hypothesized that there would be a direct correlation between the number of frames and
measures of patient satisfaction and recall. We suspected that the lower the ratio between the numbers of frames within the primary galleries to the number of frames within peripheral galleries, the lower would be satisfaction and recall.

2. Experiment, Results, Discussion, and Significance

Eighty video recordings of actual medical visits obtained for a prior study were used as the sample for this study. In addition to the recordings, data regarding patient recall and satisfaction from the actual visits were used. From the eighty recordings, one recording from each high/low category for recall and satisfaction was transcribed verbatim. Nonverbal messages were also transcribed if they were easily interpreted. Once transcribed, the four interactions were recreated into RFA tables depicting galleries and frames of the events. Data were tallied and compared to patient recall and satisfaction measures. For high recall, there were 139 total frames (doctor = 77, patient = 62). Total (doctor & patient) primary and subordinate frames combined outnumbered total (doctor & patient) peripheral frames 95 to 44, respectively. For low recall there were 261 total frames (doctor=123, patient=138). Total (doctor & patient) peripheral frames outnumbered total (doctor & patient) primary and subordinate frames 136 to 125, respectively. For high satisfaction, there were 221 total frames (doctor=142, patient=79). Total (doctor & patient) peripheral frames outnumbered total (doctor & patient) primary and subordinate frames 101 to 120, respectively. For low satisfaction, there were 308 total frames (doctor=116, patient=192). Total (doctor & patient) peripheral frames outnumbered total (doctor & patient) primary and subordinate frames 112 to 196, respectively. Trends based on these preliminary data were identified. Regarding recall and satisfaction, lower numbers of total frames corresponded to higher levels of recall and satisfaction. Conversely, higher total frame numbers corresponded with lower recall and satisfaction levels. When the total number of doctor frames exceeded the total number of patient frames in an interaction, recall and satisfaction measures were higher. Conversely, when the total number of patient frames exceeded the total number of doctor frames in an interaction, recall and satisfaction measures were lower. When contrasting the ratio of numbers of primary/subordinate frames to peripheral frames, higher recall scores were obtained when the ratio was nearly 2:1; lower satisfaction scores were obtained when the ratio was nearly 1:2, suggesting that time spent on the reason for the visit rather than in distracting or secondary “talk” is crucial.

3. Conclusions

These preliminary findings indicate that RFA is a tool that can be used to analyze doctor-patient interactions. Analyzing how time is spent during those interactions and how doctors and patients contribute to the interactions both individually and collaboratively may provide further insight into the construction of “therapeutic talk”. There appears to be a clear interaction between RFA analysis and measures of satisfaction and recall. Further study is indicated.

4. Acknowledgements

The first author wishes to acknowledge Dr. Julie Scherz and Dr. Anthony DiLollo for the ongoing guidance and support in the development of this project.

DNA Methylation and its Role in a form of Hormone-Dependent Cancer

Megan Simpson* and Dr. William Hendry

Department of Biological Sciences

Abstract. Diethylstilbestrol (DES), a synthetic estrogen, was widely administered to pregnant women between 1947 and 1971 on account of a misconception that it could prevent miscarriages. The offspring of these women were diagnosed with various reproductive tract abnormalities, including cancer. We focused this study on DES-induced abnormalities in the uterus. We screened for altered DNA methylation patterns in uteri from control vs. neonatally DES-treated hamsters using MSRF. Preliminary results show differential DNA methylation patterns in uteri of control vs. DES-treated hamsters. Next we will determine the nucleotide sequence of the differentially methylated genetic elements.

Introduction

Diethylstilbestrol (DES) was synthesized in 1938 and imitates the action of estradiol-17b (E2), the primary ovarian estrogen [1]. From 1947-1971, it was often prescribed due to the belief that increasing estrogen levels could prevent miscarriages. This practice ceased due to reports of reproductive tract abnormalities (including cancer) in the offspring of DES-treated mothers. At least four million women and their fetuses may have been exposed to DES [2]. The condition gained vast attention and became known as the “DES Syndrome”. DES was then recognized more generally as the prototypical “endocrine disruptor agent” [3].

When hamsters are treated neonatally with DES, reproductive tract abnormalities were always seen in adult animals [4, 5]. Significant to this study, however, was the high incidence of endometrial adenocarcinoma, a form of estrogen-dependent uterine cancer. We are now probing the molecular mechanisms of this phenomenon.

Epigenetics is defined as heritable changes in gene expression that are not accompanied by changes in DNA sequence. Epigenetic events play important roles in the process of gene silencing that allows genetically identical cells to differentiate into functionally diverse tissues and organs.

Methylation of the cytosine within the dinucleotide CpG is the epigenetic modification that is most commonly studied in humans. CpG islands (regions rich in CpG dinucleotides) span the 5’ region of many genes. Usually, these cytosines are unmethylated, allowing transcription to occur. Methylation of these regions silences expression of the gene. However, aberrant methylation events can have adverse effects on normal gene expression. For example, hypermethylation events taking place in the CpG islands of tumor-suppressor genes will cause inactivation. These events are critical components of the tumorigenic process. [6]

Neonatal exposure to DES can cause a number of reproductive tract abnormalities, including cancer, in both males and females. How DNA methylation is involved in the progression of these abnormalities is not known. However evidence does suggest that it plays an important role in endocrine disruption [7].

Experiment, Results, Discussion, and Significance

We use Syrian golden hamsters for our animal model system. Within 6 hours of birth, they are injected with either corn oil alone (control), or with corn oil containing 100 ug DES. On day 5 of life, hamsters are sacrificed and uteri are harvested.

DNA is extracted from the uteri and then precipitated and quantified. Methylation Sensitive Restriction Fingerprinting (MSRF) is performed as follows: 2 ug of genomic DNA is digested using the restriction enzyme MseI (a four base cutter, cut site: T/TAA), which cuts the genomic DNA into many pieces, mostly around 200-300 bp long; half of the initial digestion then undergoes a second digestion with the enzyme BstUI, which cuts at the site CG/C CG, but only if the C is unmethylated. The result of the digestions are 4 tubes of: control, single digested DNA (C1); control, double digested DNA (C2); DES, single digested DNA (D1);
DES, double digested DNA (D2) - each tube containing 1ug of digested DNA.

100 ng of each tube then undergoes amplification via PCR using 1 of 10 different arbitrary primer pairs. PCR product is electrophoresed on a 6% polyacrylamide gel at 1600V for approximately 30 min. The bands of interest are determined by comparing the banding pattern to those patterns shown in Table 1.

Table 1. Possible outcomes of DNA methylation changes detected by MSRF

<table>
<thead>
<tr>
<th>Methylation condition in DES-treated relative to Control DNA</th>
<th>C1</th>
<th>C2</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No Methylation</td>
<td>__</td>
<td>__</td>
<td>__</td>
<td></td>
</tr>
<tr>
<td>2. Normal Methylation</td>
<td></td>
<td>__</td>
<td>__</td>
<td>__</td>
</tr>
<tr>
<td>3. Hypermethylation</td>
<td>__</td>
<td>__</td>
<td>__</td>
<td></td>
</tr>
<tr>
<td>4. Hypomethylation</td>
<td>__</td>
<td>__</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preliminary results (Fig. 1) suggest that differential methylation events occur in the uterus of neonatally DES-treated animals compared to control animals. Further studies will involve recovering the bands of interest from the polyacrylamide gels and sequencing the fragments to determine their identity and significance.

Because methylation causes gene silencing and thereby affects cell differentiation, it is important to study the effects of altering this phenomenon. Methylation events can be altered by a number of factors such as diet and environmental influences. In our animal model, a single dose of DES within 6 hours of birth induces numerous reproductive tract problems in the adult animals. The animals studied here are only 5 days old. Even at that early stage, dramatic morphological changes (DES-exposed uterus is approximately 3 times the size of a normal uterus) do seem to be accompanied by altered DNA methylation patterns.

Epigenetic alterations are now thought to be just as important to the development of cancer as mutations.

Differential epigenetic events are much easier to induce than mutations, meaning that they can be easier to reverse. Understanding how and when epigenetic alterations take place can lead to a better understanding of how to treat, and also how to avoid, the complications that arise from such events.

Conclusions

In this study, we have shown that neo-natal exposure of hamsters to DES can alter the methylation status of the genome. Because DNA methylation is important for biological roles, such as cell differentiation, altering methylation events can be devastating to the development of the organism. Endometrial adenocarcinoma is a clinically important type of estrogen-dependent uterine cancer that we have been able to reliably induce, and therefore study, in our animal model. Studies such as these can lead to a better understanding of the mechanisms involved in such tumorigenic processes.

Acknowledgements

I would like to thank Dr. William Hendry, my mentor; Isabel Hendry, who has helped at every step of this project; and Dr. Bin Shuai and Dr. Jim Bann, members of my thesis committee, who have offered advice whenever needed.

Data Caching in Ad Hoc Networks using Bloom Filters

Julinda Taylor

Department of Electrical Engineering and Computer Science, College of Engineering

Abstract. Data caching provides efficient data access by maintaining replicas of data in strategic parts of the network. However, current research in this area does not manage memory space of each node efficiently. We propose an improvement by considering Bloom filters, a fast, space-efficient probabilistic method for looking up data. We compare the system performance with and without Bloom filters and show the performance is very close, even though the Bloom filter only takes half the space of the nearest cache table.

1. Introduction

Ad Hoc networks are multi-hop wireless networks of computing devices with wireless interfaces. The computing devices could be conventional computers (e.g., PDA, laptop, or PC) or backbone routing platforms, or even embedded processors such as sensor nodes. Caching is a method of storing data in multiple places on the network, typically to reduce response time and network traffic.

The authors in [1] proposed a benefit based data caching technique in ad hoc networks to increase the efficiency of data access. It is a distributed technique wherein each node decides whether to cache passing-by data by observing the local traffic load. It achieves good system performance in terms of access query delay, query success ratio, and total number of messages. However, benefit based data caching is not space efficient. A Bloom filter [2, 4] is a well known randomized data structure for representing a set to support membership queries. We show that Bloom filters can improve the space efficiency of the existing work while not affecting the network performance.

2. Benefit Based Data Caching and Bloom Filter

Benefit based data caching: Authors in [1] consider the cache placement problem of minimizing total data access cost in ad hoc networks with multiple data items and nodes with limited memory capacity. This optimization problem is NP-hard. Defining benefit as the reduction in total access cost, they present a polynomial-time centralized greedy algorithm that provably delivers a solution whose benefit is at least one-fourth of the optimal benefit. The centralized approximation algorithm works by iteratively selecting a data item to cache in a node that gives the highest benefit. For the distributed algorithm, to make intelligent caching decision, each node maintains a nearest cache table to keep track of the closest cache node of each data. The size of the nearest cache table is equal to the total number of data items in the network which is not space efficient.

Bloom filter: Consider a set \( A = \{a_1, a_2, \ldots, a_p\} \) of \( p \) elements. Bloom filters describe membership information of \( A \) using a bit vector \( V \) of length \( m \). For this, \( k \) hash functions, \( h_1, h_2, \ldots, h_k \) with \( h_i : X \rightarrow \{1..m\} \) are used. If \( a_i \) is a member of \( A \), in the resulting Bloom filter \( V \) all bits obtained corresponding to the hashed values of \( a_i \) are set to 1. Testing for membership of an element is equivalent to testing that all corresponding bits of \( V \) are set. Thus false positives in membership queries exist; that is, queries might incorrectly recognize an element as member of the set.

One prominent feature of Bloom filters is that there is a tradeoff between the size of the filter and the rate of false positives. Observe that after inserting \( n \) keys into a filter of size \( m \) using \( k \) hash functions, the probability that a particular bit is still 0 is:

\[
p_0 = \left(1 - \frac{1}{m}\right)^{kn} \approx 1 - e^{-\frac{kn}{m}}.
\]

Hence, the probability of a false positive (the probability that all \( k \) bits have been previously set) is:

\[
p_{err} = (1 - p_0)^k = \left(1 - \left(1 - \frac{1}{m}\right)^{kn}\right)^k \approx \left(1 - e^{-\frac{kn}{m}}\right)^k
\]

2. Experiment, Results, Discussion, and Significance

We use ns-2 [5], a network simulator to simulate the ad hoc network performance. There are 100 ad hoc nodes
and 1000 data items in the network. Each node accesses each data item with some access frequencies.

We first compare the false positive ratio (FPR) between the simulation result and the theoretical result for Bloom filter. In simulation, the FPR is measured as ratio of the total number of false positive query replies divided by the total number of query replies. We vary the size of the bloom filter as 400, 600, 800, and 1000. Figure 1 shows that the simulated and theoretical results are very close.

![Figure 1. The FPR simulation results vs. the theoretical calculated results for the Bloom Filter](image)

We then compare the network performance with and without bloom filter. Here we vary the query generating time of each node as 3, 5, 10, 20, 30, 40 seconds. We set the bloom filter size as 500. Figure 2 shows such comparison in terms of the number of messages, the average query delay, and the query success ratio. It shows the performance with bloom filter is very close to that without bloom filter, even though bloom filter only has half size of the space as the nearest cache table. To calculate the theoretical result we assume n is equal to 100 which is the maximum number of data items the data can cache. However in the simulation, not all the nodes cached 100 items.

![Figure 2. The system comparison between with and without Bloom filter: (a) total number of messages, (b) average query delay, (c) query success ratio.](image)

3. Conclusions

Data caching provides efficient data access by maintaining replicas of data in strategic parts of the network. However, current research in this area does not manage memory space of each node efficiently. We propose an improvement by considering Bloom filters, a fast, space-efficient probabilistic method for looking up data. Using ns2, a popular network simulator, we compare the system performance of data caching in ad hoc networks with and without bloom filters. We compare the system the system performance with and without Bloom filters and show the performance is very close, even though the Bloom filter only takes half the space of the nearest cache table.

Figures 2.1 -2.3 demonstrate the efficiency of the Bloom filter compared with the benefit caching.

4. Acknowledgements

I would like to thank Dr. Bin Tang for all of his help and guidance. I would also like to thank the Department of Electrical Engineering and Computer Science for their support and assistance in this project.


The Study of the Effect of Long Term Water Cover on the Mill Tailings of the Silver Lake Mill #1, near Silverton, Colorado.

Renee L. Vardy*

Geology Department, Fairmount College of Liberal Arts and Sciences

Abstract. Mining and milling of metals were the primary industries in the study area for most of the late 1800’s into the early 1900’s. Wastes from the mining and milling processes are abundant in the area and present significant threats to the environment. Abandoned in 1900, the Silver Lake Mill is located on Silver Lake, southeast of Silverton, CO. Tailings (mill wastes) are located above and below the lake level providing an excellent location to study long term water cover of mill tailings. The project included water samples from the lake, its outlet and inlets plus tailings samples above and below water level. These samples were used to determine if the lake was contaminated and if so, its source. Field parameters of pH, conductivity, temperature, and dissolved oxygen were observed. Samples were analyzed for Al, Fe, Cu, Ni, Zn, Cd, and Pb. All parameters except Ni were found in the lake but neither the inlets nor the outlets had high enough metals concentrations to be the sole contributor. Examination of these results show that the lake holds contaminated water with increasing metal concentration at depth. It also reveals that the source of contamination is primarily transfer from the submerged tailings. Lastly, it shows that the contamination is generally contained within the lake.

Introduction

The Silver Lake mill #1 is located over 12,000 ft above sea level, on Silver Lake, which is approximately 3 miles southeast of Silverton, Colorado. It is found in a classic hanging valley that is accessible only by pack trail a few months of the year. The mill was active from 1890 to 1900 extracting precious metals out of the ore produced from the mines in the Silver Lake Basin. The mill produced over 500,000 tons of tailings (mill wastes) over the ten years in production [1]. All of these tailings were piped into neighboring Silver Lake creating an artificial beach cutting the lake in half. Portions of the tailings are found above and below the water level. The milling technology used at the time was very inefficient and 40 to 60% of the metals in the original ore ended up in the tailings [2]. Approximately 400,000 tons of the tailings were removed to be reprocessed in 1913 but the rest are still present in the lake today [2]. This creates an interesting situation where metal rich mill tailings have been relatively undisturbed, above and below the water level, for over a century.

Methodology

The project included water samples from the inlets and outlets, the lake itself, as well as the tailings above and below the water level. All water sampling locations were analyzed for the dissolved oxygen, conductivity, ph, and temperature as well as tested for the metals Al, Fe, Cu, Ni, Zn, Cd, and Pb. The tailings samples were tested for the metals above as well as Hg.

Results

The stream samples consisted of all running inlets and outlets. Most of the inlets showed metals concentrations below the analysis reporting limits. Zinc generally had the highest concentration, but it also has the highest toxicity threshold [2]. Data for the stream samples is recorded in Table 1.

<table>
<thead>
<tr>
<th>Site</th>
<th>Al</th>
<th>Cd</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet #1</td>
<td>&lt;200</td>
<td>&lt;4.0</td>
<td>&lt;25</td>
<td>&lt;3.0</td>
<td>44.9</td>
</tr>
<tr>
<td>Inlet #2</td>
<td>&lt;200</td>
<td>&lt;4.0</td>
<td>&lt;25</td>
<td>&lt;3.0</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Inlet #3</td>
<td>&lt;200</td>
<td>&lt;4.0</td>
<td>&lt;25</td>
<td>&lt;3.0</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Inlet #4</td>
<td>291</td>
<td>10</td>
<td>190</td>
<td>119</td>
<td>1670</td>
</tr>
<tr>
<td>Iowa Inlet</td>
<td>&lt;200</td>
<td>&lt;4.0</td>
<td>28.1</td>
<td>40.3</td>
<td>319</td>
</tr>
<tr>
<td>Outlet</td>
<td>&lt;200</td>
<td>&lt;4.0</td>
<td>&lt;25</td>
<td>8</td>
<td>276</td>
</tr>
</tbody>
</table>

*Ni and Fe were not found above the respective reporting limits of 100 and 40 µg/l and therefore not included in this table.

The lake has also been sampled at several different depths. Figure 1 shows the metal concentrations and their linear trends for a location in the center of the lake. The overall trend shown is increasing metals concentration with depth.
The tailings were sampled above and below the water level to determine the effect of water cover on the tailings. The above water sample has a lower concentration for all analysis taken except for Cadmium where the results were within 0.8 mg/kg.

**Discussion**

It appears that Inlet #4 and the Iowa Inlet are the largest stream contributors to the metals in the lake. They are also the only two found inlets that flowed from a mine opening. According to data from Church et al. the stream below the outlet of this lake measures no toxicity for Al, Cd, Cu, and Zn [2]. It can also be assumed that, at the outlet, Pb is non-toxic because its concentration is found below the drinking water standard, which is much more strict than stream water standard [4].

The lake samples show an upward trend in the metals concentration with depth. This is unusual because lakes with a prevailing wind direction, as Silver Lake has, normally engage in annual overturning of the water column. Overturning does not appear to be happening in Silver Lake as even historical data suggests increasing concentrations with depth.

The tailings samples were analyzed to find that most of the parameters had a higher concentration in the below water sample. This could be due to the fact that the above water sample was exposed to rainwater and snowmelt. These water types generally are under-saturated with respect to metals which causes them to readily absorb metals from the tailings that are above the water level. The water in the lake, for the most part, will not absorb metals as readily as the rainwater because it is closer to its saturation point with respect to metals. Also, any rainwater in the area is washed into the lake carrying with it dissolved materials.

**Significance**

The significance of this research lies with the correlation of this situation with other underground mines, currently filled with tailings and water as well as prospective milling sites.

**Conclusion**

The findings of this project show that the water of Silver Lake does contain metals and they appear to be primarily from the submerged tailings. However, the outlet has low metal concentrations and is diluted with other stream water before it reaches the Animas River. Therefore, the quality of the water downstream does not appear to be negatively impacted by the metals found in Silver Lake.

**Acknowledgments**

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**References:**


Sexual Dimorphism of the Iliac Crest: A Quantitative Approach

Joy H. Vetter*, Peer H. Moore-Jansen

Department of Anthropology, College of Liberal Arts and Science

Abstract. This study examines indicators of male-female differences in the os Coxa, specifically in the shape of the iliac crest for the purpose of skeletal sex estimation. The iliac crest is a curved, or “S-shaped”, epiphysis which extends along the cranial margin of the ilium, posteriorly from the anterior superior iliac spine to the posterior superior iliac spine of the os Coxa. Forty two metric variables characterizing the shape of the os Coxa and iliac crest are derived from a digital database of 150 adult White human os Coxae, including 75 males and 75 females, from the Hamann-Todd osteological collection at the Cleveland Museum of Natural History. The os Coxae are all digitized using a MicroScribe-3DX digitizer, and the data is stored in an excel spread sheet, facilitating further mathematical analysis to define and calculate all variables. A single point of origin defined as the most superior point in the midline of the pubic symphysis, is common to each variable. This study hypothesizes that these variables will better define variation in form, and that they will better characterize sexual dimorphism in the iliac crest. Statistical analyses will be used to test the potential application of the findings of this study to human identification in osteological investigation.

1. Introduction

Documentation of morphological variation, particular to the estimation of sex, has proven fundamental to the estimation of biological profiles derived from undocumented skeletal remains. Thus better achieve complete inventory assessments and positive identifications [1]. This study addresses the issue of variation in adult White os Coxae, more specifically, the iliac crest. The iliac crest is an epiphysis along the cranial margin of the ilium, extending posteriorly from the anterior superior iliac spine to the posterior superior iliac spine of the os Coxa.

The research presented here quantifies the shape of the iliac crest and documents the presence and nature of male-female variation in the shape of the crest. Such differences will lend themselves to improved osteological assessment of sexual dimorphism in skeletal materials of prehistoric, historic archaeological, modern forensic complete and fragmentary os coxae.

Overall, adult male skeletons are larger and more robust than female specimens. Certain bones and areas throughout the skeleton are widely known to be better indicators of sex than others and that the most reliable area for sex estimation is the os coxae [1, 2, 3, 4, 5, 6]. Current studies of pelvic morphology describe the female os coxa as less robust, exhibiting a relative absence or lesser expression of muscle markings. The female pelvis has also been characterized as both broader and lower; whereas the male os coxa is larger in size with more extensive muscle markings, displaying a taller and relatively narrow appearance [7, 5, 1, 6].

Although there are several metric and non-metric studies that focus certain features of the os coxae in determining sex, only one study could be found that focused on iliac crest [8] and one study that briefly discussed the dimorphic condition of the crest [9]. With the lack of studies on the iliac crest, it is apparent that further research needs to be conducted in this area of sexual dimorphic features.

2. Materials and Methods

To quantify the shape of the iliac crest, 150 adult Caucasian os Coxae (75 males and 75 females) from the Hamann-Todd osteological collection at the Cleveland Museum of Natural History in Cleveland, Ohio were digitized by a MicroScribe-3DX digitizer. Once the os Coxae were digitized, the data was entered into an excel spread sheet where mathematical analysis was conducted to establish 42 nontraditional variables. The nontraditional variables included seventeen chords, sixteen angles, a total triangular area, an anterior triangular area, a posterior triangular area, a posterior chord, an anterior chord, the subtense at ninety degrees, the anterior breadth, the posterior breadth and the iliac breadth. The origin point for all variables is the most superior point in the midline of the pubic symphysis. In addition to digitizing the iliac crest, the sciatic notch was scored qualitatively from hyperfeminine (-2) to hypermasculine (+2). Preliminary analytical methods for quantifying sexual dimorphism in the iliac crest and os Coxa include descriptive statistics, independent samples t-tests and a correct classification on all 42 variables. Statistical significance was determined using an α-level of .01 for the independent t-tests, where
p<.01. The calibration sample was subsequently compared to an independent test sample comprised of 17 males and 17 females.

3. Results and Discussion

The preliminary results from the analytical methods highlights shape differences between the male and female form. The descriptive statistics show a difference in means in all variables, with female means smaller than the male means. Additionally, in 19 of the observations, females exhibit more variability. The independent t-tests show statistically significant male and female means for five chords (chords 7-11), six angles (angles 10-12 and 15-17), iliac breadth, subtense, anterior chord, posterior chord, and all triangular areas.

Correct classification for these 18 variables based on univariate sectioning points calculated from male and female means, are consistently greater in variables also significant when tested for difference of means using a t-test. These variables have a female, male, or pooled correct classification percentage of 60-76%. The subtense measurement proved to have the best classification percentage, with 76% in female, male and pooled results.

To test the reported calibration results, the analytical methods were applied to an independent test sample of 34 males and females. The independent test sample descriptive statistics showed a difference in means, with only 8 variables having larger means in females rather than males, and females proved to be more variable in 15 of the 42 measurements. The independent t-tests show statistically significant male and female means for the subtense, anterior chord, total triangular area, anterior triangular area, and angles 11 and 12.

In the correct classification percentage of the independent test sample, 18 variables had a female, male, or pooled percentage of 64.7-94.12%. As in the calibration sample, the subtense had the best classification percentage, with 70.59% for females, 94.12% for males and 82.35% overall.

The independent female test sample results of the independent t-tests and correct classification percentage supports the findings of the calibration sample. The subtense, anterior chord, total triangular area, anterior triangular area, and angles 11 and 12 proved to be statistically significant and have a relatively high associated correct classification percentage for both samples.

4. Conclusions

From the results outlined above, it is clear that there are slight indications of sexual dimorphism in the shape of the iliac crest and the overall os Coxa among White males and females. In this study, the best discriminators between females and males are the height of the iliac blade (subtense), the shape of the iliac blade (anterior and posterior chords and the three triangular areas), and the shape of the middle portion of the iliac crest (chords 7-11 and the associated angles). Such findings are relatively contrary to the hypothesized results. Thus further research of the observed variation is necessary to better address these findings. The new approach to quantifying the os Coxae and the iliac crest as presented here, does cast further light on the complexity of the question of sexual dimorphism in the human pelvis and it provides a new basis for its continued investigation.

Acknowledgements. The authors would like to thank Mr. Lyman Jellema of the Cleveland Museum of Natural History, for providing access to the Hamann-Todd Osteological Collection. Many thanks also go to Tarl Vetter and to Charlie Burdsal for their mathematical and statistical assistance. A special thank you goes to the Berner Research Fund for their financial support.

Dynamics of Gender Ideology of Hamas

Kristen Waymire*

Department of Women's Studies, Fairmount College of Liberal Arts and Sciences

Abstract. The West has often approached Hamas as monolithic and static. However, careful analysis reveals that the movement is flexible and fluid. Hamas actually provides its own discourse that offers an ever-changing framework of identity formation. By one merely labeling the group as a "terrorist" organization, the potential for comprehensive analysis is not only undermined but is reduced to focusing on the group's actions and doctrinal aspects of its charter. Although some scholars have begun serious in-depth studies and research into the Islamic Resistance Movement as a dynamic group within a broader context of socio-economic and cultural factors influenced and generated by the Nakba and subsequent Israeli occupation, the gender ideology of Hamas as well as other Islamic movements has been greatly ignored. Not only has the gender ideology of Islamic movements been sketchy but that also the women militants and their role(s) have been neglected in the study of Islamic movements.

1. Political Ideology: A Reflection of Adaptability

Palestinian Islamists have continuously fluctuated between revolutionary and reformist means to establish an Islamic state. The Israeli authors Shaul Mishal and Avraham Sela define Islamic movements as revolutionary whose ideology states that through the seizure of power, whether through legal means or violence, will "Islamize" the society from above by use of state mechanisms. According to the authors, the other form of Islamic movement is reformist. Reformist Islamism contends that the Islamic state or umma can be achieved through education and social action (Mishal et al. 2000:28).

In August of 1988, Hamas issued its charter. The charter utilized the national values and ideology of the secular Palestinian Liberation Organization. However, Hamas reinterpreted those ideas within an Islamic framework through Islamic terminology and belief system (Mishal et al. 2000:43). The charter proclaimed that the Palestinian land was an Islamic waqf or “endowment” ‘consecrated for future Muslim generations until Judgment’ (Mishal et al. 2000:44). The proclamation also declared that any forfeit of that land was forbidden by sharia or Islamic law. The use of “external jihad” was also indoctrinated as a religious duty to establish and preserve this waqf. Thus effectively combining religious values and nationalist desires and goals (Mishal et al. 2000:44).

Although the charter of Hamas is very dogmatic, the movement has continuously demonstrated its adaptability and dynamic character in response to its own inherent contradictions and to the political and social conditions in the Occupied Territories. Mishal and Sela argue that like other Sunni Islamic movements Hamas has to struggle with the innate difficulty of forming an institutional hierarchy, which contradicts the Sunni ideal of open interpretation of the Qur’an and the Hadith. The rivalry between Hamas and the PLO has been the ultimate source of conflict. Due to the PLO’s hegemony, Hamas had learned from its inception to coexist with the PLO. However, the movement had to do so without relinquishing its legitimacy as an opposing alternative to the PLO (Mishal et al. 2000:46-47)

2. Gender Ideology

The Gender Ideology of Hamas: A Continuous Discourse

Because Hamas—like other fundamentalist movements—strives to construct a “moral society based on the moral family,” its gender ideology and religious ideology cannot be separated (Jad 2005:174). Thus, in order to gain better insight into the neglected gender ideology of Hamas the texts generated by the movement as well as their mobilization of women must be examined. The history of the movement’s attitudes towards women must begin with the eruption of the Intifada.

Prior to the attempted nationalization of the hijab or headscarf, the headscarf in Gaza assumed diverse forms and meanings. Through the hijab, class, regional background, age, or religion was indicated. Hammami argues that: “These forms and meanings are fluid, and since 1948 there has been an ongoing appropriation and reinvention of various traditions of clothing and head-covering.” Hammami 1990:25).
During the late 1970s, the hijab began being redefined by the emerging Islamic movements, particularly al-Mujamma (which would later form Hamas). These groups strove to “restore” the hijab on women in the Gaza Strip as a means of returning to a more authentic Islamic tradition. However, Hammami contends that it is:

…in fact an “invented tradition” in both form and meaning. Here the hijab is fundamentally an instrument of oppression, a direct discipline of women’s bodies for political ends. The form itself is directly connected to a reactionary ideology about women’s roles in society and a movement that seeks to implement this ideology (Hammami 1990:25).

The Mujamma provided a model for both society and behavior that was relevant to the current conditions generated by the Israeli occupation. The group was able to offer a feasible solution to the social upheaval. By appealing to common cultural ideals and experiences as embodied in their Islamic interpretations, al-Mujamma’s influence and popularity grew in Gaza (Hammami 1990:25).

During the early years of the first Intifada, a fierce and sometimes violent campaign ensued in Gaza to impose the hijab on all women (Hammami 1990:24). The campaign would quickly spread into the West Bank. However, the UNLU would help suffuse it further spread into the West Bank. Hamas was at the forefront of the campaign. Upon its active participation in the Intifada, it soon summoned all women to adopt the hijab (Hammami 1990:25).

While Hamas actively campaigned for all women to adopt the headscarf, Hammami maintains that the hijab campaign was comprised of several forces. These forces operated collectively. The most compelling force was the combination of social pressure and the attempt to nationalize the hijab. The headscarf was soon ascribed new meaning as a symbol of political commitment to the uprising. Another argument for the hijab was that it acted as assurance of safety from soldiers. However, causality statistics reveal that soldiers do not distinguish along the lines of gender. The final reason for the adoption of the hijab was to ward off attacks from religious youths (Hammami 1990:26).

Although the campaign to impose the hijab failed in the West Bank for various reasons—particularly the lack of al-Mujamma and Islamist influence—it was remarkably successful in the Gaza Strip. Neither the UNLU (Unified National Leadership of the Uprising) nor the women’s committees effectively hindered the influence of the Islamists (Hiltermann 1991:56). By December of 1988, it was common practice for women to wear the some form of hijab while walking about Gaza (Hammami 1990:25).

While some may argue that the gender ideology of Hamas is “fixed” and conservative (Jad 2005: 180), Islah Jad argues that it is indeed fluid and continues to evolve. Hamas’s beliefs regarding the role of women is constantly fluctuating and inherently contradictory. The ever-changing ideology is not only due to the socio-economic conditions of the Occupied Territories but also due to the discourse with feminist and nationalist women as well as Islamist women within Hamas (Jad 2005:178). The adaptability of the group is demonstrated in various forms. One, the movement recognized the importance of women as a mobilizing force; as a result, it encouraged the education of women. Another example is that Hamas provided career and public sphere opportunities not generally accessible to women (Jad 2005: 176). The veil or the hijab has become the ultimate symbol of Hamas’s evolving gender ideology. Islamic dress has assumed new meanings. It now signifies a woman as an active political member who is modern and highly educated (Jad 2005:177).

Acknowledgements

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References

POSTER PRESENTATIONS
Tensile Pulse Generation Techniques in a Split Hopkinson Bar

J. F. Acosta* and K. S. Raju

Department of Aerospace Engineering, College of Engineering

Abstract. Experimental testing in a tensile Split Hopkinson Pressure Bar showed that the generated tensile pulse using a transfer flange methodology differs from the theoretical prediction. Flange attachment technique to incident bar and flange dimensions distort pulse shape and alter pulse width. Secondary pulses are introduced that hinder the calibration of the testing apparatus and its application to recovery experiments to study history effects. Lagrange diagrams are used to visualize pulse propagation and to identify secondary pulses sources. Geometrical parameters that hinder a proper generation and transfer of the loading pulse are identified and the effect on pulse characteristics is quantified using an Ls-Dyna explicit finite element model.

1. Introduction

The Split Hopkinson Pressure Bar (SHPB) for tensile impact testing follows the same principles and data analysis as the classical SHPB. However, tensile and compression systems differ on the technique to grip the specimen, the methodology for introducing a tensile loading pulse, and the testing specimen geometry. The main criterion for selecting a load transfer methodology, such that it allows for a proper calibration of the testing apparatus, is the reliability of the generated tensile pulse. In the present investigation, direct tensile loading is generated after impacting a flange attached on the end of the incident bar with a hollow striker bar, see Figure 1. From the impact, a tensile pulse is generated on the incident bar and propagated down to a specimen. At the interface, the pulse is partially transmitted through the specimen onto the transmitted bar as a tensile pulse and partially reflected back into the incident bar as a compressive pulse [1]. The aspect ratio between the dimensions of the flange and the striker would shape the resulting pulse. Wave propagation is evaluated through every component on the apparatus, and the pulse’s superposition is detected and corrected.

2. Experiment, Results, Discussion, and Significance

There are a few possibilities to attach the flange to the bar, i.e., clamp, threaded, welded, or a press fitted connection. As an alternative option a sleeve flange is proposed. It is clamped to the end of the incident bar over a matching profile. The sleeve is compounded of two halves that are fastened together (see Figure 2). Other types of connections may observe stress concentration at the bar-flange interface, i.e., fatigue can degrade the connection.

Experimental tests were conducted on a Tensile SHPB. Strain history for two flange locations are presented in Figure 3. Pulses observe large oscillations after the initial peak. Secondary pulses, result of subsequent reflections, are over imposed to transverse oscillations result of Poisson effect. Pulse superposition is visualized in the Lagrange diagram in Figure 4. The tensile pulse, and its symmetric compressive pulse, can be traced as they travel and reach each interface. Strain history is plotted on the right. The leading pulse has not crossed the strain gage entirely when a secondary pulse reaches the gage. Final output is a summation of pulses extending the pulse width and altering pulse shape. Superposition cannot be fixed by simply changing the location of the gages. A pulse under these conditions cannot be use for strain rate studies, system calibration, or history effects studies.

An explicit finite element model was created for the simulation using the commercial code Ls-Dyna. In the simulation a hollow cylindrical striker of length Ls is fired against a transfer flange of length Lf with a velocity 20 m/s. Penalty formulation is used for the contact analysis. Automatic surface to surface contacts were specified at the interfaces between striker, the transfer flange, and the incident bar. Linear elastic isotropic material properties for aluminum 7075-T6 were defined. Element size of 3 mm was used based on mesh sensitivity studies [2].

Numerical and experimental observations suggested the addition of a momentum trap after the transfer flange. It would contain the compressive momentum generated at the collision of the striker and the flange, see Figure 4. Lagrange diagram on Figure 5 shows the compressive pulse being trapped after crossing the flange. After reaching the back face of the trap it reflects as a tensile pulse, but since there is not attachment between the flange and the trap, the tensile pulse gets truncated and simply moves the trap apart from the flange. A momentum trap 254 mm long is included in the simulation of the general type flange and in the simulation of the sleeve flange. General type
flange dimensions are 15.24 mm length and 20.9 mm height. Sleeve flange dimensions are 76.2 mm long and 25.4 mm radius. The effect of the trap on the loading pulse is compared with previous simulations where no momentum trap is included (see Figure 6). Pulse width observed an error of only 15.73% compared to the theoretical width.

3. Conclusions

Pulse characteristics as width, amplitude, shape, and levels of oscillations were evaluated experimentally using a Tensile SHPB apparatus. Results were compared with analytical models for improvements. Examining such characteristics allowed understanding of the mechanics of the momentum transfer and the tensile load generation on the incident bar. An improvement on the transfer flange technique was achieved by simply adding a momentum trap to the apparatus. This is an alternative that minimizes load levels on the flange-bar intersection since the trap contains the compressive momentum and prevents any additional tensile loading over the incident bar. Results showed a significant improvement reducing the load levels and minimizing the distortion of the pulse. A momentum trap in combination with a sleeve flange not only reduces the load levels on the connection but also provides control over the pulse width. Secondary pulses are restrained and fatigue related problems are lessened.

First Step to Active Health - Online Plus: Pilot Study

Sahar B. Amini*, Mindy L. Slimmer, Eun Young Park, Nicole L. Rogers

Gerontology, College of Liberal Arts & Sciences

Abstract. The aim of this project is to implement, and demonstrate the efficacy of, a blended delivery multi-component physical activity program. The experimental group (FSAH-O) consisted of 24 male and females (age = 68.7 ± 5.5 yrs). The control group (N = 15; 74.7 ± 6.2 yrs) was drawn from a similar project. The program consisted of flexibility, strength, and balance training, and cardio-respiratory activity. Participants met 1day/week for 8 weeks for 50 minutes of exercise at a senior center while supplementing class with home exercise 2 days/week. Participants were given access to a program web site (an interactive, secure, online method to motivate, educate, and track activity). Program effectiveness was assessed using the Senior Fitness Test (SFT) (chair stand, arm curl, sit and reach, up & go, scratch test, and 12-min walk); balance (movement velocity (MVL), endpoint excursion (EPE), maximum EPE (MXE), and directional control (DCL) for forward (F), right (R), left (L) and back (B) movements). No baseline difference existed between groups. Repeated measures ANOVAs revealed interactions (p<.05) on most measures. SFT improvements were noted in the FSAH-O group: Chair Stand 10%, Arm Curl 22%; Up-&-Go 8%; 12-min Walk 18%. With respect to LOS, EPE and MXE improved in two directions (R 21%, R 8%; L 7%, L 7%). The control group did not change on any variable. Participating in an 8-week blended FSAH-O program improves FF, and 2 of 4 balance measures. A longer intervention may result in greater improvements.

1. Introduction

A vast amount of research supports the hypothesis that regular physical activity improves health and function and contributes to the prevention or delay of disability and disease. Despite this evidence, most Americans are not sufficiently physically active. More than one-half of US adults do not meet the public health recommendations for physical activity and those over the age of 50 years report the highest levels of insufficient physical activity (34%). We need to take greater initiative to communicate physical activity recommendations and to support increased regular physical activity among midlife and older adults. This project implemented an internet program to provide support for older adults interested in engaging in a well-rounded exercise program. The program was designed to be delivered in a hybrid setting (class and home) using simple and inexpensive equipment (i.e. pedometer, elastic resistance band, balance stability trainer). Design of this program is based on two areas in the literature, home and class based exercise and internet applications. Briefly, evidence from a recent review suggests that exercising at home or at a center improves the health and physical function of older adults. Notably, home based programs appear to have a significantly higher adherence rates than center based programs, and are superior over the long-term. According to Sciamanna et al., “the Internet has a vast capacity for disseminating patient-oriented interventions to improve the quality of the nation’s care.”[1] Web-based interventions provide inexpensive delivery of components of effective, but expensive interventions, such as personal feedback and individual goal-setting[2,3]. In a review by Lattner [4], the author describes several interventions demonstrating the effectiveness of computer-assisted self-monitoring of caloric intake and physical activity, goal setting, response-contingent feedback, and regular prompts reminding users to enter self-reports. Ryan et al [5] reports computer interventions to be especially effective when ipsative feedback (eg, comparing current to past behavior) is utilized. This is evident in a recent pilot study examining enhanced pedometer feedback + nutritional counseling on weight loss [6]. Findings suggest that tailored, computer-generated, step-count feedback to be an affordable way to increase the physical activity and lose weight.

2. Experiment, Results, Discussion, and Significance

Recruitment: Older adults were recruited through newspaper advertisement. Potential participants were screened using the EASY (Exercise and Screening for You) tool to ensure it was safe for individuals to participate in the program. Assessment. Eligible subjects underwent a variety of assessments including a functional fitness battery, balance measures, and measurement of daily physical activity. Functional Fitness was measured using the following assessments: 1. chair stand (lower body strength); 2. arm curl (upper body strength); 3. sit and reach (lower body flexibility); 4. scratch test (upper body flexibility); 5. up and go (physical mobility); and 6. 12-min walk (aerobic endurance). Daily physical activity was measured using pedometers. A force platform (Balance Master Platform,
NeuroCom International) was utilized to obtain the dynamic balance measure called Limits of Stability. The Limits of Stability assessment quantified the maximum distance a participant could lean in a given direction without losing balance. The subject’s center of gravity appeared as a point in the middle of a computer screen and targets were arranged around this point. The subject leaned toward each target (front, back, left, and right) holding each position for 10s. Measured parameters were reaction time, sway velocity, directional control, endpoint excursion, and maximum excursion. Intervention: The program web site was a user-friendly, interactive, secure, online method to motivate, educate, and track physical activity. The site consists of eight elements: educational material, step tracking logs and graphs, individualized step goals, strength training routines and logs, walking progression along a virtual US trail, walking competition, motivational newsletters, and incentives. Subjects formed teams of 4 to “race” across the US. They logged into the site at least once per week and recorded steps, non-translatory physical activity (swimming, gardening, etc), and home FSAH exercise sessions. Non-translatory physical activity was converted to steps and combined with daily step counts to be reported as one measure of total physical activity. Subjects received immediate feedback regarding activity accumulation and could view graphs and maps of their progress as well as team standings. Program staff provided newsletters sharing health-related information as well as team and individual progress and activity goals. FSAH-O was offered at a local senior center once per week for 50 minutes. The FSAH-O program consisted of: (a) flexibility training; (b) strength training, using elastic resistance bands; (c) balance training, using firm and pliable foam pads surfaces; and (d) increasing cardio-respiratory activity. Cardio-respiratory progression was based on an individualized approach of goal-setting and self-monitoring. A 1-week baseline (steps/day) was established as subjects performed their normal daily activities while wearing a pedometer and recording non-translatory physical activity. The web site calculated activity goals by increasing baseline values 10% week until an overall step goal (6,000-10,000 steps) was achieved. Subjects received FSAH program instructions and demonstrations during class. Photos and instructions were also provided on the web site. Results: The FSAH-O group consisted of 24 male and females (age = 68.7 ± 5.5 yrs). The control group (n = 15; 74.7 ± 6.2 yrs) was drawn from a similar project. No baseline difference existed between groups or genders. Repeated measures ANOVAs revealed group x time interactions (p<.05) on most measures. SFT improvements were noted in the FSAH-O group: Chair Stand 10%, Arm Curl 22%; Up-&-Go 8%; 12-min Walk 18%. With respect to LOS, EPE and MXE improved in two directions (R 21%, R 8%; L 7%, L 7%). The control group did not change on any variable. With respect to website use, 20 of 24 users successfully entered physical activity data. Four subjects lacked computer experience and were non-compliant with website entry. In lieu of this, subjects recorded steps and other activities on paper logs and program staff entered data in subject accounts. Ninety-eight percent of subjects entered their daily activities each day of the project. One hundred percent of subjects completed at least one FSAH session at home, and 91% of subjects completed 3 home sessions. Subjects appeared to enjoy the friendly team competitions.

3. Conclusions

Given the brief duration of this project, results were promising. Significant improvements were noted for most functional fitness tests. Balance improvement was not as prevalent; however there was a trend for improvement in EPE and MXE for the front and back directions. Longer project duration would likely lead to additional balance improvements. Due to the progressive nature of the program and subject’s poor initial balance, more challenging balance exercises would come in latter weeks of a longer program. More importantly, overall, subjects were successful in using the website to track their daily activity, suggesting an internet-based physical activity program could be successful in motivating older adults to initiate and maintain a physical activity program. Future studies will be more qualitative in nature, evaluating older adult’s opinions and suggestions regarding the usability of the program website.

Not Dying from Disease: A Narrative Analysis of HIV/AIDS in the Film *Rent*

Ashley M. Archiopoli*

Elliott School of Communication, Fairmount College of Liberal Arts and Sciences

**Abstract.** Set when AIDS was the scourge of New York City the film adaptation of *Rent* follows the lives of eight characters struggling to live their lives in the early 1990s; four of whom are HIV positive or have AIDS. This research utilizes narrative criticism to analyze the characters’ stories as they manage the physical and emotional consequences of AIDS. The platonic and romantic relationships among the characters act as the catalysts for personal growth, encouraging the characters to live their lives fully within the context of AIDS. The rock opera unfolds to reveal how Angel, Collins, Mimi, and Roger individually cope with the virus. Evaluation of the characters experience resulted in the creation of the HIV/AIDS Lifestyle Integration Continuum.

1. Introduction

The rhetorical artifact of *Rent* was chosen because it is a unique piece popular culture that addresses the theme of HIV/AIDS and serves as a social commentary for its time. Narrative criticism is used to analyze the “meaningful discursive structures” [1] in the film adaptation of the rock opera, *Rent.* Specifically, focusing on how the characters living with HIV/AIDS. “Narratives organize the stimuli of our experience so that we can make sense of the people, places, events, and actions of our lives” [2]. The characters Angel, Collins, Roger, and Mimi supported by their friends Mark, Maureen, Joanne, and Benny build relationships that serve as catalysts for personal growth.

2. Experiment, Results, Discussion, and Significance

**Research Questions**

- RQ1: How is HIV/AIDS represented in the narrative of Rent?
- RQ2: How do the individuals cope with having the HIV/AIDS virus?

**Methodology**

Data was gathered over a one-month period and multiple viewings of the film. Data collection consisted of comprehensive note taking to determine parts vital to narration and specific dialogue concerning HIV/AIDS. The film was broken down into 10 events integral to understanding the discourse surrounding Roger, Mimi, Collins, and Angel’s experience with HIV/AIDS.

**Results, Discussion, and Significance**

Addressing the first research question, the theme of HIV/AIDS is woven throughout the film. Character representations act to humanize the virus, allowing the audience to create a shared experience – connecting faces, names, and stories to HIV/AIDS. Additionally the characters living with HIV/AIDS are of different ethnicities and sexual orientation. Realistic characters with complex emotions facilitate the audience’s ability to relate the characters and their experiences to their own life. This strategy relays the message that any one may become infected with the virus no matter their race or orientation. Integration of Life Support meetings also allows the audience insight to a more sensitive side of living with HIV/AIDS. Two important themes from the Life Support meetings include the fear of losing one’s dignity to the virus represented in the song, *Will I?* More importantly Life Support meetings introduce the mantra for the film, “no day but today,” which encourages the idea of living one’s life to its full extent according to what drives their happiness.

The second research question reveals that each of the characters is in a different stage of their HIV/AIDS experience. Their individual experiences are represented on the Lifestyle Integration Continuum below. The continuum has three benchmarks moving from left to right, un-integrated, integrated, and external integration. To be un-integrated is to exhibit little regard for the virus and the lifestyle changes it demands i.e. drug use, or disclosure
to potential partners. To be integrated is have a sense of normalcy, or homeostasis. A person who is integrated has a full acceptance of the virus and takes steps to secure their physical and mental health. External integration moves beyond internal integration to self-actualized, this person also helps others begin the process to become internally integrated. The chart below illustrates the characters standing on the continuum at the end of the film.

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<th>Un-integrated</th>
<th>Integrated</th>
<th>External Integration</th>
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<tbody>
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<td>Mimi</td>
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<td>Roger</td>
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<td>Collins</td>
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Mimi is the least conscious of her HIV/AIDS status, illustrated by her continued drug use and disregard for her health, placing her at the lowest end of the Lifestyle Integration Continuum at un-integrated. For example, Mimi invites Roger to do drugs with her when the two first meet. Roger hovers between un-integrated and integrated on the continuum because he has taken steps to better his life by abandoning his drug habits, but he still struggles accepting his HIV/AIDS, and the loss of his girlfriend. Collins represents homeostasis or normalcy, placing him at integrated on the Lifestyle Integration Continuum; he exudes optimism while personally dealing with HIV/AIDS. Angel is the most open about his HIV/AIDS status. He is in the final stages of the virus; he secures his mental well being by attending Life Support regularly and encourages others to join him drawing them toward internal integration. At different times Collins, Mimi, and Roger all attended Life Support at the request of Angel, he represents the far right end of the continuum, external integration.

3. Conclusions

The story of Rent gives unique insight into the human experience of those living with HIV/AIDS. Character creation is an effective way to humanize HIV/AIDS and to deliver social commentary. Additionally the variety of characters allows for widespread relatability, it also shows the different journeys characters take to HIV/AIDS lifestyle integration. However, the rock opera has two major limitations. First the story does not reveal how each character was infected, without that information the audience will assume that both Roger and Mimi were infected by drug use, while being sexually active in the gay community infected Angel and Collins. These are the two most common ways one may become infected, but it excludes those who were infected by blood transfusions or other circumstances. This research also found that the upbeat melodies at times glorify drug use and/or degrade the seriousness of HIV/AIDS if not interpreted in the context of living one’s life to the full extent. One will also find the two songs that are sung during Life Support meetings are slower and more somber.

4. Acknowledgements

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References


Near Infrared Spectroscopy Measurement of Sacral Tissue Oxygenation Saturation (StO₂) in Healthy Volunteers Immobilized on Spine Boards

Jessica Baumchen*, Erin Gurss*, Emily Hennes*, Sue Nyberg, Gina M. Berg-Copas

Dept of Physician Assistant, College of Health Professions, *University of Kansas School of Medicine-Wichita

Abstract. Immobilization of patients utilizing rigid spine boards (RSB) is standard practice in the management of trauma patients. Pressure ulcers (PU) have been associated with prolonged immobilization. The possibility exists that PU formation may begin when the patient is initially immobilized, the effects not fully recognized because of limited research on the direct tissue effects of prolonged immobilization. Near-infrared spectroscopy is an emerging tool to measure peripheral tissue oxygenation (StO₂). The purpose of this pilot study was to study the effects of prolonged spinal immobilization on sacral tissue oxygenation of healthy volunteers. This cross-sectional study measured tissue oxygenation (StO₂) in 73 volunteers at baseline and then after 30 minutes of immobilization on a RSB at two sites, the sacrum and a control site not subjected to direct pressure. Data were analyzed utilizing within-subjects analysis of variance. There was a significant increase in the StO₂ percentage at the sacral (intervention) area following immobilization, p < .001, r pb = .48. No significant change in oxygenation was noted at the control site. An increase in oxygenation of sacral tissue following immobilization was an unexpected finding and may be a result of initial, rapid tissue reperfusion at the time of pressure release and the inability of this methodology to detect hypoperfusion during tissue compression.

1. Introduction

Immobilization of patients utilizing rigid spine boards (RSB) is standard practice in the initial management of trauma patients. Nationally recognized practice guidelines recommend spinal immobilization until spine injury is excluded [1]. Pressure ulcers (PU) of the skin have been associated with prolonged patient immobilization during medical procedures and may begin with initial immobilization [2]. Near-infrared spectroscopy is an emerging technology used to measure peripheral tissue oxygenation (StO₂) [3]. The purpose of this study was to measure the effects of prolonged spinal immobilization on sacral tissue oxygenation of healthy volunteers.

2. Methods

This cross-sectional study received approval from the Wichita State University Institutional Review Board. Inclusion criteria included the following: healthy volunteers aged 18 or older; exclusion criteria included history of diabetes, smoking, or extensive skin rashes over spine. Participants were recruited from the WSU community using block stratification for sex, age, and BMI in order to obtain a representative sample.

Each study participant’s height and weight was measured prior to study initiation. Each participant had three baseline measurements of tissue oxygenation taken prior to the intervention: 1) at the intervention position (sacral area at top of buttocks); 2) at the local control position (area 8 to 10 cm above buttocks); and 3) at the distal control position (the thenar eminence). Tissue oxygenation measurements were taken with the InSpectra™ StO₂ Tissue Oxygenation Monitor (Hutchinson Technology®, Hutchinson, MN). Tissue oxygenation measurements were taken by placing the near-infrared probe at the measurement site and waiting for 15 seconds for equilibration. The percentage of tissue oxygenation was recorded. All baseline measurements were taken by two independent researchers.

Participants were categorized into BMI classifications defined as follows: underweight, < 18.50; normal, 18.50 – 24.99; overweight, 25.00 – 29.99; and obese ≥ 30.00. Participants were immobilized on a rigid spine board for a period of 30 minutes. At the end of the 30 minute period, participants were then log-rolled to one side and two tissue oxygenation (StO₂) readings were taken: 1) at the intervention position (sacral area at top of buttocks) and the local control (area 8 to 10 cm above buttocks). Participants were then released from immobilization.
Baseline measurements were averaged for pre-rigid spine board (RSB) comparison analysis. Pearson correlation coefficient was used for inter-rater reliability and t-tests were used to evaluate mean comparison between raters for baseline measurements. Within-subjects analysis of variance was used to analyze differences between the three baseline measurements. Pre/post mean comparison was analyzed using repeated measure t-tests. Sub-group comparisons were analyzed using mixed-model analysis of variance. Similarities for age, sex, body mass index (BMI) groupings in sub-groups were analyzed using chi-square and t-tests where appropriate. Analyses were performed using SPSS 15.0 for Windows. Probabilities of < 0.05 were considered significant.

3. Results

There were 74 volunteers who were eligible to participate in this study. One participant was excluded from analysis because three of the eight tissue oxygenation measurements were less than two standard deviations from the mean; thus, 73 participants were included in the analysis. The study sample almost equal in sex with slightly more females (55%) and the average age was 37.7 (CI: 33.9 - 41.5) years old. Mean height (cm) was 170.1 (CI: 168.0 – 172.2); mean weight (kg) was 81.6 (CI: 76.6 – 86.6) and the mean BMI was 28.0 (CI: 26.3-29.6) Two participants fell within the “underweight” category with less than 18.5 BMI; thus, they were excluded from the BMI status comparison.

The pairs of baseline measurements for each location were averaged as all pairs of baseline measurements were significantly correlated and means were not statistically different. Variance accounted for was 66%. At the sacral area (contact with RSB), the tissue oxygenation measurement was significantly higher at post-RSB than at pre-RSB, p < .001, rpb = .48. Forty-eight percent of the variance was accounted for. At the local control (above sacrum), there was not a significant difference in StO2 oxygenation in the pre/post RSB measurements, p = .274.

Sub-group analysis revealed no significant differences in StO2 measurements between participants of varying BMI, gender or age group.

4. Conclusion

An increase in sacral tissue oxygenation following immobilization was an unexpected finding and may be a result of initial, rapid tissue reperfusion at the time of pressure release and the inability of this methodology to detect hypoperfusion during tissue compression. If tissue damage resulting in an increased rate of PU formation is associated with compression, it is not well known if this results from tissue hypoperfusion or rapid reperfusion of the tissue. Future research is indicated with a larger sample size and possibly varying times of spinal immobilization.

5. Acknowledgements

The authors would like to recognize and thank the people who contributed to this research project. Dr. Paul Harrison, trauma surgeon, Dee McDaniel and Melissa Ellenz, trauma department staff at Wesley Medical Center, and the students and faculty of the PA Program at Wichita State University.

Measuring the Physical Activity Level of Two Children with Combined Cerebral Palsy and Intellectual Disability

Megan Bengtson, Stephanie Blake, Laurie Chamberlain, and Jodi Runge

Abstract. Current guidelines recommend that school-age children accumulate at least 60 minutes of moderate to vigorous physical activity (MVPA) on most days of the week. Research has established a valid methodology in measuring the intensity of physical activity levels in children without disabilities via heart rate (HR) monitoring. This case report describes whether this methodology can be applied to children with combined cerebral palsy (CP) and mild intellectual disability (ID). Physical activity (PA) patterns of two children with spastic CP and with mild ID were evaluated during three consecutive school settings: physical education, classroom, and recess. Amount and intensity of PA was successfully recorded in all three settings. Data indicated that the female child spent a total of 98.2 minutes (73% of allotted time) whereas the male child spent 21.1±8.8 minutes (16.2%) in MVPA, respectively. The results suggest that it is feasible to measure the intensity of physical activity in a school setting for children with combined spastic CP and ID. Further investigations with more participants at different function levels of CP will determine the extent to which this methodology can be used.

1. Introduction

Extensive research has addressed the PA behaviors, patterns, and determinants of youth without disabilities[1] but there is limited information on the PA characteristics of youth with either cerebral palsy (CP)[2] or intellectual disabilities (ID, i.e. mental retardation).[3] To date, no studies exist that have considered the PA characteristics of youth with combined CP and ID. The latter is important when considering that the estimated prevalence of ID among children with CP varies from 30-70 percent.[4] The importance of establishing a valid and reliable method for objectively measuring the daily PA levels of children with CP was addressed in a recent article by Fowler and colleagues: “Although….research demonstrated reduced cardiorespiratory fitness within laboratories, less is known about the daily PA levels of children with CP at home, at school, and in the community.”[2] Therefore, this study represents an exploratory investigation in measuring the PA in two children with combined spastic CP (GMFCS levels III and IV, respectively) and mild ID via HR monitoring in the school setting. Specifically, the focus of this study was to determine whether or not established methodology used to measure intensity of PA via HR monitoring could be applied to children with combined CP and ID.

2. Experiment, Results, Discussion, and Significance

Our sample of convenience consisted of 2 children, 1 male (8.5 yrs) with ataxic triplegia (both legs and left arm) CP and 1 female (9.0 yrs) with spastic diplegia CP. The male and female participants were classified at level IV and Level III, respectively, according to the Gross Motor Function Classification System (GMFCS).[5] Both have been diagnosed with mild mental retardation (MR) as determined by qualified school personnel according to the model for diagnosis by the American Association on Mental Retardation.[6] Heart rate was measured by telemetry (S410™ Heart Rate Monitor, POLAR®, Helsinki, Finland). The receiver was programmed to record heart rate every minute and was placed on the wrist of the participants. Protocol used for determining resting heart rate (RHR) followed the standardized methodology previously established for non-disabled children.[7,8,9,10] However, adjustments were made to accommodate the special needs of these children. For the school setting, all measures were administered during regularly scheduled morning classes, which included three different settings and took place in the following chronological order: 55 minutes of adapted physical education (PE), 55 minutes of instructional class time (IC), and 25 minutes of inclusive recess (R). Using RHR, activity intensity for each setting was calculated by the time spent >1.25% RHR (PAHR-25) for moderate physical activity (MPA) and >1.50% RHR (PAHR-50) for vigorous physical activity (VPA). Studies have demonstrated that these indices are reliable and can objectively discriminate between different levels of activity in children.[6,9] Mean and standard deviations for RHR on the three days of collection were analyzed by a repeated measures one-way ANOVA followed by a Newman-Keuls multiple...
comparison to detect specific differences. The RHR’s of 94 bpm (female child) and 103 bpm (male child) were used to determine PAHR-25 and PAHR-50, respectively. Mean time spent in the PAHR-25 and PAHR-50 ranges during the three consecutive school settings of adapted physical education, instructional class time, and inclusive recess. For the female child, a total of 98.2 minutes (73%) was spent in the MVPA range. Total MVPA time for the male participant differed depended on whether or not he engaged in adapted physical education in or out-of-chair. When he participated out of his chair, total MVPA time more than doubled (21.1±8.8 vs 43.4±7.9 min; 16% vs 32% of allotted time) when compared to his activity in-chair.

3. Conclusions

Intensity of PA was established using heart rate ranges for PAHR-25 and PAHR-50. Results indicate that the methodology used in this study proved feasible in measuring the amount of time spent in MVPA within these environmental venues. In addition, when the three school settings were combined: (1) the female participant engaged in approximately 98.2 minutes of MVPA, well above the recommended level of 60 minutes [11,12]; and (2) the male participant doubled his total MVPA time when taking part in PE out-of-chair. This case study verifies the feasibility and, additionally, the sensitivity of this methodology in detecting determinant factors that influence intensity of PA for children with combined CP and ID. This procedure offers the ability to gain insight into the daily physical activity levels of children with combined CP and ID.

4. Acknowledgements

We would like to first and foremost thank our research advisor Dr. Kenneth Pitetti for all of his guidance, knowledge and support. Without him, this project would not be possible. We would also like to thank Cindy Combs for her help in this project. Lastly, we would like to thank our two children subjects for being the focus of this project.

Quantifying Male and Female Shape Variation in the Mastoid Region of the Temporal Bone

Kristen A. Bernard*, Peer H. Moore-Jansen

Department of Anthropology, College of Liberal Arts and Sciences

Abstract. The shape of the temporal bone of the adult human cranium, specifically the mastoid region, is documented widely in past literature as a measure of sexual dimorphism within and among human populations. Yet, past research focus primarily on the qualitative assessment of the size of the mastoid region as it varies between males and females. This study explores both standard qualitative and standard and nonstandard quantitative measures of variation, in both size and shape, of the inferiorly projecting cone-shaped process of the temporal known as the mastoid process. A set of five measurements, two of which use five non-metric scores, compiled or developed at the Wichita State University Biological Anthropology Laboratory (WSU-BAL) to better characterize the mastoid region, are recorded for 100 male and 100 female adult crania from the Hamann-Todd collection at the Cleveland Museum of Natural History. Descriptive statistics demonstrate patterns of sexual dimorphism in the mastoid region and the results indicate that a quantitative approach provides greater consistency in identification than the qualitative characterization of the mastoid region, as it is used almost exclusively in current practice.

1. Introduction

This study examines patterns of variation within a group, particularly the variation between sexes. The topic of this study is the mastoid process, which can be defined as a cone-shaped process of the temporal bone located posterior to the external auditory meatus that projects inferiorly. The mastoid process is typically more robust in males than in females and this is most likely due to the larger muscles that insert on the mastoid process in males.

Visual assessment is commonly applied to the estimation of sex from the mastoid region because of its relative ease of use, but it is critical to note that the terms used to describe the mastoid process are variable and reflect subjectivity in observation. This study seeks to achieve greater consistency by quantifying the sexual dimorphism of the mastoid process. It is important to try and define more specifically what is a small, medium, or large mastoid process, and measuring the mastoid process can hopefully clarify and provide a more consistent method for assessing the size and shape of the mastoid process for sex estimation.

2. Materials and Methods

The study sample consisted of 100 adult White males and 100 adult White females from the Hamann-Todd Osteological Collection, which represents a Central European sample. The recording protocol for this research includes five measurements (Table 1) and are derived from standards developed by Howells (1973) [1]; Acsádi and Nemeskéri (1970) [2]; Moore-Jansen (n.d.) [3]; and Krogman (1962) [4].

Table 1. Definitions of measurements collected from the Hamann-Todd Osteological Collection

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastoid height (MDH)</td>
<td>The length of the mastoid process below and perpendicular to the eye-ear plane, in the vertical plane (Howells 1973).</td>
</tr>
<tr>
<td>Mastoid breadth (MDB)</td>
<td>The width of the mastoid process at its base, through its transverse axis (Howells 1973).</td>
</tr>
<tr>
<td>Mastoid radius (MDR)</td>
<td>The perpendicular to the transmeatal axis from the most inferior apex of the mastoid process (Moore-Jansen n.d.).</td>
</tr>
<tr>
<td>Supramastoid crest size (SMC)</td>
<td>The raised area of bone that forms the posterior root of the zygomatic process. The crest is scored on a scale from -2 (female) to +2 (male).</td>
</tr>
<tr>
<td>Mastoid size (MDS)</td>
<td>The overall size of the mastoid process as described by overall shape and projection based on a scoring method as described by Acsádi and Nemeskéri (1970).</td>
</tr>
</tbody>
</table>

A nonstandard measure of height, the mastoid radius, is tested against the standard measure of height, mastoid height. The mastoid radius measures the height of the process relative to the transmeatal axis, a fixed dimension, in contrast to the standard mastoid height which is measured from the eye-ear plane and sighted to the tip of the mastoid process (Howells 1973:177) [1]. Measuring the height from a sighted reference point is likely to introduce both interobserver and intraobserver error, whereas a radius, as defined in the MDR measurement, is expected to, if not eliminate, at least reduce this error (Moore-Jansen n.d.) [3].
Analytical methods for quantifying male and female shape variation in the mastoid process were composed using descriptive statistics. Sectioning points were created using the mean of the male and female means of the mastoid measurements MDR, MDH, and MDB.

Independent samples t-tests were performed to assess the differences between males and females for each of the three quantitative measurements. T-tests were also performed to test for significant differences between MDR and MDH. The $\alpha$-level used is $\alpha=.05$, where $p < .05$ is judged statistically significant.

3. Results and Discussion

It is clear that there is variation in the size of the mastoid processes among males and females as demonstrated by descriptive statistics. For each measurement, the male mean is slightly larger than the female mean. Independent t-tests reveal that there are significant differences between males and females, with p-values much less than 0.05.

When examining the two qualitative observations SMC and MDS, the results indicate that scoring the supramastoid crest (SMC) is more consistent than scoring the size of the mastoid process (MDS). Within males, using SMC scored 6% more correct than MDS. Among females, 80% were scored correctly using SMC versus 61% using MDS.

Three paired quantitative classifications were calculated for the three mastoid measurements (MDR, MDH, MDB) for males and females to see which measurements are more consistent for determining sex. Of the three measurements, among males and females, MDR classified the highest percentage of crania to the correct sex. Among the pooled sample of males and females, MDR correctly classified the greatest percentage and MDB the least. From the results, it is suggested that MDR is the most consistent measurement for estimating sex.

One of the goals of this study is to assess the consistency of the mastoid height and mastoid radius, which are both used for recording the height of the mastoid process. Independent samples t-tests indicate the two measurements are significantly different within both males and females. The data suggest that the use of the mastoid radius is associated with a smaller standard deviation and there is less variance around the mean of MDR compared to MDH which suggests that observer error is reduced.

When examining the pooled results (qualitative and quantitative) of MDR, MDH, MDB, and MDS, all which examine the overall projection of the process, MDR classifies the greatest percentage, with MDH, MDS, and MDB following behind in order. Overall, when examining the height of the mastoid, quantitative analysis, using the mastoid radius, provides the greatest consistency.

4. Conclusions

An important find from this study is regarding the nonstandard measurement of the mastoid radius. The variances around the means and the standard deviations of the two measurements reveal that the mastoid radius is more consistent than the mastoid height. This is important for future analysis of the mastoid process for sex identification purposes and this research suggests that the mastoid radius should be employed more often. The main research was devoted to testing whether quantitative analysis is more consistent than qualitative analysis. Although qualitative assessment of the mastoid process has been widely used to estimate the sex of an individual rather than quantitative assessment because it is faster than measuring, this study suggests that visual assessment using MDS to score the overall size of the mastoid process is not as consistent nor as efficient as measuring the mastoid using the mastoid radius or height measurements. Further, the mastoid radius measurement appears to be the least variable when compared to mastoid height.

4. Acknowledgements

The authors would like to thank Mr. Lyman Jellema of the Cleveland Museum of Natural History, whose assistance in this research of the Hamann-Todd Osteological Collection is greatly appreciated. Many thanks go to Dr. Robert Lawless and Dr. Christopher M. Rogers for their support as well as the Berner Research Fund for financial assistance in carrying out this research.

Effects of Lower Trapezius Muscle Strengthening Exercises

Rachel Haag, Barbara Voegele, Staci Cook, Jennie Carlgren*, Robert Manske, Michael Reiman

Department of Physical Therapy, College of Health Professions

Abstract. The lower trapezius (LT) muscle is important for normal shoulder function. Evidence for optimal strengthening exercises and dosage for a weak LT muscle does not exist. Our goal was to determine if purported LT strengthening exercises are effective. Shoulder external rotation, prone elevation in the scapular plane, and scapular retraction were used in this study. Fifty-five healthy participants (33 experimental; 22 control) between the ages of 20-30 participated. Strength was assessed with hand held dynamometer pre-training and post-training at 4, 8, and 12 weeks. A mixed 2-way ANOVA assessed differences between experimental and control LT strength at the various time frames. Results found no difference between experimental and control groups LT strength pre-training and post-training 4, 8, and 12 weeks.

1. Introduction:

This study was designed to determine if exercises deemed to be effective for strengthening the lower trapezius muscle do indeed create strength gains. One goal of shoulder rehabilitation is to regain lower trapezius muscle strength to reestablish normal scapulohumeral rhythm. Limited knowledge exists on exercises to prescribe for a weak lower trapezius muscle. Previous research has determined by electromyographic (EMG) analysis, which exercises illicit the highest amount of lower trapezius muscle activity [1]. The three exercises selected for this study (shoulder external rotation, prone elevation in the scapular plane, and scapular retraction) were chosen based on these EMG analyses [1,2]. See Figure 1. Previous studies focus only on EMG activity of the scapular muscles rather than actual exercises and strengthening of these muscles, thus establishing the basis of this study. Our study used a handheld dynamometer to assess the force of lower trapezius force production. A handheld dynamometer can be used to quantify muscle performance to address EMG limitations [3].

2. Experiment, Results, Discussion, and Significance:

A sample of convenience was used of normal male and female college age students (ages 20-30) whom have had no recent shoulder injury. Each subject was randomly placed into either a control or exercise group. Subjects in the exercise group had an exercised extremity determined randomly with hand dominance taken into account. Subjects drew from a hat to determine if dominant or non-dominant upper extremity would be exercised. The control group was not instructed in any exercises and they were instructed not to change their present exercise routine. The exercise group subjects were asked to perform the three previously mentioned exercises, for three sets of ten repetitions, progressing to three sets of fifteen repetitions, three to four times per week, for eight weeks. Subjects were tested at 12 weeks to determine if any carry over occurred of cessation of exercise. Subjects were assumed to perform the exercises correctly at least three times a week and assumed to give maximal effort during strength testing with the hand held dynamometer (HHD). Each participant had their lower trapezius strength assessed with HHD pre-training and again post-training at 4, 8, and 12 weeks. Subjects’ were measured in prone on a plinth. The HHD was securely fastened under a plinth which was adjusted to the appropriate height. The subjects were positioned so that the HHD was correctly positioned on the distal forearm. Subjects then gave maximal effort elevating arm in the scapular plane against the HHD. After three trials the average score was recorded.

Following statistical analysis using a mixed 2-way ANOVA, results found no significant difference between experimental group and control group. More specifically, statistical analysis investigated and found no significant strength gains in the experimental group from pre-test to 4 weeks and pre-test to 8 weeks. No significant carry over was noted from 8 weeks to 12 weeks in the experimental group.

The intention of this study to determine a relationship between lower trapezius exercises and strength gains. It was hypothesized that strength gains would be established from pre-test to 8 weeks in the experimental group. There are numerous factors that could have affected the results of this study. Factors include; lack of control of compliance...
within the experimental group, participation of each subject throughout the course of this study, and subject familiarization of testing procedure.

3. Conclusions:

This study found no significant strength gains in the lower trapezius muscle after an eight week program of exercises determined by EMG analysis to have high lower trapezius activity. Further research would be beneficial to physical therapists for treatment protocols for shoulder pathologies involving weakness of the lower trapezius muscle.

4. Acknowledgements

Researchers wish to thank Rob Manske, DPT and Micheal Reiman, DPT, for their guidance and expertise regarding measurements and subject matter. We would also like to thank Ruth Bolhken of the Exercise Science Department at WSU for supplying exercise equipment and Barb Smith for statistical analysis. To all the participants that were involved in this study, we express our deepest gratitude and appreciation.


Fig. 1- Exercises

Scapular Retraction
Shoulder External Rotation
Prone Elevation in Scapular Plane
Effects of Dynamic Warm-up With and Without a Weighted Vest on Lower Extremity Power Performance of High School Male Athletes

John Carter, Amber Boehner, Cori Cameron, Jessica Murphy, Ashley Peintner

Physical Therapy Department

Abstract. The purpose of this study was to compare lower extremity power performance utilizing the Margaria-Kalamen Power Test after a dynamic warm-up with and without a weighted vest. Sixteen \( n = 16 \) high school male football players participated in two randomly ordered testing sessions. One session involved performing the football team’s typical warm-up while wearing a vest weighted at 5% of the individual athlete’s body weight before performing 3 trials of the Margaria-Kalamen Power Test. The second session involved performing the same team warm-up without wearing a weighted vest before performing 3 trials of the Margaria-Kalamen Power Test. The dynamic warm-up consisted of the following dynamic exercises, which lasted 5 minutes total: straight leg kicks, forward lunges, backward lunges, heel-rear kicks, high knees, stride-outs, deep lunges, and jogging. No significant difference was found in power performance between the non-resisted and resisted dynamic warm-up protocols \( p = 0.161 \). It was concluded that a dynamic warm-up with a vest weighted at 5% of the athlete’s body weight was not advantageous for increasing lower extremity power output in high school football players.

Keywords: power, male, weighted vest, Margaria-Kalamen Power Test

1. Introduction

Research has shown that by using resistance during dynamic warm-up, power performance improved in high school female athletes (1) and male/female collegiate athletes (2, 3). The effectiveness of a resisted dynamic warm-up for high school male athletes has not yet been determined. Consequently, this study was designed to compare lower extremity power performance of high school male athletes following a dynamic warm-up without a weighted vest and dynamic warm-up with a vest weighted at 5% of the athlete’s body weight. Using previous research to guide our exploration of power production in athletic performance, we hypothesized that the use of a weighted vest during dynamic warm-up protocols would amplify lower extremity power performance in high school male athletes to a greater degree than dynamic warm-up activities without a weighted vest.

The information ascertained by this study is significant for the progression of practice, training, and competition warm-up protocols in the augmentation of power performance of high school male athletes and could be of benefit to coaches, athletic trainers, athletes, and health care professionals.

2. Experiment, Results, Discussion, and Significance

Participants who sustained a lower extremity injury that required surgical intervention in the two years prior to testing were excluded from the study. Subjects were also required to have obtained a current physical allowing them to participate in athletic events, which provided us with additional evidence that each participant was healthy enough to participate in the study. Sixteen male athletes, 14 to 18 years old, who were members of a local high school’s football team and met the original criteria volunteered for this study. Participants served as their own controls.

Each subject was required to participate on two separate testing days which were exactly one week apart. On the initial testing day, the subjects were randomly divided into two groups. On Day 1, Group A wore weighted vests during the dynamic warm-up and Group B did not wear vests during the warm-up. Both groups completed a standardized dynamic warm-up together. Following the warm-up, Group A removed the weighted vests. Groups A and B combined into one large group for the power testing procedures and moved to a staircase in a gymnasium to perform the Margaria-Kalamen Power Test. On Day 2, Group B wore weighted vests during the dynamic warm-up and Group A did not wear vests during the warm-up. Since all sessions involved the same warm-up and the power
testing was performed in the same gymnasium on the same staircase, inter-day reliability of the testing procedures was established.

A paired $t$-test was used to determine whether there was a significant difference between mean power values after warm-ups with and without a weighted vest. A two-tailed test was conducted with alpha set at .05. The paired $t$-test was used because there was one independent variable (type of warm-up) with two related or dependent samples (with and without a weighted vest) and one dependent variable (power) in this study. The test was two-tailed because the hypothesis was non-directional.

The paired $t$-test showed that there was no significant difference ($t_{15} = -1.474, p = 0.161$) between warm-up protocols. The mean difference in absolute power (with – without weighted vest) was -80.50 +/- 218.5 W. There was, however, considerable intersubject variability (755.1 W to 1814.4 W).

Major limitations to our study may have included the lack of available resources (time, space, participants), group testing rather than individual testing, inappropriate sensitivity of the timing mats and specificity of the Margaria-Kalamen Power Test, inability to control the effort put forth by the participants, and either insufficient resistance provided by the weighted vests or excessive resistance leading to fatigue of the lower extremities (1).

Our findings are consistent with some (1, 4), but not all (1-3) research comparing the effects of different warm-up protocols on power performance. Future research related to this topic should redevelop and expand upon the foundations of our study and could include diversified dynamic warm-up protocols, different tests of lower extremity power performance (i.e. standard vertical jump, long jump, 10 yard sprint, Wingate Test), multiple warm-up durations, and varying resistances. In addition, prospective studies could include a more assorted sample, comprised of male and female participants of varying age, training status, and athletic background. Individual testing sessions may be beneficial, as well, to reduce the effects of time-dependent power change, camaraderie, intersubject distraction, and a learning curve.

3. Conclusions

Our study found no significant difference when comparing lower extremity power performance of high school male football players following a dynamic warm-up without a weighted vest and dynamic warm-up with a vest weighted at 5% of the athlete’s body weight, utilizing the Margaria-Kalamen Power Test. These findings are consistent with some (1, 4), but not all (1-3) research comparing the effects of different warm-up protocols on power performance. According to our findings, a resisted dynamic warm-up does not enhance power performance to a greater degree than a non-resisted dynamic warm-up in high school male athletes.

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What Does That Molecule Look Like? 
Using Tandem Mass Spectrometry, Computational Chemistry and Vibrational Spectroscopy to Determine Molecular Structure

Ryan P. Dain* and Michael J. Van Stipdonk

Department of Chemistry, Fairmount College of Liberal Arts and Sciences

Abstract: Scientists wanting to determine the structure of a molecule have many tools at their disposal. Tandem mass spectrometry (MS/MS) allows one to study the fragmentation pathways of molecules, examining how a molecule will fall apart when energy is added to it through a process known as collision induced dissociation (CID). By measuring the mass and abundance of these fragments, one can make determinations about the original, or parent, species. Computational chemistry allows one to model a molecule with many different structures, determining which represents the most likely one by looking at the relative energies and theoretical infrared (IR) vibrational spectra. Vibrational spectroscopy is used because each molecule, in principle, has a different IR spectrum that depends on its structure, much like a fingerprint. The theoretical IR spectra for various structures can then be compared to an experimental IR spectrum, to establish the true conformation. Therefore, using these three tools a scientist can confidently determine the structure of a molecule, and a better understanding about the innate chemistry of that molecule.

1. Introduction

Determining molecular structure is important because it allows for the investigation of the fundamental properties of the systems of interest. Mass spectrometry and vibrational spectroscopy have been used for many years to investigate chemical structures. With the rapid increase of availability and quality of computational resources, computational chemical modeling has bridged the gap in the understanding of experimental results. These three methods provide an excellent way for scientists to investigate the intrinsic chemistry of discrete gas-phase ions by determining their molecular structure. Our research group at Wichita State has used these methods extensively over the past years and what follows will give a better understanding of our methods and what we can do with them.

2. Experiment, Results, Discussion, and Significance

Mass spectrometry experiments are conducted in our lab at Wichita State University. We use a Thermo-Finnigan LCQ-DECA quadrupole mass spectrometer. The species of interest are generated by a process known as electrospray ionization (ESI), where a liquid sample is sprayed through a fine needle that has a voltage running across it. This process causes the liquid sample to go into the gas phase and the voltage creates a charge on the molecule, turning them into ions. Mass spectrometry measures these discrete, gas-phase ions and displays them according to their mass to charge (m/z) ratio. Ions with a certain m/z can be isolated and reacted with energized helium atoms to break apart the bond in the ion through a process known as collision induced dissociation (CID). The fragments will be displayed at a lower m/z ratio and information about the structure of the original, or parent, ion can be deduced from the m/z and abundance of these fragments. This is a good way to get basic structural information about a molecular system.

Since we work in the gas-phase, we can study discrete molecules. This means that when we want to examine a certain system, we can look at just one single molecule without worrying about other factors affecting the molecule. Luckily the best computational chemistry programs are set up to model single molecule systems, making them an important tool in the effort to determine molecular structure. We use the Gaussian 03 series of programs, developed by John Pople in the 70’s and 80’s. The program allows us to build a model of the molecule, starting with the basic structure derived from the CID spectrum, and then using complex quantum mechanical equations to theoretically predict the behavior of the electrons in that molecule. By modeling the interactions of the electrons, the program can predict the bonding behavior of the molecule. When the program models, or optimizes, the geometry of the molecule, it also provides intrinsic information about the system, such as energy and vibrational modes. By comparing relative energies, you can make deductions about which conformation is more likely to be the true conformation. The best way to tell is to compare the theoretical vibrational spectrum to an actually experimental benchmark.
Infrared multiple photon dissociation (IRMPD) spectroscopy provides this benchmark for our systems. This process involves creating ions as described above, but then bombarding them with energized photons at different wavelengths, generated by a free electron laser. The photons add energy to the molecule, making it vibrate to the point where the bonds break. The fragments are then measured at each different wavelength and graphed as photodissociation as a function of wavelength. This provides an infrared (IR) spectrum that can be used as the benchmark for the theoretical to experimental comparison. By matching the IRMPD spectrum to the predicted IR spectrum generated by the Gaussian program, you can make a definitive determination about the structure of your species of interest. Since free electron lasers are very rare and very expensive, we work in collaboration with the FOM Institute for Plasma Physics, located in Nieuwegein, The Netherlands. They run the Free Electron Laser for Infrared eXperiments (FELIX) facility where the IRMPD spectra for our work are collected.

This method has been used again and again by our research group at Wichita State to study the fundamental chemistry of many interesting systems, both organic and inorganic in nature [1-5]. This method has become a vital tool for scientists in this field to learn as much as they can about the systems they are studying. Below is an example of these three tools in use, to determine the structure of the b2+ product from the peptide Trialanine, AAA.

This shows the CID of AAA, forming the b2+ product ion. The two possible structures of the b2+ product ion, either featuring an oxazolone or a diketopiperazine ring structure, were modeled and compared to the IRMPD spectrum. It can be seen that the b2+ product ion most likely features the oxazolone ring.

3. Conclusions
So, it can be seen that these different methods can be used to determine the structure of ions of interest that we want to study. While any one technique will give you part of the picture, all three are needed to give you the whole story.

4. Acknowledgements
I would like to thank all responsible for the ongoing support of this work, including WSU, NSF, US Department of Energy, Nederlandse Organisatie voor Wetenschappelijk Onderzoek, all members of the Van Stipdonk research group, past and present, and our talented collaborators around the globe.


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Synthesis of CdTe Quantum Dots of Different Sizes and their Interactions with Water Soluble Porphyrins

Sushanta K Das* and Francis D’Souza

Department of Chemistry

Abstract. Progress in the synthesis of CdTe quantum dots through controlled colloidal-thermal processing and understanding of the factors that control the luminescence quantum yields of CdTe quantum dots enable us to discover technological applications such as fluorescence probes for chemosensor development and biological imaging, tunable absorbers and emitters in nanoscale electronics, quantum dot lasers and advanced materials for electrochemical applications. In the present study, CdTe quantum dots of different sizes are synthesized in aqueous solution using both anionic (thioglycolic acid) and cationic (2-aminoethanethiol hydrochloride) as stabilizers. The quantum dots are synthesized in a known pH range and the quantum dots are seen to depend on specific pH values depending on the stabilizer added. Their characterization is made using various spectroscopic techniques. The size of the quantum dots is found to vary with the processing time and temperature. Additionally, interaction of the quantum dots with water soluble porphyrins is investigated using steady-state and time-resolved emission studies. Preliminary results suggest photo induced energy transfer as a mechanism of fluorescence quenching.

1. Introduction

Due to their unique optical properties like strong size dependent emission wavelength, continuous excitation spectrum, excellent emission spectrum, photo stability, and longer photoluminescence decay time, Quantum dots have drawn lots of attention in the past few decades. Due to their unique size dependent optical properties QDs have been exploited in the development of optoelectronic devices, biological labeling, and building blocks of superstructures. Quantum dots synthesized using thioglycolic acid as stabilizer acts as a donor and so their interaction with water soluble porphyrins (acceptor) are investigated using steady state and time resolved studies. In the present study we are concerned on synthesizing CdTe QDs of varying size and their interaction with porphyrins and study the mechanism of energy transfer occurring between the Donor-acceptor systems.

2. Experiment

Figure1. CdTe quantum Dots synthesized at different time interval.
Negatively charged CdTe quantum dots were synthesized in an inert atmosphere using one pot synthesis method as shown in figure 1 above using thioglycolic acid as the stabilizer. The reaction was carried out in an autoclave at a constant temperature of 130°C and at a pH value of 11.2 in an aqueous medium.

3. Results and Discussion:

CdTe quantum dots can be synthesized as both negatively and positively charged. This depends upon the stabilizer we use for the synthesis in the one pot synthesis method. The quantum dots synthesized were collected at different time interval and the UV-Vis and PL spectra were recorded. Depending upon the time of sample collection we have synthesized different sizes of CdTe QDs as can be seen in the absorption spectra from figure 2. It has been observed that the CdTe QDs starts growth at a wavelength of 530nm and with the passing of the reaction synthesis time it shifts towards the red region. This is further confirmed from the emission spectra measurements. From figure 3 it can be observed that we have a wide range of the emission spectra showing fluorescence of the QDs. The sizes were calculated and CdTe quantum dots were found to have the sizes of 2.88nm, 3.04nm, 3.19nm, 3.31nm, 3.38nm, 3.43nm, 3.47nm respectively. It has been seen that the quantum dots grow faster as higher temperature. CdTe QDs are purified and stored in dark for further studies. It has been found that the negatively charged CdTe QDs are stable and retain their property for 2-3 months. Lifetime studies of the water soluble CdTe were also done.

4. Further Investigations

The CdTe-Porphyrin system (water soluble) would act as the Donor-Acceptor System. Further studies are taken on photo-induced energy transfer as a mode of fluorescence quenching studies. This promises to be excellent area of energy transfer study that would be a boost in developing solar energy harvesting considering the need of future energy consumption. Biomedical applications of CdTe quantum dots are also being focused in treating diseases such as cancer.

5. Acknowledgement

We thank NSF for supporting the project.
The Relationship of Plantar Flexor Strength to Functional Balance in Older Adults

Amber N. Droegemeier, Kirsten A. Ensz, Danielle M. Hildebrand, Kelly S. Moore

Department of Physical Therapy, College of Health Professions

Abstract: The incidence of falls in older adults increases with a decline in lower extremity strength, functional balance, and multi-tasking while walking. This study examined the relationship between plantar flexor muscle strength and balance as it is used in everyday tasks. The participants were thirty-eight adults age 65 or older residing in an independent living community. Participants’ plantar flexor strength was measured using a Hand-Held Dynamometer followed by performance of the Timed Up-and-Go (TUG) test under three different conditions. The relationship between strength and TUG scores was explored. No significant relationship was found, therefore, plantar flexors were not found to be the most important muscle group in the lower extremities to reduce fall risk.

1. Introduction

In situations that older adults face daily, challenges beyond their functional abilities may increase their risk of falls. We chose to study the relationship between the functional ability to balance and plantar flexor muscle strength. It is hoped that knowledge gained will allow older adults to improve functional balance by training specific muscle groups, such as the plantar flexors. Research has shown that lower extremity strength correlates with functional balance.[1,2,3] However, specific studies regarding the relationship between functional balance and plantar flexor strength have not been studied extensively.[4] This study measured plantar flexor strength using a hand-held dynamometer (HHD) and challenged functional balance with the Timed “Up & Go” Test (TUG) under three different conditions to examine the relationship between plantar flexor strength and balance in independent, community-dwelling older adults.[4,5,6,7]

2. Experiment, Results, Discussions, Significance

Experiment

Testing began with measuring the strength of the plantar flexors of the ankle using a HHD. Seated participants were instructed to place both feet flat on the ground. The tester positioned the participant’s dominant foot at a 90° angle from their lower leg with the heel resting on the ground and the HHD was placed with the force plate at the ball of the foot. Participants were then instructed to push the foot down (plantar flex) with as much force as possible. The average of three trials was recorded. Following this, the TUG was performed to assess functional balance during mobility.[5,8,9,10] Subjects rose from a standard arm chair, walked 10 feet to a tape line on the floor, turned and walked back to the chair, and descended to the starting seated position. Timing began just before the subject rose from the chair and ceased upon return to the starting position. This test was repeated two additional times adding a functional or cognitive challenge. The functional challenge was carrying a plastic cup of water filled up to a 1 inch mark from the lip, and the cognitive challenge was counting backwards by threes from 85. The order of TUG tests was randomized.

Results

No significant relationship was found between plantar flexor strength and time taken to complete the TUG under each of three conditions. However, the time to complete the TUG test increased with addition of a physical or mental task.

Discussion and Significance

This study challenged attention by adding a functional and cognitive component to the TUG. Research has shown that any redirection of attention or cognition during a movement will alter the performance of that movement.[11]
This includes performing a motor task while walking, or backward counting.[12,13,14,15] Increasing levels of difficulty in cognitive tasks result in decreased ability to adapt motor tasks.[16]

Factors to consider in analyzing our results included reliability, muscles involved in the movement, testing procedures, and the population tested. Researcher inter-rater reliability for the TUG was +/-0.01 and intra-rater reliability for the HHD was +/-0.02. McCarthy et al found that although ankle plantar flexor, hip flexor, and knee extensor strength play essential roles in performing the sit-to-stand movement, most variance was unexplained, suggesting that variables other than muscle strength are involved.[17] Factors in this study that may have impacted movements during the TUG include attention, visual distractions, or anxiety. Verbal cueing rather than standardized instruction was used in administering the tests. According to Nordin et al verbal cues were found to be an equally effective method of test administration.[5] Also, note that the sample population used may have been more high functioning than our target population. In a study by Daubney et al, the average PF strength of their sample was 19.61Nm in subjects without falls.[1] The average PF strength of our sample was 38Nm. This may be contributed to the HDD testing position. Our subjects were measured in a closed kinetic chain position to mimic standing on a solid surface. Daubney et al, measured subjects prone.

3. Conclusion

Although our study showed no significant relationship between plantar flexor strength and functional balance in older adults, it is still important to strengthen the lower extremity muscles as well as address balance and/or proprioceptive training to reduce fall risk. The addition of a mental or physical task during gait will increase the risk for falls, therefore needs to be addressed with this population in addition to general strengthening by integrating cognitive challenges with gait and balance training. Further research is needed to determine if there is a muscle of more importance to functional balance or another contributing factor that has not been identified.

4. Acknowledgements

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Member Retention in Consumer-Run Organizations

Dziadkowiec, Oliwier; Vu, Connie; Shagott, Todd; Reinhart, Crystal; Keele-Lien, Ashlee; Swink, Nathan; Banta, Adrienne; Hymer, Kimberly; Wituk, Scott; Meissen, Greg

Center for Community Support and Research/Department of Psychology, College of Liberal Arts and Sciences

Abstract. Consumer run-organizations (CROs) have been empowering and socially supportive settings chosen by mental health consumers as a complement or an alternative to traditional mental health services. According to previous research the benefits of actively attending and participating in CROs included increased social support, empowerment, and sense of community (2, 6 &13). This poster will present findings from one of few longitudinal studies of mental health consumers in consumer-operate organizations in the United States. Results of this study will focus on the predictive relationship between age, hope, organizationally mediated empowerment, personal empowerment, empowerment-decision making, social participation, social network as related to member retention. Face-to-face interviews were conducted with CRO members from eight different Kansas CROs at baseline (N=172) and at a 12-month follow up (N=171). Discussion will focus on the reasons why some mental health consumers might be more likely than other mental health consumers to become long time CRO members and how should CROs use this information to ensure their longevity.

1. Introduction

The history of mental health consumer operated self-help groups, including consumer-run organizations (CROs), can be traced to the 1960’s “ex-patient’ movement [1]. This movement aimed to empower individuals with mental illness to take a more active role in their recovery from mental illness and reject the notion that mental illness is a disease that needs to be treated in the same way as physical illness [4]. CROs in Kansas operate as 501c3 non-profit peer support organizations staffed by and attended by individuals with serious and persistent mental illness. Staff and members work together to provide education, volunteering opportunities, recreational and wellness activities, advocacy, and peer support. CROs are most often attended by current or former consumers of the public mental health system mental health service system [9]. The core values in CROs are based on principles of peer support, recovery, and empowerment [4 & 10].

Consumer-run organizations, among other forms of peer-support have been designated as a promising new practice [8]. Some of the benefits of actively attending and participating in consumer-run organizations and other similar organizations include increased social support [2], increased social participation [11], increased participation in the community [13]; personal and organizational empowerment [11], increase in social networks [5], and reduction in hospitalization and psychological service utilization (12) Although there considerable amount has been done investigating the benefits of CROs [3 & 7], not much is know about the characteristics of individuals who become the long term members.

2. Methods

Face-to-face interviews were conducted with 176 mental health consumers from 8 Kansas CROs at baseline (N=172) and at a 12-month follow up (N=171). A discriminant analysis of the baseline data was conducted in order to determine the predictors of membership at the 12-month follow up. The independent predictor variables included: age, gender, ethnicity, level of education, service utilization, reasons to come, social network size, social participation, organizationally mediated empowerment, empowerment-decision making, and hearth hope index. The outcome variable was membership status, which was a binary variable.

3. Results

A discriminant analysis was conducted to determine whether the thirteen predictors could predict CRO member retention 12 months from the baseline interview. The CRO members reported that that they were either still
members of their CRO (Yes group) or that they were not (No group). The overall Wilk’s lambda was significant, \( \Lambda = .81, \chi^2(13, N = 171) = 34.86, p < .001, \eta^2 = .20 \) indicating that overall the predictors differentiated among the two membership status groups. Because this test was significant we chose to interpret the discriminant function. The group centroids were .33 for the “Yes” group, and -.72 for the “No” group. Based on these coefficients, the number of years in the neighborhood, number of hours spent alone at home, age, and size of the social network respectively, demonstrated the strongest positive relationship with the discriminant function, and represent the “Yes” group. Personal empowerment was the most negatively correlated with discriminant function, which means that it represents the “No” group. CRO members who stayed in their CRO after 12 months (“Yes” group) lived in their neighborhood longer (\( M = 16.50 \)) than people who were no longer the members of the CRO (\( M = 8.90 \)), were older (\( M = 43.43 \)) than the people who are no longer attending the CRO (\( M = 42.00 \)), spent longer amounts at home by themselves (\( M = 1.15 \)) than people who were no longer members (\( M = .90 \)), had a larger social network (\( M = 6.26 \)), than people who are no longer attending the CRO (\( M = 4.91 \)). At the same time they were less likely to report more choice in their personal life (\( M = 16.01 \)) than people who were no longer members (\( M = 18.41 \)). Although not statistically significant at .05 level, CRO members in the “Yes” group scored higher on the three Neighborhood Sense of Community Factors.

3. Discussion and Conclusion

The findings of this study are a bit surprising in relation to other CRO related literature. We found that being older, living longer in the neighborhood, bigger social network size, close relationships in the community, and longer amount of time spent home alone was more related to continued membership and variables such as organizationally mediated empowerment (OME), empowerment-decision making (EDM), and hope (HHI) were not related to continued CRO membership. This means that people who continue attending CROs are people more invested in their community with more roots and deep/meaningful relationship. These people have made their surrounding communities their home and whether it is staying at home or outside of home, they spend more time in their community and attending their CRO might be an important part of their community engagement. It’s quiet interesting why personal empowerment was higher for individuals who have left their CROs before 12 months passed. Perhaps, since the non-member group was on average a bit younger and did not spend as much time at home, they did not feel like they fit in their community as much and looked elsewhere. Further analysis is needed to replicate these results on bigger samples.

4. Acknowledgements

The authors of this study would like to thank the 8 CROs that took part of this study, SRS of Kansas, Center for Community Support and Research, and Department of Psychology at Wichita State University.

References

Trigger Mechanisms of Progressive Crushing – Energy Absorption in Flat Plate Fiber-Reinforced Composites

Sana Fazal Elyas*, Kian Yip Tan, K.S.Raju

Department of Aerospace Engineering, College of Engineering

Abstract. A study has been made of flat plate chamfer-based, crush trigger mechanisms subjected to axial compression, for use with energy-absorbing Fiber reinforced composites. This paper will focus on the trigger mechanisms in flat panels made of Newport Nb321/7781 fiber composites. Progressive crushing can often be induced by initiating or triggering fracture at one end of the plate. Crushing initiates in the highly stressed region at the tip of the chamfer and this develops into a stable crush zone. The sequence of crushing events depends on the type of chamfer and chamfer angle. The test panels would be subjected to low and high speed compression testing. We would like to validate the best optimized model for trigger mechanisms using FEA, with the experimental results.

1. Introduction

Composite materials provide significant benefit such as enhanced strength and durability, weight reduction and lower fuel consumption; in addition to being an efficient crashworthy structure. Crashworthiness is typically defined as the ability of a structure to absorb energy in a collision or the ability to ensure the survivability of the airplane/helicopter passenger. Most structural composites are in the form of plate-like elements.

The variable known to affect energy absorption in composite structure is the method of failure initiation, commonly called triggering. The crushing of a structure is generally triggered by providing a zone of stress concentration which initiates crush and away from which the crush propagates. The bevel trigger, produced by beveling the end edges to sharp edges, is the initiator that is most frequently used in energy absorption studies. For a composite structure to absorb a large amount of energy during crushing it is important to establish a crush zone that will propagate through the material. This is usually attained by introducing a chamfer at one edge, shown in Fig 1. The ideal progressive crushing mechanism in composites is a balance between brittle fracturing and lamina bending as this imparts the highest energy absorption. Such complex crushing mechanisms require careful design of the composite crush structures, and a significant amount of testing. Composite materials under crushing may experience a wide variety of interacting failure modes, including fiber and matrix fracture, delamination, local instability [1]. Experiments on the crushing of composite laminates under axial crushing loads have shown that the appearance and growth of delamination can significantly influence the energy absorbency of the laminate [2, 3]. The high stresses generated in the chamfer owing to an external applied load \( P \) initiate a crushing zone and prevent the load from building up to values which exceed the critical buckling load of structure [5].

The ability of a material to dissipate energy can then be expressed in terms of Specific energy absorption \( SEA \).

\[
SEA = \frac{EA}{\delta L t} \quad (1)
\]

The EA can be calculated as the total area under the Load-displacement diagram:
\[ EA = \int F \cdot \delta \] (2)

It can be summarized that for flat plate specimens, delamination suppression is indeed crucial to maintain high levels of energy absorption [3].

2. **Experiment**

Test-setup is shown in Fig 2, it’s a Quasi-static uni-axial test and chamfer end is at the bottom as shown in the schematic Fig 1. Flat plate specimens with chamfer of 30 degree were crushed in a cyclic loading-unloading compression cycle and the resulting microstructure were examined microscopically.

Specimen have a length of 4 inch and width 1 inch, having a chamfer about 30 degrees. 12 ply specimens of two different stacking sequence were tested \([0]_{12}\) and \([45]_{12}\). For the \([45]_{12}\) specimen had 13 cycles in steps of 0.025 inch increase at a speed of 0.001 in/sec and the \([0]_{12}\) specimen had 29 cycles in steps of 0.01 inch at a speed of 0.001 in/sec. The specimens were cleaned and the crush zone was observed under the microscope. The \([45]_{12}\) showed a crack formation (Fig 3) which was filled with debris unlike the \([0]_{12}\) specimen. Initial bending always occurred outwards followed by delamination.

3. **Result**

Fig 4, shows the Load-Displacement, [Energy absorption] of the specimen. The \(L_{ch}\), chamfer length of \([0]_{12}\) and \([45]_{12}\) are 0.2689 inch and 0.2195 inch respectively, with chamfer angles of 25.189 degree and 31.0175 degree. The \(E_{abs}\) in the \([0]_{12}\) is 770 lb-in and in \([45]_{12}\) is 546.75 lb-in, hence we observe a 29\% better \(E_{abs}\) in the \([0]_{12}\) than \([45]_{12}\).

4. **Conclusion**

Although a limited amount of testing has been performed, and the analytical substantiation through explicit finite element analysis has not yet begun, preliminary results seem to suggest that trigger mechanisms in the fiber reinforced composites under compression, depend on the chamfer angle. In future flat plate specimens of chamfer angle 30, 45 and 60 degrees will be tested at different speeds in the denomination of 0.001 in/sec, 0.01 in/sec 1 in/sec and 10 in/sec. Failure modes are highly dependent on a number of parameters, geometry of the structure, material, stacking sequence and test speed.

**Reference**

Possible Ageism in the Aggressiveness of Severe Sepsis Treatment

R.A. Ewing*, D.J. Heaton*, and L.S. Hale
Department of Physician Assistant, College of Health Professions

Abstract. Sepsis is an emerging concern among older adults, associated with high mortality. Evidence of possible ageism, in the form of less aggressive treatment, has been reported for other diseases. The goal of the study was to investigate whether age was a determining factor in aggressiveness of treatment for severe sepsis and to evaluate in-hospital mortality rates. A subanalysis of previously collected data was performed. This database contained 143 adult patients admitted to a 760-bed tertiary care teaching hospital from June 2004 to May 2005 with a diagnosis of severe sepsis and/or septic shock. Aggressiveness of treatment was measured by rates of compliance with the Society of Critical Care Medicine (SCCM) treatment guidelines and activation of the hospital’s sepsis response team (SRT). There were 73 patients in the older adult group (≥65 years) and 62 in the younger adult group (18-64 years). SRT was activated less often for older adults (19% vs. 41%, p = 0.008), but treatment compliance rates were similar. In-hospital mortality was higher in the older adult group, 51% vs. 27%, p = 0.008, despite similar treatment compliance rates. The decision to activate the SRT is one indicator of aggressiveness of treatment. Neither age nor activation of the SRT appeared to be correlated with treatment compliance. Although treatment compliance was similar between groups, mortality was higher in the older adults.

1. Introduction

Some evidence suggests there may be a tendency to treat older patients less aggressively due to a perceived increased risk of side effects from treatment, reduction in expected treatment success, reduced life expectancy, and reduced life quality [1]. When these treatment decisions are independent of medical appropriateness or patient preference and seem to be based on age alone, it indicates ageism [2]. Ageism has been reported in cancer screening and treatment, prescribing of statin therapy, ICU admission and overall decision making for inpatients [3-5]. No literature could be located evaluating ageism in sepsis treatment.

Sepsis is body-wide inflammation resulting from infection. If inadequately treated, it may progress to severe sepsis, defined as sepsis plus organ failure, hypotension, or hypoperfusion.[6] Severe sepsis is nearly nine times more common in people ≥85 years as compared to younger adults with a 28.6% mortality rate overall and 38.4% mortality in those ≥85 years [7].

The Society of Critical Care Medicine (SCCM) has developed specific evidence-based treatment guidelines for optimal management of severe sepsis. Successful, aggressive treatment relies heavily upon early diagnosis and timely implementation of interventions. One way to improve treatment may be to use a Sepsis Response Team (SRT). The SRT consists of providers who are paged to the patient’s bedside where they rapidly assess the patient and initiate appropriate, aggressive, and timely treatment. In June 2004, Wesley Medical Center (WMC) developed a SRT to manage severe sepsis with a goal of reducing sepsis-related mortality.

A large-scale retrospective study was completed at WMC to compare mortality and compliance with the SCCM guidelines in patients treated by the SRT as compared to those treated by individual physicians (non-SRT group). Early analysis showed that the mean age of patients in the SRT group was significantly lower than the non-SRT group, 54 ± 15 vs. 74 ± 16, p=0.01. The patient’s attending physician made the medical decision whether or not to activate the SRT. This raised the question of the possibility of ageism. Were physicians more likely to activate the SRT in younger rather than older patients?

2. Methods, Results, Significance

Methods: A subanalysis of previously collected data was performed on a database of 143 adult patients admitted to a 760-bed tertiary care teaching hospital from June 2004 to May 2005 with a diagnosis of severe sepsis and/or septic shock. Aggressiveness of treatment was measured by compliance with the SCCM treatment guidelines and activation of the hospital’s SRT.

Data Analysis and IRB Approval: Statistical significance was set at p ≤ 0.05. Descriptive data were reported using means ± standard deviation or percentages as appropriate. Means were compared
of older adults did achieve 24-hour glucose control goals than in the younger adults (41% vs. 24%, \( p=0.04 \). In-hospital mortality was higher in the older adult group, 50.7% vs. 27.4%, \( p=0.008 \)

**Discussion:** Lower rates of SRT activation in older adults may indicate ageism, but other factors such as physicians’ unawareness of the SRT, physicians’ comfort level with self-treating sepsis, or unrecognized sepsis severity cannot be ruled out. Severe sepsis in older adults presents a diagnostic challenge for clinicians in that the typical signs and symptoms may be blunted, thus masking the severity of disease and possibly delaying aggressive treatment [7].

**Clinical Significance:** Although this study was unable to clearly demonstrate ageism, it did demonstrate poor overall compliance with the SCCM treatment guidelines. With this evidence of low compliance, WMC may be able to perform further research to determine why compliance is so low, and how they can improve it, such as increasing awareness or educating the providers on the bundle branch components.

### 3. Conclusion

The decision to activate the SRT is one indicator of aggressiveness of treatment. Lower rates of SRT activation in older adults may indicate ageism, but other factors cannot be ruled out. Neither age nor activation of the SRT appeared to be a factor in SCCM treatment compliance. Although treatment compliance was similar between groups, mortality was higher in the older adults.

### 4. Acknowledgements

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Molecular interactions between *Medicago truncatula* and *Macrophomina phaseolina*

Andres Reyes Gaige*, Bin Shuai

Department of Biological Sciences, College of Liberal Arts and Sciences

**Abstract.** *Macrophomina phaseolina* is a soil-borne fungal pathogen that causes a disease commonly known as charcoal rot. Currently, there is not an effective method for controlling the disease, because knowledge about the pathogen, the development of the disease and how it interacts with the plant host is limited. Therefore, a study is proposed to investigate the interactions between *M. phaseolina* and the plant species *Medicago truncatula* using a molecular genetics approach where the host genes involved in the disease development will be identified. We will first conduct a genetic screen in a mutant population of *M. truncatula* and look for strains that have altered susceptibility to *M. phaseolina*. We will then identify the genes that are involved in host-pathogen interactions.

1. **Introduction**

Charcoal rot is a root disease caused by the soil borne fungus *Macrophomina phaseolina*. It is also called summer wilt or dry weather wilt because it often occurs during the summer, when plants are under heat and drought stresses. This disease has been an endemic problem in soybean growing areas where summers are dry, especially in the central part of the Midwest: Kansas, Nebraska and part of Missouri being the most affected regions [1]. When severe, the disease reduces yield by killing plants at early reproductive stages. Symptoms of charcoal rot appear during hot, dry weather when unfavorable environmental conditions stress the plant. It usually develops when soil temperatures are 80-95°F (27-35°C) for 2 to 3 weeks [2]. This fungus is highly variable with a wide host range and geographical distribution. Furthermore, it has the potential to infect more than 500 crops and weed species. Results from controlled studies have demonstrated that *M. phaseolina* can reduce plant height, root volume, and root weight by more than 50% [3]. Damage to the root system is most evident during the pod formation and filling stages, when demand for water and nutrient absorption is high. Because diseased plants have smaller root systems, resulting seeds tend to be fewer and lighter. Diseased plants will mature several weeks earlier, which further contributes to yield loss. The charcoal rot pathogen survives from year to year as microsclerotia in soil and infected crop residue. Microsclerotia is a compact mass of hardened mycelium stored with reserve food material that becomes detached and remains dormant until a favorable opportunity for growth occurs. A number of management measures have been applied to control *M. phaseolina*. Crop yield loss can be reduced by making rotations with small grains such as wheat and barley (poor hosts) for one or two years. Wheat and barley are considered poor hosts because they do not bloom and set pods during the normally dry months of July and August, so they are more likely to escape infection by charcoal rot. Also, increasing seeding rate is not recommended because high plant populations increase drought stress. Charcoal rot incidence can also be reduced through proper fertilization, weed control, and irrigation. However, no chemical treatments are available to control charcoal rot.

Considering the difficulties in managing charcoal rot disease with traditional methods, genetic engineering may be the best alternative. However, we know very little about the interaction between *M. phaseolina* and its hosts at the molecular level. Therefore, we propose to study the molecular mechanism that takes place when the plant species *Medicago truncatula* interacts with *M. phaseolina*.

In this investigation, we try to identify the host genes that are involved in the disease development using a molecular-genetic approach. This study will lead to a better understanding of the charcoal rot disease at the molecular level, and provide important information for crop improvement in the future.

2. **Experiment, Results, Discussion, and Significance**

First, the interaction between the plant species *Medicago truncatula* and the fungus *Macrophomina phaseolina* must be shown. This is demonstrated in both in-vivo and in-vitro assay. The in-vivo assay was performed by directly exposing the root of *M. truncatula* to the fungus. The in-vitro assay was done by exposing a detached leaf of *M. truncatula* to growing hyphae of the fungus. Both assays have shown that Medicago can be easily infected with *M.
Our next step is to screen a mutant population of *M. truncatula* plants to identify strains that have altered susceptibility to the fungus. These *M. truncatula* mutants lines were generated by using a Tnt1 retrotransposon. The Tnt1 retrotransposon was first identified in tobacco, and it is considered to be an efficient insertional mutagen in *M. truncatula* [4]. It has been estimated that approximately 14,000 – 16,000 lines would be sufficient to tag 90% Medicago genome. Therefore, by analyzing 150 different mutant plants in our initial screen, we will be covering ~0.3% of the genome.

By applying the in-vitro assay, we will identify the mutant lines that have altered susceptibility to *M. phaseolina*, and the interaction will be confirmed with in vivo assay. In case we find a plant with altered susceptibility, we will try to identify the genes that are involved in the host-pathogen interaction using molecular biology tools. The *Fabaceae* (legumes) are second only to the *Poaceae* (grasses) in importance to humans as a source of food, feed for livestock, and raw materials for industry [5]. Seeds and shoots of legumes are a rich source of dietary protein, oil, carbohydrates, fiber, minerals, vitamins, and other beneficial secondary compounds for humans and livestock [6]. In addition, legumes account for approximately one third of the world's primary crop production, human dietary protein, and processed vegetable oil. We can see that legumes are of great importance for an appropriate sustainability of human-beings on earth. Moreover, legumes are a lynch pin of sustainable agriculture because they supply their own nitrogen (N) by 'fixing' it in a symbiotic association with bacteria called rhizobia. This mutually beneficial association provides legumes and subsequent crops with a free and renewable source of usable nitrogen. It is estimated that between 40 million and 60 million tonnes of nitrogen are fixed annually by cultivated legumes [7], equivalent to about US$10 billion fertilizer [5]. The impact of charcoal rot disease on many legume species will become more devastating, as the dry and warm weather become more prominent in many parts of the world as a result of global warming. We hope that our research will be valuable for future development of much-needed disease-resistant crop plants.

3. Conclusions

We have created ideal conditions in the lab to establish the interaction between *Macrophomina phaseolina* and *Medicago truncatula*. We have also developed a protocol that will be applied in the mutant screening. We hope that our effort in identifying the genes that are involved in the host-pathogen interaction will generate the knowledge required for managing this fungus.

Correlation and Predictability of Science Prerequisites and GPA/PANCE Scores Among Five Cohorts of Physician Assistant Students

Jason C. Gifford*, Randi D. Haun*, Richard D. Muma

Abstract. The primary purpose of this study was to determine whether a correlation existed or a prediction could be made regarding PA graduates who had taken advanced undergraduate science coursework along with the required science prerequisites, and those that had not, and subsequent performance in the WSU PA program and on the PANCE. The hypothesis being that those who completed these advanced courses would have better problem solving abilities and better performance in the Program and on the PANCE. Study data was collected on 208 PA Program graduates from 2003-2007 who had taken the PANCE. The explanatory variables included graduating program GPA, PANCE scores, and completion (or not) of organic chemistry and/or biochemistry undergraduate course work. The sample was divided into two groups categorizing them based on completion of the standard prerequisites or the standard prerequisites plus organic and/or biochemistry. Point-biserial Pearson correlation=no correlation between GPA and PANCE by group. Linear regression=no predictability of GPA or PANCE scores. Advanced courses (beyond standard prerequisites) were not correlated or predictive of PA program performance or PANCE scores.

1. Introduction

Many would agree that a solid undergraduate background in the basic sciences is required for physician assistant students to perform well in their program of study.[1] As physician assistant (PA) programs have moved to the graduate level, there is a renewed interest in evaluating the prerequisites. PA program prerequisites across the country are not standardized and vary from program to program, but they likely include two courses in human anatomy and human physiology, one course in general biology, one course in microbiology, two courses in chemistry, and one course in statistics.[1] The decision to accept a student into a PA program presents a major challenge to selection committees. Understanding which prerequisites are best for student success would be helpful.

The science paradigm has been assumed as the most appropriate way to prepare students for meticulous medical education.[2] For this reason, a modification of required prerequisites to include organic chemistry, biochemistry, or both courses is under consideration at many PA programs across the country.

2. Experiment, Results, Discussion, and Significance

This cross-sectional study was undertaken at Wichita State University in Wichita, Kansas. Study data was collected and analyzed on 208 PA program graduates from 2003-2007 who had taken the Physician Assistant National Certifying Exam (PANCE). 2003 was the first year that the National Commission on Certification of Physician Assistants (NCCPA) data was made available by individual student names, making it possible to match individual scores with their specific undergraduate science coursework and graduate program GPA. PANCE scores used represented first time test administration only.

The sample was divided into two groups. Group one included students who completed the typical science prerequisites currently required by the WSU PA program (noted above). Group two included students who completed the above and an additional course in organic chemistry and/or biochemistry. Correlation analysis was conducted for both groups comparing program graduate GPA and PANCE scores using linear models to see how the scores relate. Statistics used included stem and leaf plots, t-tests, point-biserial correlation, and bivariate linear regression.

Descriptive statistics demonstrated similar results between prerequisite groups for PANCE and GPA. There was no significant difference in means between the two groups as determined by independent samples t-test. A point-
biseternal Pearson correlation comparison of student scores on the PANCE (measured by the reported score) to groups 1 and 2 showed no statistically significant relationship. Likewise, no statistically significant relationship was seen in the comparison of student GPA to groups 1 and 2. (Table 1)

Table 1. Point-Biserial Pearson Correlation

<table>
<thead>
<tr>
<th>CLASSES 2003-2007</th>
<th>PANCE</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP 1 and 2</td>
<td>0.039*</td>
<td>0.009*</td>
</tr>
</tbody>
</table>

Group 1 = Standard Prerequisites; Group 2 = Organic/Biochemistry
*Not significant

Linear regression of PANCE and GPA with prerequisite groupings revealed no significant findings. As is outlined in table 2, only 0.2% of the variance in the PANCE scores could be accounted for between prerequisite groups and 0% of the variance in GPA could be accounted for between prerequisite groups.

Table 2. Linear Regression of Prerequisites (Standard or Organic/Biochemistry) and PANCE Scores and GPA

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>R Square</th>
<th>Adj. R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANCE</td>
<td>0.039</td>
<td>0.002</td>
<td>-0.003</td>
<td>106.334*</td>
</tr>
<tr>
<td>GPA</td>
<td>0.009</td>
<td>0.000</td>
<td>-0.005</td>
<td>.255886*</td>
</tr>
</tbody>
</table>

* Not significant

The results of this study demonstrated advanced courses (beyond standard prerequisites) were not correlated or predictive of PA program performance or PANCE scores. However, upon interpretation of this data, it must be noted that this was a small sample size and results can not be generalized beyond Wichita State University.

3. Conclusions

This study demonstrated that advanced undergraduate science coursework in organic chemistry and/or biochemistry by Wichita State University physician assistant students from the classes of 2003 to 2007 was not correlated or predictive of performance on the PANCE or graduate program GPA. The prerequisite groups accounted for 0.2 % of the variability on the PANCE and 0 % of the variability for GPA. Therefore, at this time, requiring advanced undergraduate science coursework in organic chemistry and/or biochemistry as admission requirements to the WSU physician assistant program would not prove beneficial to improving program GPAs and performance on the PANCE.

4. Acknowledgements

We would like to thank our friends and family for all of their support throughout our education. We would also like to thank the Wichita State University Physician Assistant program for continuing to assist us on this project.

Permission was granted by Dr. Muma to use previous data from Barbara Oberle, Class of 2008, in her paper entitled The OSCE Compared to the Packrat as a Predictor of Performance on the PANCE.

Survey of Psychiatric Physician Assistants Determining Scope of Practice, Preparedness, and Post-Graduate Training

Amanda Ginther*, Mindy Woydziak*, and Tim Quigley

Abstract. The physician assistant was originally created to alleviate the lack of physicians in primary care. Today, with the growing trend of specialization, an increasing number of PAs are following suit with physicians and opting to specialize. Psychiatry is one of many specialties and as of 2006, accounts for only 1% of practicing PAs. Formal training specifically for psychiatry is sparse and relies heavily on on-the-job training. Since the demand for PAs in psychiatry has grown over the past 10-15 years, it is expected that the current scope of practice, level of preparedness, and post-graduate training have all been directly affected. A 13 question survey assessing the scope of practice, level of preparedness, and post-graduate training in psychiatry was developed and tested. The survey was distributed to current members of the Association of Psychiatric Physician Assistants (APPA). Scope of practice was diffuse. Forty percent of respondents felt somewhat prepared upon entering the field of psychiatry, and 60% felt adequately prepared after 0 to 2 years in practice. In addition to PA certification, only 8% of respondents maintained other licenses or certifications pertaining to psychiatry.

Overall, it appears that the PA scope of practice has broadened over the years, yet post-graduate training is inadequate and proves the importance of on-the-job training and continuing medical education (CME) in psychiatry.

1. Introduction

Physician Assistants have been working in the field of psychiatry since 1975[1], however, they only represent 1% of total practicing PAs [2]. Psychiatry was originally added to the general PA curriculum in Pittsburgh, Pennsylvania in 1974, and was adopted by subsequent schools thereafter in order to familiarize students with different psychiatric patient presentations [3]. In 1998, a formal mental health training program was developed which consists of course work as well as one-on-one training with a supervising psychiatrist. Students are also trained in effective psychiatric interviewing techniques, psychopharmacology, and recognizing specific psychiatric disorders [4, 5]. Nationwide, however, there exist only two formal post-graduate training programs for psychiatric PAs, both of which have limited enrollment [6].

In 1998 the Association of Psychiatric Physician Assistants (APPA) was recognized by the House of Delegates for the American Academy of Physician Assistants (AAPA). It represents PAs who specialize in mental health care. It was designed in order to educate, develop training programs, publicize and promote the profession, define the professional role of, and maintain a professional relationship with other medical professionals. In a 2002 survey conducted by APPA, 29% of members had additional mental health practitioner licensures and the average member had over 10 years experience in psychiatry [7].

Review of the literature demonstrates that the discipline of psychiatry recognizes the need for additional manpower to meet the needs of growing community demand. PAs have proven to be competent to perform the duties necessary [1, 4, 5, 8, 9]. By working closely with supervising psychiatrists, PAs have earned trust and confidence, leading to increased independence in their practice [4].

2. Experiment, Results, Discussion, and Significance

Experiment: This project was carried out through the Department of Physician Assistant at Wichita State University between March 2008 and May 2009. Don St. John, President of APPA, provided identification of physician assistants in psychiatry. A survey was designed to investigate the scope of practice in psychiatry, level of preparedness, and post-graduate training. The survey used was a partial replication of the 2001-2002 membership survey conducted by APPA [10]. The survey was conducted via email using surveymonkey.com to the current members of the APPA. They included physician assistants currently working in psychiatry and ranged from recent graduates to experienced professionals. Those surveyed were asked a series of questions based on patient case load.
and responsibilities. Questions regarding certifications, licensure and educational background were also examined. Finally, participants were asked questions assessing their confidence within the discipline.

Results: A 13 question survey was sent to a total of 100 PAs practicing in psychiatry who was also members of APPA. Completed surveys were received from 50 percent of individuals invited to participate. Results of the survey revealed the majority of PAs working in psychiatry have worked in their specialty for either 3-5 years or +10 years, both being 32%, respectively. An overwhelming 62% have a Master’s degree as their highest level of education, the next highest being a Bachelor’s at 26%. The majority practice in a private practice clinic or hospital setting (46%), and they generally work 40-50 hours per week (52%). The average number of patients treated per day was 11-15 (42%), while performing a variety of duties with almost everyone writing orders for initiating treatment (92%), continuing treatment (94%), and ordering and interpreting laboratory, imaging and other tests on patients (92%). The majority (92%) have no other certifications/licenses in addition to their PA certification. Over 80% of the respondents report completing 21-50 CME hours in relation to psychiatry, while only performing <10 hours of CME before entering the field (52%). Upon entering the field of psychiatry, the majority of PA’s felt somewhat prepared (40%) with neutral being the second highest answer (20%). The average time it took to feel adequately prepared was 0-2 years (60%) and 3-5 years (34%). The PAs treat a variety of diagnostic groups with all (100%) of them treating mood disorders, psychotic disorders, and anxiety disorders. Personality, sleep, cognitive and attention disorders were also commonly treated at 88%, 84%, 82% and 82%, respectively. Discussion: Based on the results of the survey, it appears PAs have a wide scope of practice. They are working a regular full-time job while caring for patients with psychiatric conditions across the board. They are performing duties from routine histories and physicals to writing orders to initiating treatment plans, while treating every diagnostic group of psychiatric patients. Of the PAs surveyed, more than half felt less than prepared when entering the psychiatric field. With available CMEs related to psychiatry it took ≤ 5 years for them to feel prepared in their field. There are very few opportunities in post-graduate studies for PAs in psychiatry.

Significance: The boundaries seem limitless as PAs currently working in the psychiatric field are performing a variety of responsibilities with the treatment of a wide range of psychiatric conditions. The results imply a potential need for more post-graduate training for PAs entering psychiatry. There does appear to be an adequate number of CMEs related to psychiatry, which is intended to keep PAs knowledgeable in the psychiatric field.

3. Conclusions

With the expansion of the medical field from general practice to specialization, physician assistants are following suit. Although physician assistants in the field of psychiatry only represent a minute portion of specialization, their responsibilities are ever expanding and important to physician time management while increasing the patient load. Although there are few formal post-graduate training programs in psychiatry, continuing medical education hours and on the job training seem to be adequate preparation and training for physician assistants in field of psychiatry.

4. Acknowledgements

We would like to acknowledge president of APPA, Don St. John.

An Examination of Becoming a Certified Peer Specialist

Emily A. Grant*, Crystal Reinhart, Ashlee-Keele-Lien, Nathan Swink, Scott Wituk, Greg Meissen

Abstract. Peer support between mental health consumers in the mental health system is not a new concept. However, the position of Certified Peer Specialist (CPS) is a recent addition to the mental health system. CPSs are people in recovery who are employed by the mental health system to provide support through sharing lived experience with those who are working on their recovery from mental illness. CPS services became Medicaid reimbursable in 2001. Since then, CPS programs have been implemented in several states. Each state has its own standardized training and certification process that CPSs complete. Kansas began having a Medicaid reimbursable CPS program in 2007. The first training session was held in September 2007, and five trainings have been held. More than 100 people have been trained to provide CPS services in Kansas.

The Center for Community Support & Research at Wichita State University has conducted interviews with those who attend the training. Interviews are completed during the initial training, and again 6 months and 12 months after the training. This poster will examine the responses to the interview questions regarding their experiences of being a CPS, their responsibilities and activities as a CPS, and their incorporation into the mental health system. It will also provide background information on the development and implementation of the CPS program in Kansas. Implications for CPS providers, mental health administrators, and researchers are provided.

1. Introduction

Peer support is a natural human response to any number of issues and circumstances. It is important for people to feel that they are not alone and that others are capable of understanding experiences and share common characteristics. Among those with mental illness, an important part of coping and recovery is the particular understanding and support provided by peers ([2], [4]). Peer support takes place when two or more people share a common problem or concern and together they provide emotional support to each other and develop ways to effectively manage the issue and personally grow (Davidson et al., 1999). Peer support is a reciprocal exchange based on respect, shared responsibility, and mutual agreement ([4]). Peer support is found in self-help groups and self-help organizations. Positive outcomes from peer support have been demonstrated for those dealing with bereavement, mental health, parenting, cancer, substance abuse issues and mental illness ([5],[6]). The Recovery Movement has revitalized the concept of peer support as an integral way to help people with mental illness. The values of peer support give consumers in recovery encouragement to share their recovery story with people who are beginning their own recovery journey. Many states have begun to implement training and certification processes for mental health consumers to become Certified Peer Specialists. The Kansas Certified Peer Specialist (CPS) program began in July 2007 and the first 40 CPSs were trained in September 2007. In Kansas and in 13 other states across the Nation, CPSs are entering into a new role that is being established in the already existing mental health care system. It is important to understand the activities and services of CPS services as they are becoming better known and are beginning to be seen as an essential component in the recovery process. Also, it is important to understand the background of the people who are being trained to be CPS. To date, research on these areas has not been conducted.

2. Experiment, Results, Discussion, and Significance

Interviews have been conducted with those who attended the 5 day basic training sessions to become a CPS in Kansas. To date 116 people have participated in the CPS training. During the basic training, the trainees were asked to complete an interview. One hundred and eleven people chose to participate in the interviews (N=111). The face to face interviews focused on understanding the activities and services provided by CPS and the processes of becoming a CPS in Kansas. There was also as thorough demographic section. The interview was developed by the CPS research team at Center for Community Support & Research. The participants were informed that they would be contacted again at 6 and 12 months post training to do follow up interviews (via telephone) to see if things had changed after completing the certification process.
Descriptive statistics will be used to analyze frequency of CPS activities and services provided and personal characteristics of the CPSs themselves. Characteristics include age, race, sex, education status, marital status, number of children, number of children under the age of 18, and previous employment at the mental health center.

3. Conclusions

Results will provide a very rich description of the people who are becoming Certified Peer Specialists in Kansas. The results will also show the frequency in which the standard CPS services and activities are being delivered by these CPSs in their mental health centers. This information will be useful to mental health centers who are considering adding peer support to their services offered. This preliminary research on understanding the basics of who is becoming a CPS and what the services and activities provided by CPSs are will set the foundation for future research on CPS in the mental health system.

4. Acknowledgements

The authors of this study would like to thank the CPS Training Team, SRS of Kansas, Center for Community Support & Research, and the Department of Psychology at Wichita State University.

References

Physical Therapist Clinical Instructor
Perceived Benefits and Reservations of the Clinical Instructor Role

Debra Greenwood*, Hy-Vong Ha, Danette Harris, Toni Knabe, Candace Bahner

Department of Physical Therapy, College of Health Professions

Abstract. During clinical internships, physical therapy students must be supervised by clinical instructors (CIs) who are practicing physical therapists (PTs). The willingness of CIs to take on student PTs is imperative, as approximately one third of the physical therapy curriculum is clinic based, and CIs are not reimbursed for their time. The purpose of this study was to update the body of knowledge regarding these instructors’ perceived benefits of being a CI, as well as identifying reservations that would discourage them from serving as a CI. Surveys were sent to 288 Center Coordinators of Clinical Education (CCCEs) within the Wichita State University’s (WSU) physical therapy education database. Eighty six CIs responded who met all the inclusion criteria. The survey used a Likert-like scale to measure the benefits and reservations of being a CI and included a demographic section. Significant differences (p< 0.017) were found in three of the benefits questions based on practice setting and with 11 of the responses to the 17 statements taken from Gwyer et al. Overall, the perceived benefits were ranked higher than the perceived reservations.

1. Introduction
The success of clinical education and the future of allied health professions are reliant upon the success of clinical field work. To maintain high standards for clinical fieldwork, it is imperative to motivate professional clinicians to participate in teaching incoming professionals [1]. To achieve this, it was important to explore what motivates and frustrates current CIs in order to reduce the stressors which may inhibit their continued participation [2, 3, 4]. Gwyer et al studied the benefits perceived by PT CIs and was used as a comparison for the current study [2]. Due to the void in research concerning physical therapy CI’s perceived reservations; this study explored both the PT’s perceived benefits, as well as their perceived reservations of being a CI.

The hypotheses from this study included: 1. PT CIs will perceive benefit statements similarly regardless of practice setting, 2. PT CIs will perceive reservation statements similarly regardless of practice setting, 3. physical therapy CIs will perceive more benefits than reservations as a whole, and 4. PT CIs will perceive the same benefits and reservations as important as the PT CIs whom responded to the original study by Gwyer et al [2].

2. Experiment, Results, Discussion, and Significance
A convenience sample of 288 CCCEs in the clinical education database of the WSU physical therapy program were selected to participate. Inclusion criteria also required that they had served as a CI in the past three years. Each CCCE was mailed a survey with a cover letter and a self-addressed, stamped envelope. Each CCCE who met the inclusion criteria was asked to fill out the survey. If the CCCE did not meet the inclusion criteria, they were asked to find a PT CI in his/her clinic who did and ask them to complete and return the survey in his/her place. The survey consisted of three parts: 37 perceived benefits statements, 28 perceived reservation statements, and 19 demographic questions. Respondents ranked each benefit and reservation statement from 0-3 (0= no opinion to 3 = very important/very much a benefit/reservation). Seventeen of the benefit statements were obtained directly from the study done by Gwyer et al and sixteen statements acquired from Gwyer et al were modified to further explain the statements based on the results of a pilot study. Four additional benefit statements were developed by five expert PT CIs to expand the knowledge on perceived benefits of the CI Role. The reservations section of the survey was constructed from other health profession studies secondary to the void in physical therapy research concerning perceived reservations of the CI [5, 8, 9, 10].

A total of 111 surveys (38%) were returned. Of the 111, 86 met the inclusion criteria and the respondents were found to practice in the following practice settings: acute/subacute (21%), private practice (45%), and other (34%). Responses to the benefit items were analyzed for differences in ratings based on practice setting. Several statements showed significant differences between practice settings using the Kruskal Wallis test with post hoc Mann-Whitney with Bonferoni adjustment. “I would appreciate receiving discounted registration to continuing education sponsored by university;” was perceived significantly higher (p< 0.017) by respondents from the...
acute/subacute and other settings than by those from the private practice setting. “I would appreciate being eligible for free tuition for university courses;” was perceived significantly higher by those in the acute/subacute setting than those in the private practice and other settings (p ≤ 0.017). “I would appreciate discounts at the university’s bookstore;” was perceived significantly higher by those in the acute/subacute setting than those in the private practice setting (p ≤ 0.017). No significant differences were found between perceived reservations and practice setting.

The responses to the 17 identical benefits statements derived from Gwyer et al [2] were evaluated for significant differences between the two studies. The results of the comparison found that in this study respondents perceived 11 of the benefits statements as less important than they were perceived 16 years ago in Gwyer’s study [2], which could be attributed to the change in education level and demographic data among practicing CIs. Significant differences were found in the following benefits statements: students stimulate me to learn, students appreciate CI efforts, giving back to the profession, ensuring competence, teaching makes work interesting, feel a professional obligation, learn best by teaching, student feedback improves care, students teach new skills, prestige and association with the university, and being an expert in the student’s eyes. The Chi Square test was used to determine significant differences in the seventeen benefit statements between this study and the study by Gwyer [2].

The results indicate that PT CIs perceived more benefits than reservations as a whole. Physical Therapist CIs perceived benefits as being somewhat or very important 58% of the time, whereas the reservation statements were perceived 35% of the time as being somewhat or very much a reservation. Physical therapy educational institutions should strive to ensure that they are providing the beneficial aspects of the CI role to retain CIs.

3. Conclusions

Based on the results of this study, we can conclude that the majority of PT CIs in the WSU database perceive more benefits than reservations in their role as a CI. Setting also affected the perception of benefits. This result may be explained by further examination of demographic data. The significant differences found in the 11 benefit statements obtained from Gwyer et al [2] suggest that demographic data and time impacted perceived benefits of the CI role. Applying these data, clinical education can be strengthened by maintaining or providing the highly perceived benefits and addressing the reservations that could impede the positive clinical experience of the CI. Further exploration of the impact of other demographics regarding these benefits and reservations and use of a larger sample size are recommended.

4. Acknowledgements

The authors wish to thank Candy Bahner DPT, faculty research advisor, for her support throughout the course of this study. We would also like to thank Barbara S. Smith, PhD, PT, for her statistical expertise. Special thanks is extended to the WSU Department of Physical Therapy for support and accessibility to materials.


Tympanometric Measures in Human Ears with Negative Middle-Ear Pressure

Jason Harader*, Xiao-Ming Sun (Faculty Mentor)
Department of Communication Sciences and Disorders, College of Health Professions

Abstract. Tympanometry is a physiological measurement of the acoustic admittance in sound transmission through the ear canal and middle ear and has been widely used in audiology as an objective and non-invasive means to determine the function of the middle ear system. A graphic display of the measurement is called a tympanogram. Characteristics of tympanograms have been quantified with several measures, e.g., peak compensated static acoustic admittance ($Y_{tm}$) and equivalent ear canal volume ($V_{ec}$). In the past decades, numerous investigations confirmed the effect of several middle-ear pathologies on tympanometric measures. However, little effort has been made to specifically explore the effect of negative middle-ear pressure. The objective of the present study was to present the outcomes of two tympanometric measures ($Y_{tm}$ and $V_{ec}$) in human ears with negative middle ear pressure. Data was obtained from 77 patients' records (96 ears) at the Wichita State University Speech-Language-Hearing Clinic. Results demonstrate that substantial overlap exists in both $Y_{tm}$ and $V_{ec}$ measures of tympanometry between the ears with negative middle ear pressures and those with normal pressure in previous studies. These measures are unlikely useful to serve as an index in the diagnosis of negative middle ear pressure in humans. The present study also suggests that both $Y_{tm}$ and $V_{ec}$ tend to decrease with decreasing negative middle ear pressure.

1. Introduction

The middle ear, serving as an impedance matcher between air and the inner ear fluid, is critical in effective transmission of sounds from the outside world into our inner ear. However, certain pathologies in the ear may compromise the function of the middle ear. A non-invasive electroacoustical procedure, tympanometry, has been developed to evaluate the function of the middle ear system in sound transmission. This technology is widely used by most audiologists today as part of a full diagnostic test battery and a screening tool of middle ear disorders in children [for review see 1].

In the administration of tympanometry, a microphone probe is placed in the ear canal. A probe tone, commonly 226 Hz, is presented through an earphone to measure acoustic admittance of the middle ear system as a function of air pressure in the ear canal, which is systematically varied from +200 daPa to -400 daPa. Acoustic admittance of the ear canal and middle ear system is determined at the probe tip by the ratio of the acoustic volume velocity to the acoustic pressure. A graphic display of the measurement is called a tympanogram. With increasing either positive or negative ear-canal air pressure, less acoustic energy travels into the middle ear system due to an increased stiffness of the system. As a result, the admittance decreases. Acoustic admittance is at its highest when pressure in the middle ear is equal to the ambient pressure, displaying a peak on tympanogram, which also indicates the resting pressure of the middle ear system, known as tympanometric peak pressure (TPP). In a normal functioning middle ear system, the TPP should be near 0 daPa.

Characteristics of tympanogram have been quantified with several measures, e.g., peak compensated static acoustic admittance ($Y_{tm}$) and equivalent ear canal volume ($V_{ec}$). $Y_{tm}$ is a measure of the admittance value in millimho (mmho) from the peak to the tail on tympanogram, representing the admittance of the middle ear only. $V_{ec}$ is a measure of the volume of air in the ear canal between the probe tip and the tympanic membrane, which is derived in cm³ from the admittance value at a tail for the positive or negative pressure extreme relative to the baseline on a tympanogram. There has been an abundance of research that focuses on effects of several middle ear diseases on these measures in tympanometry, but systematic examination of the effect of negative middle ear pressure alone on tympanometric measures has not been reported [for review see 1]. Although a minor problem in the ear, negative middle ear pressure may cause other major disorders. Acoustic admittance of the middle ear with negative pressure is definitely reduced because of an increased stiffness of the middle ear system. Although negative middle ear pressure is compensated at the peak of the tympanogram with the application of an equivalent amount of ear-canal pressure, air pressure in both middle ear and ear canal is still negative. The $Y_{tm}$ of the middle ear may not be the
same as that for a normal middle ear. Negative middle ear pressure most likely has little effect on $V_{ec}$ since the tail of a tympanogram theoretically is independent of middle ear pressure.

This study seeks to find effects of negative middle ear pressure without other disorders on the tympanometric measures, $Y_{tm}$ and $V_{ec}$. A retrospective study will be conducted using case files of patients who have been tested with tympanometry. The results may provide a clearer understanding of effects of negative middle ear pressure on tympanometric measures and implications regarding the reliability of these measures.

2. Experiment, Results, Discussion, and Significance

**Experiment:** Data used in this study was obtained from the case files of patients at the Wichita State University Speech Language Hearing Clinic. A total of 96 ears of 77 subjects were used in this study with various age ranges. Patient inclusion criteria included: 1) a negative TPP lower than -50 daPa; 2) no current sign of otitis media based on audiologist’s inspection; 3) negative history of frequently occurring otitis media. The GSI tympanometer was used to record tympanometric data for patients.

**Results:** To perform descriptive statistics, patients were divided into two groups: adults (15 to 99 years of age, $n = 79$ ears) and children (1 to 9 years of age, $n = 17$ ears). Negative TPP of the adults ranged from -50 to -320 daPa and the children from -50 to -280 daPa. The mean $Y_{tm}$ for adults was 0.68 mmhos (90% range = 0.2 – 1.5 mmhos) and children 0.44 mmhos (0.2 – 0.9 mmhos). The mean $V_{ec}$ for adults was 1.36 cm$^3$ (90% range = 0.7 – 2.8 cm$^3$) and children 0.79 cm$^3$ (0.6 – 1.3 cm$^3$). When correlation analysis was conducted, data for the two groups were combined. Although the results did not show a strong correlation between TPP and both $Y_{tm}$ ($r = 0.2$) and $V_{ec}$ ($r = 0.2$), trends were observable that both $Y_{tm}$ and $V_{ec}$ decreased with decreasing TPP.

**Discussion:** The mean $Y_{tm}$ values of both adult and child patients with negative TPP in the present study are slightly lower than those in normal human ears (0.72 to 0.84 mmhos for adults and 0.5 mmhos for children) reported by previous studies [2, 3, 4], but the 90% ranges of $Y_{tm}$ in this study are similar to those in the previous studies. Both mean and 90% range of the $Y_{tm}$ value of adult ears in this study are similar to those in a previous investigation with a large sample [5]. It seems that $Y_{tm}$ value may be reduced in some ears with a negative middle ear pressure due to an increased stiffness of the system, whereas the range of $Y_{tm}$ in ears with negative middle ear pressure largely overlaps the normal range. The mean $V_{ec}$ values as well as 90% ranges for both adults and children in the present study are slightly higher than those of normal ears in previous studies [2, 3, 4]. This suggests that the ear canal volume slightly increases as a negative pressure forms in the middle ear. The present data exhibits that both $Y_{tm}$ and $V_{ec}$ tend to decrease as the middle ear pressure becomes more negative, whereas correlations between TPP and both $Y_{tm}$ and $V_{ec}$ are weak, as shown in the data distribution. Overall, it is unlikely that either $Y_{tm}$ or $V_{ec}$ measure in ears with negative middle ear pressure is significantly different from that in normal ears because of large variability of these measures in humans.

**Significance:** To the best of our knowledge, a systematic investigation on tympanometric measures in human ears with negative middle ear pressure has not been conducted. The present study provides scientific evidence concerning the variability of these measures in human ears and the reliability of the measures applied in separating ears with and without negative middle ear pressure.

3. Conclusions

The present study demonstrates that substantial overlap exists in both $Y_{tm}$ and $V_{ec}$ measures of tympanometry between the ears with normal and negative middle ear pressures. These measures are unlikely useful to serve as an index in the diagnosis of negative middle ear pressure in humans. Results also suggest that both $Y_{tm}$ and $V_{ec}$ tend to decrease with decreasing negative middle ear pressure.

4. References

An Efficient Carrier Offset Estimator for Multicarrier Modulation System

Gami Hiren, Heba Shatnawi, Qasaymeh M. M., Ravi Pendse, M.E. Sawan

Abstract—In this paper, we proposed a closed-form solution for blind Carrier Frequency Offset (CFO) estimation employing the Rank-Revealing QR triangular factorization Method (RRQR) for Multicarrier Modulation system. The advantage of using the RRQR it gives precious information about numerical rank and efficiently separates the signal space from the noise space. Computer simulations are showing the superior performance of RRQR compared with the method employing ESPRIT Algorithm.

I. INTRODUCTION

Multicarrier Modulation (MCM) technique [1] is used in data delivery systems over the phone line, digital radio and television, and wireless networking systems. It has already been accepted for the wireless local area network standards IEEE 802.11a, High Performance LAN type 2 (HIPERLAN/2), and Mobile Multimedia Access Communication (MMAC) Systems. Even though MCM technique like Orthogonal Frequency Division Multiplexing (OFDM) is showing excellent performance against multipath fading, it is very sensitive to Carrier Frequency Offset (CFO), that leads to a severe distortion in subcarrier orthogonality and causes inter channel interference (ICI) [2]. Hence CFO must be estimated and compensated either by using periodic pilot tones [3]-[4] or blindly [5]-[7].

We proposed a novel algorithm for estimating the CFO in an OFDM receiver without using reference symbols, pilot carriers or extra cyclic prefix. We employed the Rank-Revealing QR triangular factorization (RRQR) [8]-[9] for estimating the carrier offset in the received signal. The RRQR is a good alternative of conventional subspace decomposition techniques like SVD, EVD [10] etc. with a lower computational cost. Moreover, it is quite supportive in rank deficient least square problems.

II. PROBLEM FORMULATION

We consider an OFDM system implemented by inverse discrete Fourier transform (IDFT) and discrete Fourier transform (DFT) each of size N for modulation and demodulation respectively. Only P subcarriers of total N subcarriers are used to avoid aliasing. The N samples of IDFT output are given by $x(k) := W_p s(k)$, where $W_p$ consist of the first P columns of the $N \times N$ IDFT matrix and $s(k) = [s_0(k), s_1(k), ..., s_{P-1}(k)]^T$ is a QPSK or QAM data symbol to be transmitted through the $k$-th block. An OFDM symbol is denoted as $\{x_{N-G}, ..., x_{N-1}, x_0, x_1, ..., x_{N-1}\}$ of which the first $G$ samples are guard samples to cancel ISI. The receiver input for the $k$-th block given by

$$y(k) = EW_F H s(k) e^{j(k-1)\varphi(N+G)} + z(k)$$

where $H = \text{diag}[H(0), H(1), ..., H(P-1)]$, $H(i) = \sum_{l=0}^{N-1} h(l) e^{-jil}$. $E = \text{diag}(1, e^{j\varphi}, ..., e^{j(N-1)\varphi})$ and $\varphi$ is the carrier offset. To maintain orthogonality among the sub-channel carriers and to avoid ICI, the matrix $E$ must be estimated and compensated. The task now is to estimate $\varphi$ assuming that the $k$ received noisy data blocks are the only measurements available.

III. DEVELOPMENT OF PROPOSED METHOD

By collecting the $K$ blocks of the received data in matrix $Y$ of size $(N \times K)$

$$Y = [y(1) y(2) ... y(K)] + Z$$

where the $k$-th block of the received signal in (2) is given by $y(k) = [y_0(k) y_1(k) ..., y_{N-1}(k)]^T$, and the $Z$ is the corresponding additive white gaussian noise matrix. Constructing $(N-M+1)$ sub-matrices from $Y$, each of size $M \times K$ such as $M \geq P$. The $i$-th sub matrix is given by

$$y^i(k) = [y_{i-1}(k), y_i(k), ..., y_{i+M-1}(k)]^T + z^i(k)$$

for $i = 1, 2, ..., N-M, k = 1, 2, ..., K$

Collecting $(N-M+1)$ sub matrices calculated in (4) to form a $LM \times K(N-M+L+2)$ matrix $X$

$$Y = XS = \begin{bmatrix} y^1 & y^2 & \cdots & y^{N-M-L+2} \\ y^2 & y^3 & \cdots & y^{N-M-L+3} \\ \vdots & \vdots & \ddots & \vdots \\ y^L & y^{L+1} & \cdots & y^{N-M+1} \end{bmatrix}$$

Also, it can be easily shown that

$$X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_L \end{bmatrix} = \begin{bmatrix} \Phi^0 & \Phi^1 & \cdots & \Phi^{N-M-L+2} \\ \Phi^1 & \Phi^2 & \cdots & \Phi^{N-M-L+3} \\ \vdots & \vdots & \ddots & \vdots \\ \Phi^{L-1} & \Phi^L & \cdots & \Phi^{N-M} \end{bmatrix}$$

Where, $A := E_M W_M$, $W_M$ consists of the first M rows of $W_p$, $E_M = \text{diag}(1, e^{j\varphi}, ..., e^{j(M-1)\varphi})$ and the matrix $\Phi = \text{diag}(e^{j\varphi}, e^{j(\omega+\varphi)}, ..., e^{j(\omega(M-1)+\varphi)})$ including the information of carrier offset, with
\( \omega = 2\pi/N \). The matrix \( X \) can be partitioned into two subgroups of same size \( X^e \) and \( X^o \), where group matrices \( X^e \) and \( X^o \) are given by even and odd sub-matrices of matrix \( X \). It can be noticed that the matrices \( X^o \) and \( X^e \) are related by \( X^e = X^o \Phi \). Applying RRQR
\[
X = QR = \begin{bmatrix}
Q_{11} & Q_{12} \\
Q_{21} & Q_{22} \\
\vdots & \vdots \\
Q_{L1} & Q_{L2}
\end{bmatrix}
\begin{bmatrix}
R_{11} & R_{12} \\
0 & R_{22}
\end{bmatrix}
\]
(6)
where the \( L \) sub-matrices \( Q_{11}, Q_{21}, \ldots Q_{L1} \) are of dimensions \( M \times P \) and collectively forming signal sub-space in matrix \( Q \). The sub-matrix \( R_{11} \) is upper triangular square full rank matrix while \( R_{12} \) is holding remaining important information with dimensions \( P \times K(N - M - L + 2) \). Because of rank-revealing QR-factorization re-write (6) as
\[
X^o \approx Q^o [R_{11} \ R_{12}]
\]
(7)
\[
X^e \approx Q^e [R_{11} \ R_{12}]
\]
(8)
where group matrices \( Q^e \) and \( Q^o \) are given by even and odd sub-matrices of signal subspace, from (7), we get
\[
[R_{11} \ R_{12}] = Q^o X^o
\]
(9)
where the operator \([\cdot]^T\) is the pseudo inverse of the matrix. Substituting the above equation into (7)
\[
X^o \Phi = Q_o X^o
\]
(10)
where the matrix \( Q_o = Q^o Q^o^T \). Re-write (10) as
\[
\Phi_i X_i^o = Q_o X_i^o , \ i = 1,2, \ldots \ldots P
\]
(11)
Equation (11) is a classical eigenvalue problem with the eigenvector \( X_i^o \) and the eigenvalue \( \Phi_i \). The eigenvector \( X_i^o \) is the \( i \)-th column of the matrix \( X^o \) and the \( \Phi_i \) is the \( i \)-th diagonal element of the diagonal matrix \( \Phi \). Clearly here \( P \) eigenvalues of the matrix \( Q_o \) correspond to the \( P \) diagonal elements of the diagonal matrix \( \Phi \). Hence, the CFO can be estimated as
\[
\exp(j \varphi) = \frac{\text{trace}(Q_o)}{\sum_{k=0}^{P-1} e^{j k \omega}}
\]
(12)

IV. SIMULATION RESULTS
We considered OFDM system with \( N=64 \) carriers, of which \( P=40 \) are used carriers. Transmitted symbols are drawn from equiprobable QPSK constellation. The cyclic-prefix (CP) length is eleven symbols, the matrix structure parameter \( L \) is assumed to be two and the frequency offset is assumed to be \( 0.1 \omega \). The experiment is verified under AWGN environment with \( N_t = 1000 \) independent monte-carlo realizations.

The normalized MSE is compared with two different number of blocks (\( K=2 \) and \( K=4 \)) acquisition. Even for a small number of block acquisition our algorithm performs much better than the classical ESPRIT [7] type algorithm. For example, to achieve the same MSE performance with just \( K=4 \), the reference algorithm requires an approximately \( 20 \) dB of additional SNR.

V. CONCLUSION
We proposed a low complexity blind OFDM CFO Estimation algorithm. The main advantage with the proposed algorithm is that it does not use any training symbols and therefore saving transmission bandwidth. Also, it is equipped with a closed-form formula which alleviates the problem of searching entire subspace for required parameter of interest.

REFERENCES
Effectiveness and Invasiveness in Patient Medical Decision Aids

Lukas Hulsey*, Victoria A. Shaffer

Department of Psychology, College of Arts and Sciences

Abstract. This research tested the hypothesis that including anecdotal evidence impacts treatment choice by influencing the trade-off between effectiveness and invasiveness. In addition, the role of decision-making style was examined. Participants imagined making a decision between two treatment options for angina (chest pain). Bypass is more effective, but more invasive; balloon angioplasty is less effective, but less invasive. Participants received statistics about the effectiveness of the two treatments, testimonials, or both. They then indicated their choice between the two treatment options and rated the importance of the effectiveness and invasiveness of the treatment chosen to their decision. A subset of the participants also completed the Decision Making Styles Inventory (DMI) which describes individuals on three styles of decision-making: analytical, intuitive, and regret-based. Treatment choice was not shown to differ between experimental conditions. However, ratings of the importance of treatment invasiveness and effectiveness did explain a significant amount of the variance in treatment choice. Therefore, the trade-off between effectiveness and invasiveness appears to be an important source of individual differences in treatment choice. In addition, this research provides some evidence that individual differences in decision-making style play a role in the impact of anecdotal evidence on treatment choice.

Introduction

Research has begun to show how different materials and pieces of information affect medical treatment choices [1]. Sometimes a given medical ailment can be treated successfully in a number of ways. In these instances, the ultimate decision may be left to the patient. When considering the options of these types of choices, effectiveness and invasiveness are generally in competition with each other. More effective treatments are often more invasive; less invasive treatments are less effective. Therefore, patients have to trade-off one treatment aspect for the other in the search for the optimal treatment choice. The materials presented in a decision aid may affect treatment choice through changes in the importance placed on effectiveness and invasiveness. At the same time, underlying individual differences may have an even stronger impact on treatment choices. These individual differences may also interact with the materials presented.

Method

Two hundred and forty-two undergraduate psychology students participated in a computerized survey for extra credit or partial course credit. Participants were asked to imagine needing to make a decision between two treatment options for angina (chest pain). Bypass is more effective, but more invasive; balloon angioplasty is less effective, but less invasive. Three experimental conditions were utilized. One group received statistics about the effectiveness of the two treatments, another group received testimonials about the treatments, and a third group received both the statistics and the testimonials. Participants made a choice on a six point bipolar scale ranging from “extremely likely to choose bypass” to “extremely likely to choose angioplasty”. They then rated the importance of the effectiveness and invasiveness of the treatment chosen to their decision. Furthermore, 196 participants also completed the Subjective Numeracy Scale to assess their subjective numeracy and 183 completed the Decision Making Styles Inventory (DMI) to determine general decision making style. Subscales in the DMI include analytical, intuitive, and regret-based decision making styles.

Results

Treatment preference of the three groups was analyzed using one-way analysis of variance. Those who received both statistics and testimonials were the most likely to choose bypass and those receiving only testimonials were the least likely to choose bypass, but these differences between groups were not significant, F(2, 239)=.471, p>.05. This is not consistent with previous research [1] which found that those who received only statistics were significantly more likely to choose bypass compared to those who received both statistics and testimonials. Ratings of the importance of effectiveness were correlated with treatment choice, r = .22, p>.01. Ratings of the importance of
invasiveness were strongly related to treatment choice, \( r = -0.64, p<0.001 \), indicating that those more likely to choose bypass (the more invasive procedure) valued invasiveness as less important. Ratings of the importance of invasiveness did not differ by group, \( F(2, 239) = 0.57, p>0.05 \)

For those receiving only statistics, intuitive decision making style was a significant predictor of treatment choice, \( \beta = -0.375, p<0.01 \). Those scoring higher on the intuitive subscale were more likely to choose angioplasty – the less effective, less invasive procedure. For those receiving both statistics and testimonials or only testimonials, intuitive decision making style was not a significant predictor of treatment choice, \( \beta = -0.15, p>0.05 \) and \( \beta = -0.05, p>0.05 \), respectively. Neither subjective numeracy nor the other decision making style subscales were predictive of treatment choice in any of the groups.

**Discussion**

Findings of previous research [1] were not replicated. Those receiving both statistics and testimonials were not significantly more likely to choose angioplasty as compared to those receiving only statistics. This lack of replication may be due to a relatively small effect size for the influence of testimonials. However, this result could also be explained by differences in populations studied (undergraduate psychology students versus potential jurors) and the way in which treatment preferences were elicited (forced choice versus a bipolar scale). Future work will compare the forced choice approach versus the bipolar scale approach to determining participant treatment preference.

Of greater interest was the strong relationship discovered between treatment choice and the importance participants place on treatment invasiveness and effectiveness. These individual difference measures proved to be more useful for predicting patient treatment preferences than the materials received (i.e. statistics, testimonials, or both). A potential limitation, however, is that the questions of invasiveness and effectiveness importance followed directly after a treatment was selected. Ratings of these two items may therefore be a justification on the part of the participant for choosing a particular treatment rather than a representation of an underlying valuation of the two constructs. In future studies, a simple manipulation of putting the ratings before the treatment selection will provide more evidence about the true nature of this relationship.

People who are more intuitive decision makers prefer to rely on gut feelings when making decisions. For the statistics only group, higher scores on intuitive decision making style were shown to predict a greater likelihood of choosing the less effective less invasive procedure. This seems to indicate that when presented with only statistics, patients who are more intuitive in their decision making style may be less swayed by statistical information. Therefore, consideration of underlying patient characteristics is important when determining what to include in patient decision aid materials.

**Conclusion**

These results indicated that the presentation (or lack) of statistics and testimonials has little influence on treatment choices, which is in contrast to previous research conclusions [1]. There was large variability in treatment choice within groups which can help to explain the lack of replication. Ratings of the importance of invasiveness appear to account for more of the within group variance than the between group variance. The strong relationship between treatment choice and ratings of the importance of invasiveness might be present for two reasons. Participants may have simply justified their choice with corresponding invasiveness ratings, or it may be due to the existence of a true underlying valuation of invasiveness. At the same time, it appears that there is an interaction between the type of materials presented and intuitive decision making style. Research looking at how decision aid materials affect treatment choices needs to consider this potential interaction.

Facies Characterization and Mechanism of Termination of a Tertiary Carbonate Platform: Rajamandala Fm., West Java

Brad M. Jeffrey* and Dan Lehrmann

Abstract: The objective is to better understand an Oligocene coral reef ecosystem, exposed in SW Java as a scenic ridge of karst towers. Extensive mining threatens to destroy the spectacular scenery and important geological history. Depositional environments were interpreted from field and laboratory studies. Previous studies established the system as a fringing reef in a deep marine back-arc basin. It has been debated whether the reef formed an isolated platform or if it was attached to the island arc. Results indicate an attached shelf receiving sedimentation from a landward source, due to the presence of quartz sand. Initial reef development in a high-energy environment is indicated by fractured grains. The biologically diverse reef contains massive corals, algae, and foraminifera. The slope contains delicate platy corals and experienced episodic debris-flows. Extinction of the reef is represented by deepwater limestones, indicating platform drowning. The geologic context suggests rapid subsidence. The presence of photosynthetic red algae suggests submergence was not to subphotic depths. Abundant giant foraminifera indicates delayed reproduction under stressed conditions, which may have included cool waters, increased nutrients, algal blooms, and/or influx of sedimentation. Results will improve the understanding of similar ancient and modern reefs and their response to environmental change.

1. Introduction

The Oligocene Rajamandala Formation forms a northeast trending belt of limestone in the Padalarang and Sukabumi areas of southwest Java. The belt, exposed along a north-verging thrust fault, forms a scenic ridge of karst towers in an area dominated by volcanic and siliciclastic rocks. The limestone records the life history of a relatively young coral reef ecosystem similar to modern reefs. Results of this study will improve the understanding of similar ancient and modern reefs, and their response to environmental change. Extensive mining for building stone and concrete production threatens to destroy the spectacular scenery and geological history of this deposit.

2. Methodology

The coral reefs of the Rajamandala Formation occur north of an Oligocene volcanic arc and face a deep-marine, back-arc basin to the north. The regional stratigraphic framework consists of a shallow platform with a restricted lagoon, and a fringing reef that changes northward and eastward into slope and basin [1]. Within the stratigraphic framework, various types of limestone were categorized into facies based on interpreted environments of deposition, through field and laboratory studies. Stratigraphic sections were measured in the field and computer-drafted to interpret depositional environments. Representative samples were collected from the field and petrographically analyzed using the binocular microscope to identify lithology, sedimentary structures and textures, fossils, and cements, in order to substantiate depositional environmental interpretations.

3. Results

The base of the Rajamandala represents the initial development of the reef ecosystem. The initiation of the reef occurred under high energy conditions, indicated by quartz sandstones containing highly fractured grains, marine carbonate cements, and fossils. It has been debated whether the reef formed an isolated carbonate platform within the back-arc basin or if it was a shelf attached to the southerly arc. The presence of sandstone layers in the base and quartz sand in the reef and lagoon suggest it formed as an attached shelf receiving sedimentation from a landward source.

The platform interior consists of shallow-marine fossil assemblages embedded in carbonate mud, including benthic foraminifera, miliolids, red algae, echinoderms, and coral fragments. The abundance of mud indicates deposition during low wave energy, and miliolids indicate a relatively restricted, shallow lagoon environment. The platform margin contains magnificent biodiversity, including reef-builders such as massive head corals, sheet and 'staghorn' corals, with encrusting red algae and possibly calcareous green algae, and reef-dwellers including large foraminifera, mollusks, and bivalves. The upper slope contains delicate platy corals representing quiet, low-energy conditions. Episodic debris-flows transported reef material from the platform, down the slope, and into the basin. In the distal
slope and basin, argillaceous limestones contain deep-sea fossil assemblages including abundant planktonic foraminifera, and are interbedded with the debris-flow deposits, which contain fragments of benthic foraminifera, coral, and red algae from the reef and platform interior.

The upper Rajamandala records the extinction of the ecosystem. It consists of dark brown, argillaceous limestone followed upward by siliciclastic deep-sea turbidites of the Citarum Formation, indicating drowning of the platform to deeper waters. The geologic context indicates rapid tectonic subsidence, causing the platform to sink into deep waters, as indicated by the dark colored marl. However, the presence of photosynthetic red algae indicates that subsidence was not great enough to submerge the system completely beneath the photic zone, suggesting other additional environmental factors contributed to the extinction of the ecosystem. The presence of abundant, exceedingly large foraminifera (up to 7 cm) indicates delayed reproduction under stressed conditions, which may have included cool waters, excessive nutrients, algal blooms, and/or siliciclastic flux.

4. Significance

The reconstruction of the Rajamandala reef and its history from development to extinction will contribute to the understanding of the evolution of Oligocene coral reefs in Indonesia. The petrographic results of this study will serve as analogs for quality and distribution of hydrocarbon source and reservoir rocks in the subsurface to aid in hydrocarbon exploration in the region. A solid understanding of the environmental controls on reef ecosystems will benefit the study of similar ancient reefs. Results will provide insight to the response of modern Indonesian coral reefs to environmental change.

5. Conclusions

The Oligocene Rajamandala Formation records the complete life cycle of a biologically diverse coral reef ecosystem similar to modern reefs. Initial development of the reef occurred in a high wave energy environment. The well-developed platform margin contains a shallow lagoon interior attached to land, indicated by the presence of quartz sand. The margin and upper slope contains a diverse community of coral reef formers, red algae encrusters, and foraminifera dwellers. Episodic debris-flows brought reef material to the distal slope and basin. Extinction of the ecosystem is indicated by a shift to deepwater fossil assemblages, indicating drowning. The geologic context suggests rapid tectonic subsidence. However, the presence of red algae indicates that drowning was not to subphotic depths, suggesting additional mechanisms for extinction. Giant foraminifera indicate stressed conditions, which may have included cool waters, increased nutrients, algal blooms, and/or siliciclastic flux. Results will improve the understanding of the evolution and environmental controlling factors of Oligocene reefs in Indonesia and similar ancient coral reefs, and provide insight to the response of modern coral reef ecosystems to environmental change.

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An Evaluation of Indirect Interactions Between Herbivore Guilds: Effects of Meristem Miners on Flower Head Feeders

Jones, M.* and Russell, F.L.

Abstract. In the study of biological control of weeds, effects of insect herbivores that attack different plant organs have long been assumed to be independent events. Emerging research indicates stronger interactions between herbivore guilds than was expected historically. My research focuses on damage to apical meristems of tall thistles (*Cirsium altissimum*) by stem mining insects and the indirect, plant-mediated effects of this damage on flower head feeding insects. Two questions were addressed: 1) how does mining of the apical meristem affect tall thistle architecture, including number of branches and flower heads produced? 2) what influence does apical meristem mining have on the intensity of damage to the plant by flower head feeding herbivores? Forty adult tall thistles at two different sites (80 plants total) were assigned to levels of a “meristem-herbivore exclusion treatment” in April, 2008. Insecticide was applied to the apical meristem of treatment plants. Control plants were sprayed with water or were not sprayed. Apical meristem mining had significant affects on; flower heads (F2,2=45.97, p=0.021), primary stems (F=11, p<0.001) and plant height overall (F2,4=26.39, p=0.004). There was a marginally significant effect on flower head damage, further work will be needed to understand the biological significance of this finding.

1. Introduction

A long-standing, dominant paradigm in insect community ecology has been independence between different guilds of insects feeding on a plant, illustrated by the ideal free distribution hypothesis (1). This hypothesis states that resources in an ecosystem are divided up to decrease inter-specific competition. For example, the ideal free distribution hypothesis would suggest that a folivore removing leaf tissue would have little or no effect on a pollen feeder. It is becoming increasingly clear that there is non-independence between phytophagous insect guilds. There are diverse mechanisms by which non-independence of phytophagous insect guilds can arise. One is direct competition where damage to a plant by one insect species deprives a second insect species of limiting resources. Another mechanism of non-independence could be plant-mediated indirect effects. This includes morphological or chemical changes in a plant in response to damage by one herbivore guild that either increases or decreases the plant’s attractiveness to a different guild. Root herbivory often causes physiological and/or morphological changes in a plant (2). Masters et al (2001)(3) used *Cirsium palustre* for a study of indirect interactions between different feeding guilds of insects. They found that a root feeding herbivore changed the chemistry of the plant making it more attractive to a seed-feeding Tephritid fly. Increased tephritid fly densities, in turn, led to an increase in abundance of a parasitoid wasp, illustrating a non-independence of three insect guilds; two herbivorous and one parasitoid.

My research focuses on damage to apical meristems of tall thistle (*Cirsium altissimum*) by stem mining insects and the indirect, plant-mediated effects of this damage on flower head feeding insects. Two hypotheses were addressed; 1) Apical meristem mining has no affect on tall thistle architecture, including number of branches and flower heads produced. 2) Apical meristem mining has no impact on the intensity of damage to the plant from flower head feeding herbivores.

2. Experiment, Results, Discussion, and Significance

For my experiment, I am using three sites; the WSU Biological Field Station, Chisholm Creek Park, and Pawnee Prairie Park. Apical meristem damage was prevented by insecticide treatment. Insecticide was carefully applied to the center of thistle rosettes before they produced a reproductive stalk. Every effort was made to avoid applying insecticide to rosettes’ leaves, so as to not incur confounding effects of reduced damage to the leaves. The insecticide was Bifen IT (Control solutions INC). This insecticide is non-systemic, so it is not taken into the plant,
and will only deter insects that use plant parts where the insecticide was applied. Insecticide was applied repeatedly to the apical meristem once rosettes produced reproductive shoots. The controls consisted of no treatment and an application of water in an equivalent amount to the insecticide sprayed, to account for the extra water added to the plant when insecticide is applied.

Measurements of plant architectural complexity, size and flower head production were taken three times during the growing season for WSU Biological Field Station and Chisholm Creek. Pawnee Prairie received only two rounds of measurements. Early season measurements (April) included stem length, root crown diameter and rosette diameter. Measurements at onset of flowering and end of flowering included number of flower heads per plant, number of primary branches, stem length, plant height, root crown diameter, plant diameter and presence/absence of the terminal flower head on the reproductive shoot flower head. Flower heads were collected from thistles in the experiment and are being dissected to quantify damage by flower head feeding insects. Statistical analysis will consist of two-way ANOVA’s with insecticide application as the fixed effect, and site as a random effect. Dependent variables for describing plant architecture include stem height, number of flower heads, number of primary branches, total plant height. After flower head dissections are completed, indices of flower head damage by insects also will be analyzed.

Preliminary results show that the application of insecticide to the apical meristem and the resulting reduction in damage by apical meristem-feeding insects changes; total plant height, stem height and total number of flower heads produced. The primary stem of plants sprayed with insecticide were taller ($F_{2,2}=11.01, p=0.0228$) than water control and control plants (mean 77.125 cm, se 5.498, mean 56.81 cm, se 2.84, mean 61.21 cm, se 3.899 respectively). Total plant height was greater ($F_{2,2}=26.39, p=0.0039$) with insecticide than water control and control (mean 94.88 cm, se 4.047, mean 81.516 cm, se 3.226, mean 84.273 se 3.685). The total number of flower heads produced was lowest ($F_{2,2}=45.97, p=0.0213$) with insecticide than water control and control.

3. Conclusions

Preliminary results provide experimental evidence that meristem mining insects can result in changes in plant morphology as well as reproductive organ development. These architectural changes provide a mechanism that may drive plant-mediated effects of meristem-feeders on flower head feeders. Data will be collected throughout the summer of 2009 in the same manner.

4. Acknowledgments

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Abstract. Trunk stabilization training has grown in popularity. There are generally two accepted methods of implementing trunk stabilization training: abdominal bracing and abdominal hollowing. The purpose of this research study is to investigate the most effective stabilization method to increase trunk stability. We hypothesized that there will be no significant difference in trunk stability in those who perform abdominal draw-in exercises (hollowing) compared to those who perform abdominal bracing exercises. Each participant was randomly assigned into abdominal bracing or abdominal hollowing experimental groups. Rehabilitative Ultrasound Imaging measurements of the abdominal muscles were taken before and after an 8 week trunk stabilization exercise intervention. The ability of each participant to stabilize their trunk was measured via trunk strength with a dynamometer. There was no significant difference between the groups with a repeated measures analysis of all dependent variables.

Introduction

Trunk stability exercises have been used clinically to treat and prevent low back pain, however, controversy exists over which exercise program is more effective in increasing trunk stability.[1] There are generally two types of muscle systems that contribute to trunk stability.[2] The first is the global muscle system. These muscles act on the trunk and spine without directly attaching to it.[2] They provide general trunk stability but do not have a direct segmental influence on the spine. The local muscle system has direct attachment to the lumbar vertebrae and provides segmental stability.

Training of the local muscular system has traditionally involved abdominal hollowing. [3]This technique involves an abdominal drawing in maneuver, specifically, pulling the navel in towards the spine as to “draw in” the lower abdomen.[4,5] This technique has been identified as an effective way to retrain motor patterns in the deep abdominal muscles which have been suggested to be linked to spinal stability.[6]

Training of the global muscle system is a co-contraction (abdominal bracing) of all of the abdominal muscles that increases torso stiffness.[7] Abdominal bracing prior to and during loaded exercise or functional activity increases intra-abdominal pressure to stabilize the lumbar spine.[8] Not only do all the abdominal muscles become stiff but the back extensors also become active.[7]

The purpose of this research study is to investigate the most effective method to increase trunk stability in middle age adults. We hypothesized that there will be no significant difference in trunk stability in those who perform abdominal hollowing as compared to those who perform abdominal bracing exercises. The results of this study will help physical therapists determine the trunk stability program that will most effectively increase trunk control.

Experiments, Results, Discussion, and Significance

Experiment: Subjects were randomly assigned to one of two experimental groups: abdominal bracing (n=18) or abdominal hollowing (n=16). Each group performed their assigned contraction method while executing the same 8 week exercise program. All subjects were pre and post tested using two different instruments: A lower trunk strength assessment with use of a dynamometer, and a measurement of the thickness of the lateral abdominal wall muscles using an ultrasound imaging machine. Subjects were tested in the following order for the pre-test and post-test: (1) a test of the thickness of the right abdominal wall muscles (external oblique, internal oblique, and transverse abdominis) was recorded in resting, (2) lower trunk strength with a natural contraction (no instruction was given on how to resist), (3) each subject was then instructed in an abdominal contraction method (abdominal bracing or hollowing). (4) Next, each subject’s lateral abdominal wall muscle thickness was measured while the subject
performed the assigned contraction (bracing or hollowing), and finally, (5) lower trunk strength assessment with the assigned contraction method. Hip abduction strength was also tested using a dynamometer with the patient in sidelying.

**Results:** There was no significant difference between the bracing group and the hollowing group in separate repeated measure analysis of all dependent variables. Further analysis using a paired t-test for each intervention group revealed significant differences in several areas. Within the bracing group a significant difference was found in internal oblique resting muscle thickness (p=.005) pre and post intervention. A significant difference in lumbar rotation dynamometer strength during the bracing contraction (p=.003) was also found when comparing pre and post intervention means. In addition, a significant difference was found pre and post intervention hip abduction dynamometer strength means within both the bracing (p=.003) and hollowing (p=.030) groups. Within the hollowing group, a significant difference was found with a paired t-test analysis of resting transverse abdominus muscle thickness (p=.019) pre and post intervention.

**Discussion and Significance:** Given the recent conflicting research regarding the best abdominal exercise technique to increase trunk stability, our goal of this study was to determine whether the abdominal bracing or hollowing method is more effective in stabilizing the trunk. Data analysis of this study revealed no significant difference between the bracing and the hollowing group with a repeated measures analysis of all dependent variables. Further analysis using a paired t-test of each group found unexpected and unexplainable differences.

Further research is necessary to investigate the reliability and validity of the low trunk strength assessment, as well as, the use of ultrasound imaging in the evaluation of detecting muscle thickness changes over time. Further research should also include increased monitoring of the intervention exercise program and increased group size to improve power.

**Conclusion**

In conclusion, the results proved the null hypothesis: there is no significant difference between bracing and hollowing abdominal exercises in terms of force output and abdominal muscle thickness. Clinically, both exercises may be equally beneficial to patients. Therefore, professional judgment should guide selection and prescription of therapeutic exercises for addressing core stability.

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Static and Dynamic Warm-up in Upper Extremity Functional Activities

Shane Katz, Jeremy Jabara, Afton Sumler and Tim Swanson, Robert Manske

Department of Physical Therapy, College of Health Professions

Abstract.

Considerable research has explored stretching the lower extremity prior to activities; limited literature examined the upper extremity (UE). The purpose of this study is to determine whether a static or dynamic stretch will increase the functional capacity of the UE. Students between the age of 21-35 were randomly assigned to a static or dynamic stretching group. Regardless of initial assignment, subjects served as their own control and performed both warm-ups. The dominant arm was tested during the following: concentric IR and ER strength testing, proprioception, softball throw and a closed-kinetic chain upper extremity stability test (CKCST). Paired t-tests revealed no significant difference between proprioception, isokinetic, and softball throw. However, there was a significant difference between dynamic warm-up and the CKCST.

Introduction

Considerable research has discussed pre-activity warm-up before functional use of the lower extremity; however, limited evidence exists for the UE, and no research comparing static warm-up (SWU) to dynamic warm-up (DWU) in the UE. Maintaining muscle flexibility, increasing proprioception and maximal muscle performance, injury prevention, and sustaining biomechanical movement are all reasons to perform a warm-up prior to any functional activity. Muscle flexibility can be preserved or increased with stretching. Identifying the best method to warm-up the UE prior to functional activities can enhance rehabilitation, training, and testing outcomes. Therefore, the purpose of this study is to determine whether a SWU or DWU prior to functional activity will improve the functional performance of the UE.

Experiment, Results, Discussion, and Significance

Tests chosen to evaluate functional performance of the UE included: concentric IR and ER isokinetic strength testing, proprioception, distance of softball throw and a closed-kinetic chain upper extremity stability test (CKCST). Prior to each test, a coin toss determined the subject’s warm-up method. All stretches were performed once with a 30-second hold. Following warm-up, participants lay supine on LIDO isokinetic dynamometer to test proprioception[2,6]. The dominant arm was abducted to 90° with elbow flexed 90° and taken through a range of motion (ROM). Pre-determined angles for joint replication were 60° and 30° of external rotation (ER) and 15° and 40° of internal rotation (IR). The researcher held the subject’s arm in place for 10 seconds and then moved the arm back to neutral[2,6]. The subjects were asked to return their arm to the previously held position.

Following proprioception testing, subjects rested for 10min and warmed-up prior to strength testing. Subjects performed an interval warm-up of 25%, 50%, 75%, and 100% of maximal internal and external rotation against 180° per/sec[4]. Subjects performed 10 consecutive IR and ER maximal repetitions. Average peak torque and work was calculated. The subject repeated interval warm-up and testing for 300° per/sec[5]. Testing was repeated a week later with the opposite warm-up.

The third test day, subjects reported to WSU Cessna stadium for softball throw. Following warm-up subjects were given a softball and instructed to take one step and throw[1]. Three maximal throws with distance recorded were allowed. One week later the other warm-up protocol was performed.

The last test was a closed-kinetic chain upper extremity stability test (CKCST)[3]. Following warm-up males assumed the push-up position and females the modified push-up position. One hand was moved from the floor, touched the opposite hand and then returned to the original position[3]. Testing lasted 15 seconds and touches were
counted[3]. Three trials were allowed with 45 seconds rest between[3]. One week later the other series of warm-up stretches and the same procedure was performed.

The Statistical results represent the performance on each dependent variable based on warm up conditions. A paired T-test was used for all analysis of variables. Internal rotation total work @ 180 (deg/sec) revealed that subjects scored better after the DWU than SWU (p<.05). No differences existed between the DWU and SWU for all other strength testing. Analysis of proprioception testing revealed no difference between SWU and DWU at all four loci. Softball throw scores revealed no difference between SWU and DWU during all 3 trials. Dynamic stability testing via CKCUE test revealed subjects scored better after the DWU than SWU in Trial 1(p<.05), and Trial 2(p<.05), while no difference was found in Trial 3.

<table>
<thead>
<tr>
<th>Table: 1</th>
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<tbody>
<tr>
<td>Type of warm-up</td>
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<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Static trial 1</td>
</tr>
<tr>
<td>Dynamic trial 1</td>
</tr>
<tr>
<td>Static trial 2</td>
</tr>
<tr>
<td>Dynamic trial 2</td>
</tr>
<tr>
<td>Static trial 3</td>
</tr>
<tr>
<td>Dynamic trial 3</td>
</tr>
</tbody>
</table>

The results of the study suggest that a DWU might offer performance benefits not found with SWU. Performing a DWU with similar movement of the following activity will increase performance compared to a SWU. Future investigations should evaluate the subjects conditioned; thus eliminating the element of fatigue. In addition, choosing a warm-up more specific to the activity may change the results. Fatigue and using a sample of convenience may be a limitation of this study. Decreasing the number of repetitions and increasing the recovery time between velocities may eliminate the element of fatigue. Fatigue also may have been a factor during the CKCUE activity and the softball throw.

Conclusions

DWU might offer performance benefits not found with SWU prior to performance of selected strength testing and functional closed kinetic chain activity in the UE.

Acknowledgements

Thanks to our advisor Robert Manske for his leadership and to the College of Health Professions for testing supplies and facilities. In addition, thank you to first and second year physical therapy students for volunteering as subjects and to Papa John’s Pizza for providing complimentary pizza.

References


Relationships of Demographic Background and Practice Setting Among Practicing Physician Assistants in the United States

Justin Kelley *, Shawn Lies *, Richard Muma

Department of Physician Assistant - College of Health Professions

Abstract: The assumption has always been that minority health care providers were more likely to work in areas of need. However, no recent research has been conducted to determine this. The purpose of this study was to determine the relationships between current practice specialty and population served to demographic variables (e.g., race) among physician assistants (PAs). This cross-sectional study measured demographic and practice setting survey data. A random sampling of 10,500 PAs was surveyed. Nearly 12% of the sample was minority (compared to nearly 25% nationally). The main results indicated minority PAs were more likely to work in underserved and primary care practices as compared to non-minorities (Underserved=31.9% vs.19.3%; Primary Care=38.8% vs. 29.3%). Separately, there was a significant relationship among all those serving underserved populations and non-married individuals and those over age 39 (more likely to serve in this setting) (p<0.01). Household income less than $50,000 at the time of high school graduation was significantly related to serving underserved and primary care populations (more likely to serve in these settings) (p<0.01; p<0.001). In this sample minority PAs were more likely to serve in underserved and primary care settings. Certain demographics among all respondents were also significantly related to service in underserved and primary care settings.

1. Introduction

In 2000, the minority population in the United States was estimated to be 24.9% by the U.S. Census Bureau [1]. Minority representation in the physician profession was 10.2% [2], while minority representation in the physician assistant profession was 16.7% [3]. According to a 1985 study, underrepresented minority physicians were more likely to care for minority patients than White physicians [4]. A significant disparity in providers of health care to the minority population exists. Increasing the number of providers caring for the underserved will impact access to medical care significantly, as well as likely having an impact on the overall cost and quality of health care. If demographic predictors could be found to identify these providers, more efficient policies to increase their numbers could be implemented. Efforts have been made on a national level to increase the recruitment, retention and academic success of underrepresented minorities in health fields.

As basis for comparison to our study, a 1993 study of the physician profession demonstrated that variables found to be predictive (p<0.001) of providing substantial care to underserved populations included whether the physician was a member of an underserved minority, had participated in the National Health Service Corps, had a strong interest in practicing in an underserved area before medical school, and grew up in an underserved area [5].

No recent research on a national level has been conducted to verify that minority physician assistants are more likely to work in areas of need. The purpose of this study was to determine significant relationships between the demographic background of practicing physician assistants and their current practice settings. Likewise, we attempted to determine whether current practicing minority physician assistants returned to communities serving minority populations after attending an accredited physician assistant program.

2. Experiment, Results, Discussion, and Significance

This study was a cross-sectional, random sampling of PAs from the United States. The research question was as follows:

- What were the relationships between current practice specialty and population served to demographic variables among practicing PAs in the United States?

The American Academy of Physician Assistants (AAPA) database was queried to obtain a randomized sample of PAs in the United States. 10,500 PAs were surveyed to ensure a pool of respondents of approximately 2,000. A
A survey was mailed asking a series of questions in regard to current practice specialty (e.g., primary care, specialty, academician, not in clinical practice), population served (e.g., work setting designated as a facility that serves an underserved population or community), current practice community size (urban=>50,000; rural=<50,000), PA degree level (certificate, associate, bachelor, or master), relationship status (married or not married), gender, age, race/ethnicity, primary language (English, Spanish, or other language), family size (size of your immediate family at the time of your high school graduation) and income during high school, high school classification (public or private) and High School and PA program GPA.

Frequency counts were conducted to determine current practice specialty, population served, current practice community size, PA degree level, relationship status, gender, age, race/ethnicity, language, family size and income during high school, high school classification and GPA, and PA program GPA. Chi-square analyses were performed to determine whether there were any significant relationships between current practice specialty and population served to the demographic variables noted above. Surveys were collected from May 11, 2008, to July 4, 2008, with a 20% (n=2048) response rate.

Nearly 12% of the sample was minority (compared to nearly 25% nationally). The main results indicated minority PAs were more likely to work in underserved and primary care practices as compared to non-minorities (Underserved=31.9% vs.19.3%; Primary Care=38.8% vs. 29.3%). Separately, there was a significant relationship among all those serving underserved populations and non-married individuals and those over age 39 (more likely to serve in this setting) (p<0.01). Household income less than $50,000 at the time of high school graduation was significantly related to serving both underserved and primary care populations (more likely to serve in these settings) (p<0.01; p<0.001).

This was a nationwide survey with an adequate response rate; in which generalizations can be made. The focus of the study was to obtain a current and general understanding of the PA population and the relationship of demographic background and practice setting. The significance of this study rests in the fact that no recent study has been conducted that surveyed PAs on a national level to determine relationships between demographic information and their current practice setting.

Given these results, future research may be aimed at different methods of recruitment needed to increase the percentage of minority applicants to physician assistant programs. Increasing diversity could ultimately assist in resolving health care disparities by placing a higher percentage of PAs in underserved populations.

3. Conclusions

The results of this study demonstrate that minority PAs practice in underserved, primary care settings compared to non-minority PAs. Certain demographics, including non-married status, age over 39, and household income less than $50,000 at time of high school graduation, among all respondents were significantly related to service in underserved and primary care settings.

4. Acknowledgements

We would like to thank Richard Muma, PhD, MPH, PA-C, Research Advisor. Permission was granted by Dr. Muma to use previous survey suggestions from Angela Armour and Robin Williamson, in their 2008 project entitled Factors Influencing Rural Physician Assistant Practice. This project was funded in part by the Workforce Diversity Initiative Grant, funded by US/DHHS, grant number D57HP05123, 2005-2008, Richard Muma, PI.

References
Comparison of dissociation tendencies of \textit{meta-} \& \textit{para-}
trifluorotolylglycine methyl esters and \textit{meta-} \& \textit{para-}
tolylglycine methyl esters in ESI-MS

Dale Kerstetter\textsuperscript{a}, Anthony Vu\textsuperscript{a}, Adam Graichen\textsuperscript{b}, Richard Vachet\textsuperscript{b}, Idia Tokunbo\textsuperscript{a}, and Mike Van Stipdonk\textsuperscript{a}

\textsuperscript{a}Department of Chemistry College of Liberal Arts \& Sciences Wichita State University,
\textsuperscript{b}Department of Chemistry University of Massachusetts

Abstract. Peptide fragmentation is an integral part of an evolving field commonly referred to as proteomics. Understanding of peptide fragmentation is vital to continued proteomic research. The framework of this study was the benzylglycine methyl ester with either a methyl or trifluoromethyl constituent in the \textit{para-} and \textit{meta-} positions of the benzyl ring. The glycine methyl ester was coupled to the different acids using a PS-carbodiimide resin. The acids used were p-trifluorotoluic acid, m-trifluorotoluic acid, p-toluic acid, and m-toluic acid. Synthesis was confirmed using electrospray ionization mass spectrometry (ESI-MS). Collision induced dissociation (CID) was utilized to observe the dissociation tendencies of the given molecules. The anticipated b\textsubscript{2} \textsuperscript{+} pathway as seen in previous studies was not as readily seen for some of the molecules in this study. Density functional theory calculations were employed for the reaction pathways to determine the thermodynamic characteristics on the pathways to help explain the observed fragmentation pathways.

1. Introduction.

Understanding fundamental peptide fragmentation chemistry is essential to the effective application of tandem mass spectrometry to peptide/protein identification \cite{1,2}. As part of our ongoing effort to study and understand the factors that affect fragmentation, we investigated the collision induced dissociation of variants of hippuric acid methyl ester (benzoic acid-glycine methyl ester). Our specific goal was to determine whether the presence, identity and position of electron donating or withdrawing substituents influence the tendency for the peptides to fragment via two competing pathways by altering the strength of a specific nucleophile important to the “oxazolone” dissociation pathway to b\textsubscript{2} \textsuperscript{+} ions.

2. Experiment, Results, Discussion, and Significance

Variants of hippuric acid methyl ester were synthesized by coupling benzoic acid, \textit{meta-} or \textit{para-} toluic acid; or \textit{meta-} or \textit{para-} trifluorotoluic acid to glycine methyl ester using a commercially available resin-bound carbodiimide. ESI, CID and tandem MS was performed using a Finnigan LCQ\textsuperscript{Deca} ion trap mass spectrometer (ITMS). Double resonance experiments to probe the potential serial dissociation pathways were performed on a modified Bruker Esquire ITMS. DFT calculations at the B3LYP/6-31+G(d,p) were used to determine lowest-energy conformations of all relevant precursor, intermediate and post-reaction species, along with important transition states.

The principal products generated by CID of hippuric acid methyl ester are a formal b\textsubscript{2} \textsuperscript{+} ion, via elimination of methanol, and phenyl acyllium ion. The relative intensities of the two products are dependent on the presence and position of a ring substituent. For example, the phenyl acyllium ion dominates (9:1 ratio) the spectrum recorded from m-toluic acid-glycine methyl ester, while the product and b\textsubscript{2} \textsuperscript{+} ion appear at similar relative intensities for p-toluic acid-glycine methyl ester.

Double resonance experimentation allows us to evaluate potential competing pathways. In double resonance experiments, excitation of a parent ion and a potential product ion, is performed simultaneously \cite{3}. Ejection of a particular product ion allows for determination of “parentage” of other products, particularly those that might be formed by a cascade of sequential fragmentation reactions. Double resonance experiments clearly show that the acyllium ions are generated directly from the protonated molecule rather than from the fragmentation of energetic b\textsubscript{2} \textsuperscript{+} ion. The acyllium ion is absent in spectra recorded for the trifluorotoluic versions of the hippuric acid-methyl ester, clearly establishing a dependence of electron donating and withdrawing groups. The experimental
(CID) results are supported by DFT calculations, which show clear differences in the transition state energies for the two fragmentation pathways, and for the relative product energies.

Thermodynamic comparison of preliminary data is inconclusive in that the rate determining step for the formation of $b_2^+$ ion shows a difference of 2 kcal/mol between the methyl and trifluoromethyl substituents. In regards to the acyllium ion the energy difference is about 1 kcal/mol between the two substituents. Single point calculations were conducted at the b3lyp/6-311++G(3d,2p) level of theory exhibiting similar energy trends as the lower level of theory.

3. Conclusions

The effect of different benzene ring substituents is apparent in the fragmentation pathways of the model peptides. The electron donating methyl group in the para and meta positions favors the acyllium ion from the parent ion. Whereas the electron withdrawing group of the trifluoromethyl group in the same meta and para positions favors the $b_2^+$ ion from the parent ion.

4. Acknowledgements

Work by MVS, DK, and IT is supported by a grant from the National Science Foundation (CAREER-0239800). Purchase of the quadrupole ion-trap mass spectrometer was made possible by a grant from the Kansas NSF-EPSCoR program and matching funds from Wichita State University. DFT calculations were performed at Wichita State University using resources of the High-performance Computing Center (HIPECC), a facility supported by the NSF under Grants EIA-0216178 and EPS-0236913 and matching support from the State of Kansas and HIPECC. The double resonance experiment was conducted by Adam Graichen and Richard Vachet at the University of Massachusetts-Amherst.

Progressive Crushing Energy Absorption Capabilities of Glass Fiber-Reinforced Corrugated Panel

Kian Yip, Tan*, Sana Fazal, Elyas, K.S. Raju

Department of Aerospace Engineering, College of Engineering

Abstract. This experimental study addresses the progressive crushing of Newport NB321/7781 E-glass fiber-reinforced corrugated panel. The progressive crushing behavior is being studied at quasi-static rates and at selected dynamic loading rates. The number of ply and the laminate gross thickness affects the energy absorbing capability by 58% at various loading rates. The stacking sequence, [0], and [0], are 40% and 30% greater than [±45], and [±45], respectively.

1. Introduction

Fiber-reinforced composites are widely used in aircraft structure, automobiles as well as structurally demanding fields. The study of composite structures on aircraft crashworthiness is not only crucial on improving the overall aircraft construction but also enhance the occupant safety. However, application of fiber-reinforced composite on aircraft crashworthiness is less well understood due to the complexity in prediction of energy absorption. Theoretically, in order to avoid occupant injury during certain crash scenarios, kinetic energy has to be dissipated in order to alleviate deceleration loads on the occupants.

2. Experimental Set-up

Prepreg material used is Newport NB321/7781 E-glass. The corrugated panel is fabricated by first laying up sheet of Fiberglass prepreg on a set of aluminum matching molds. After the desired number of ply is reached, the matching mold is closed for applying uniform pressure to the panel. Parting film and breather are laid up subsequently and wrapped up cautiously with vacuum bag. The assembly is then vacuumed and cured in an oven with temperature of 270°F for three hours. After curing, a 14-in x 8-in corrugated panel is machined down to the specimen with length of 4.7-in, height of 2-in and thickness of 0.045-in, 0.075-in, 0.115-in for 4, 8, and 12 plies laminate, respectively. One end of the edges along the cross-section is chamfered for initiating the failure and reducing the peak loads.

Two circular platens were positioned parallel to each other on a 55-kip capacity hydraulic loading machine. The specimen is firmly supported by a corrugated fixture to avoid buckling in the transverse direction. The crushing tests were conducted at three distinct loading speeds which is 10^-3-in/s, 10^-1-in/s and 1-in/s for [0], and [±45], specimens, respectively and stopped when the displacement of 1-in is reached. The data acquisition rate is defined as 2-Hz, 204.8-Hz and 2048-Hz for the three loading rates. All the test data is collected and reduced for comparison purposes.

3. Results and Discussion

Typically, delamination was first noted on the edges after the test was started. Splaying and lamina buckling occurred consecutively. Energy was absorbed when the crack was propagated and followed by fragmentation. Moreover, transverse shear acted on the edges causing the splaying and the growth of interlaminar cracks more rapidly and eventually fracture.

Fig.1 A [±45]_12 corrugated specimen fractured after crushing.
In general, the initial peak increases when the loading rate is increased as seen in Fig. 2.

![Fig.2 Load-displacement response of [±45]12 E-glass prepreg at various loading rate.](image)

The test result shows that [0]8 and [0]12 has higher initial peak load compared to [±45]8 and [±45]12. The similar pattern is observed on [0]8 and [±45]12 at various loading rate. Also, the sustained crushing load for [0]8 and [0]12 is 8488-lb and 14,732-lb which is 29% and 27% greater than [±45]8 and [±45]12, respectively. The crush load efficiency is defined as the ratio of sustained crushing load over initial peak load.

![Fig. 3 Crush load efficiency of different ply stacking sequence at various loading rates.](image)

4. Conclusions

Overall, [0]n has approximately 15% greater initial peak load than the [±45]n for ply 4, 8, 12, respectively. Stacking sequence and number of ply plays a significant role in energy absorbing capability with the difference up to 30% and 40% for [0]12, [±45]12 and [0]8, [±45]8 accordingly.

References


Empowering the Disenfranchised: Creating College Access for Foster Care Youth

Chris Kirk, Rhonda Lewis-Moss, Corinne Nilsen, Deltha Colvin

Department of Psychology, College of Liberal Arts and Sciences

Abstract. College attendance has been demonstrated to be a factor in lifetime income level, quality of life, better health, and decreased strain on government financial support systems. Yet, the privilege of attending college continues to be disproportionately distributed to certain demographic groups. Among these are youth adults emerging from the foster care system. While 70% of foster care children indicate a desire to attend college, less than 10% actually do so. Kansas Kids @ GEAR UP is a program which targets foster care children in an effort to help them prepare for post-secondary education. Student participants from the Kansas Kids @ GEAR UP program were surveyed to determine their educational aspirations and expectations.

1. Introduction

Despite great gains in reducing disparity in access to post-secondary education over the past thirty years, a great deal of disparity still exists. Black and Hispanic students continue to attend college at disproportionate rates [1] as do students from rural areas [2]. Perhaps most alarming is the plight of youth from the foster care system. Each year 25,000 foster care children “age out” of their child welfare programs and enter society at large. This group faces a tremendous risk of unemployment, homelessness, and mental health issues. While post-secondary education is the surest path out of poverty for these emerging adults, as few as 10% actually enroll in college [3].

Educational Aspirations have been proven to be significant predictors of postsecondary degree attainment [4]. Many factors have been studied as predictors of educational aspirations. Among these, socio-economic status (SES), academic achievement, and parental influence have been most influential. When adjusting for these factors, differences between racial/ethnic groups do not exist. However, despite high educational aspirations, foster care youth fail to go to college, with as little as 4% obtaining a college degree [4]. Educational Expectations are a more realistic measure which forms a key link between educational aspirations and postsecondary degree attainment [5].

This project uses data from the Kansas Kids @ GEAR Up Program (KKGU). KKGU is US Department of Education program which helps increase educational aspirations and college preparedness in foster care and low-income students from across the state of Kansas. KKGU has served over 4,500 Kansas Kids since 2003.

2. Experiment, Results, Discussion, and Significance

Participants in this study were 1,376 adolescents from the KKGU program of which 65% were in the foster care (N = 894) at the time of their involvement. All participants were from low-income households. The participants came from rural and urban contexts across the state of Kansas. Several racial/ethnic identities were represented with good representations of Caucasian (N = 645), Black (N = 350), and Hispanic/Latino students (N = 171).

Upon entering the KKGU program, participants were administered a survey on the computer. This baseline data consisted of thirty-one items which assessed levels of aspiration and awareness of post-secondary education. For the purposes of this study, three measures each were used to assess the participants’ level of educational aspirations and educational expectations. Perceived academic achievement was assessed with a single item, and level of parental support with two items. Finally, demographic data was collected from survey and population data from the US Census.

The purpose of this study was to assess how educational aspirations and expectations differ among the following groups: foster care/non-foster care, racial/ethnic groups, and rural/urban youth. Table 1 displays the mean educational aspirations and expectations for these groups. There were significant differences between foster care and non-foster care youth on educational aspirations ($t(1166) = 6.16$, $p < .01$) and expectations ($t(1077) = 6.61$, $p < .003$). No significant differences existed between Caucasian youth and African American or Hispanic/Latino youth with the exception of...
educational expectations between Caucasian and African American participants ($t(725.71)=3.19, p < .003$). Further, there were significant differences for participants from rural regions and urban regions on both aspirations for ($t(815.52) = -5.49, p < .003$) and expectations ($t(913.46) = -8.49, p < .003$) of educational attainment.

Table 1
Mean Scores for Demographic Groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>Educational Aspirations</th>
<th>Educational Expectations</th>
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<td>Foster Care Status</td>
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<tr>
<td>Foster Care</td>
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<tr>
<td>Non-Foster</td>
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<tr>
<td>African American</td>
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<tr>
<td>Caucasian</td>
<td>645</td>
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</tr>
<tr>
<td>Hispanic/Latino</td>
<td>171</td>
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<tr>
<td>Urbanicity</td>
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</tr>
<tr>
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<tr>
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<td>448</td>
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<tr>
<td>High</td>
<td>470</td>
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</tbody>
</table>

As expected, educational aspirations and expectations were strongly correlated ($r = .56$), and educational expectations were lower for all groups with a greater discrepancy for foster care and rural youth. To further explore these discrepancies, perceived academic achievement and level of parental support were compared between groups. Foster care youth had lower levels of perceived academic ability ($t(996.98) = 5.70, p < .003$), as did students from rural areas ($t(923) = - 5.563, p < .003$). African American students reported higher levels of academic ability overall ($t(748.71) = 4.11, p < .003$). Figure 1 displays these results.

Another key factor from the literature is the level of parental support. As could be expected, foster care kids reported lower degrees for parental support ($t(1374) = 7.40, p < .003$). Rural youth also had lower levels of perceived parental support ($t(926) = -5.02, p < .003$), while African American youth reported higher degrees of parental support than the Caucasian students ($t(993)=4.42, p < .003$).

![Figure 1. Perceived Academic Achievement](image)

3. Conclusions

The results of this study suggest that foster care and rural youth lag behind other students of comparable socio-economic status in educational aspirations, educational expectations, and perception of academic ability. While a great deal of effort has been put into increasing college enrollment for minority groups, it seems clear that more programs should follow the lead of Kansas Kids @ GEAR UP and target children within the foster care system and those from rural areas.

4. Acknowledgements

Special thanks to Deltha Colvin, Corinne Nilsen, Vic Chavez, and all the Kansas Kids @ GEAR UP Staff and Volunteers for their great work and assistance with this research.

Paleoenvironmental interpretation of the Bandera Shale Formation, Marmaton Group, Desmoinesian Stage, Middle Pennsylvanian in southeastern Kansas

Zach Koch*, C.D. Burke

Department of Geology, College of Liberal Arts and Sciences

Abstract. In southeastern Kansas and northeastern Oklahoma the Bandera Shale Formation (BSF) (Middle Pennsylvanian) crops out from Linn to Labette Counties in Kansas and in Nowata County, Oklahoma in units ranging from 12 cm to 20 m thick. The BSF consist of shale, sandstone, and coal, is stratigraphically located between the underlying Pawnee Limestone and overlying Altamont Limestone Formations of the Marmaton Group. Preliminary results from 6 stratigraphically measured exposures, lithologic and petrographic analyses, sedimentary structures and fossil evidence indicate that variability in the BSF can be related to marginal marine depositional environments. Previous studies from rock exposures have interpreted the BFS to be non-marine in origin [1, 2, & 3]. Recently a subsurface log analysis has interpreted the BSF as mainly marine [4]. This study serves to clarify the discrepancy between log and rock exposure interpretations.

Introduction

Paleogeographic reconstruction of the Mid-Continent during deposition of the BSF and BSQM indicate that the Cherokee Platform was surrounded by topographic highs in all but the south side as depicted in (fig. 1). These features were formed in response to the collision of the South American Plate with the North American Plate during the formation of Pangaea. The Cherokee Platform formed as the Chautauqua Arch subsided due to rejuvenation of the Ouachita and Ancestral Rockies associated feature the Nemaha Uplift and uplift of the Ozark Dome. The Nemaha Uplift and the Ozark Dome are considered to be possible sources for BSF sediment. The BSF stratigraphically thins northward on to the Bourbon Arch and stratigraphically pinches out southward on the shelf edge of the Arkoma Basin. The BSF is present throughout Kansas; however the Bandera Sandstone Quarry Member (BSQM) is limited to the Cherokee Platform. The BSF based on rock exposures has been previously interpreted as mainly non-marine in origin consisting of shale, sandstone, and basal coal according to [1, 2, 3]. Conversely, the BSF was attributed to mainly marine deposition based on subsurface geophysical logs and limited field observations [4]. This study re-interprets the environments of deposition of the BSF, its relation to sea-level fluctuations, and paleotectonic history.

Methods, Results, Discussion, and Significance

Exposed sections the BSF were measured using standard stratigraphic techniques at 6 locations in the study area (fig. 1). Stratigraphic columns were constructed for each measured section to prepare isopach, stratigraphic, and structural maps of the study area. Lithologic and petrographic analyses were performed on selected samples collected. Thin sections were prepared from selected saw-slabbed hand samples. Photographs, measurements, and sketches of the sedimentary structures and fossil identification at the exposures were documented and analyzed.

Preliminary results based on 6 stratigraphically measured exposures, lithological, petrographical analysis, paleontological evidence, and sedimentary structures exhibited the BSF on the Cherokee Platform were deposited in predominantly marine conditions. The basal MCM and underclays were deposited in a non-marine environment. The majority of the BSF contain calcareous siltstones and mudstones which were deposited under low energy marine conditions. The BSQM contains a lowermost rhymically laminated, ripple marked, sandstone with abundant trace fossils on the bedding planes resembling tidal deposits. The uppermost BSQM sandstone contains abundant loading features, cross-bedding, and organic material, indicating rapid and heavy sedimentation associated with deltaic depositional settings. At the top of the BSF a clay unit is present indicating sediment source for the sand was interrupted or transported to other adjacent basins near the end of BSF deposition on the Cherokee Platform.

Sea-level fluctuations observed in the Mid-Continent region throughout Pennsylvanian times are the result of glacial and tectonic events. The BSF (fig. 2) displays a record of a sea-level low stand at the base of the unit represented by coal in the MCM. As sea-level rose siliciclastics were transported and deposited into the Cherokee
Platform. Subsequent reworking from a marine inundation cleaned and sorted sands and re-deposited clays further off shore. Tidal and deltaic features are observed in the BSQM indicating a marginal marine depositional environment. Clay units represent final BSF deposition and are considered to be deposited during maximum sea-level high stand.

The BSF has economic significance. Both the BSQM has been quarried in Bourbon County for flagstone and the MCM has been extensively strip mined for coal in southeastern Kansas and southwestern Missouri. This study serves to re-interpret the paleoenvironment of the BSF, and give insight to sea-level change and paleotectonic history on the Cherokee Platform.

Conclusions
The BSF based on lithologic, petrographic, paleontologic evidence, and sedimentary features from 6 stratigraphically measured exposures in southeastern Kansas and northeastern Oklahoma exhibits terrestrial depositional environment in the lower MCM and a marginal marine depositional environment in the BSQM. The top of the BSF represents the maximum sea level high stand with the appearance of clay as the final unit of siliciclastics and the end of BSF and the deposition of carbonates in the overlying Altamont Limestone Formation.

Acknowledgements
I would like to thank Wichita State University, Department of Geology for use of equipment and supplies.

References
Abstract. The structural components of many machines remain in service far beyond their designed lifetimes. This is especially true in the field of aerospace structures, where aircraft, wind turbines, satellites, and other components are expected to be in service for decades. Therefore, a good maintenance system is desired, allowing these structures further service use, while maintaining efficiency and reliability from failures. The focus of this research paper is on developing an improved maintenance system, called structural health monitoring, using acoustic emission sensors and artificial neural networks to detect and analyze any damage well before any component failure occurs. To replicate a damaged component for this study, an experiment was performed, involving thin, flat panels of aluminum with a designed, initial crack. These panels were subjected to static loads that were increased until crack propagation occurred. Acoustic emission sensors, which detect energy released by growing cracks in the form of strain waves, were used to detect this propagation and transform the characteristics of the propagation into electrical signals. These complex signals were then analyzed through an artificial neural network system, which allowed for fast post-processing. A structural health monitoring system was found to be plausible, using real-time analysis of the aluminum panel, detecting and reporting any growing crack from a size larger than 0.05 inches, well before any failure occurred. This study proved that acoustic emission could make structural health monitoring a reality.

1. Introduction

This paper summarizes the results of an investigation of the abilities of a passive ultrasonic scanning system, called an acoustic emission (AE) system to detect structure damage. This system is under development, so the objective of the research was to determine a quick, accurate, and precise method of optimizing the analysis capabilities of an acoustic emission system to form a structural health monitoring system. Using the AE system, an artificial neural network analysis (ANN) was implemented to mimic the human nervous system for quick and efficient analysis of structural components in real-time.

As a crack propagates in a material, molecular bonds are broken, releasing small amounts of energy. The energy released spreads throughout the surrounding material in the form of strain waves, or minute deformations in the material with wave frequencies in the ultrasonic range. Acoustic emission has been observed since the dawn of man, listening to structures crack and break. [1] Not until recently though has the technology been capable of detecting minute sounds. Sensors constructed of piezoelectric ceramic materials, which are unique in that a voltage is produced by the deformation of the material, are sensitive enough to detect these minute sounds that produce. The voltage produced by the sensors is recorded into a computer database for further analysis. The AE system uses piezoelectric sensors to passively “listening to” a structural component, recording the voltage generated by the deformation of the sensor as a function of time. The recorded waves are decomposed into characteristics of the strain waves, such as amplitude and duration, using appropriate software. These are analyzed to determine if cracks are present and growing, and whether the component needs to be replaced.[2]

An ANN is an analysis system, imitating the process of the brain of animals and humans, analyzing a set of inputs to obtain a desired output set. This process allows for quick, but approximate, analysis to complex problems. An ANN is capable of pattern recognition and analysis to approximate varying data sets in order to account for influence of unknown variables to reach a desired output. The ANN system seemed appropriate for analyzing strain waves, due to the complexities of the waves after traveling through a material, and the presence of white noise and other unaccounted variables.[3] Previous research had shown that there was potential in connecting ANN analysis to this form of nondestructive testing [4], allowing promise for an integrated system of AE and ANN’s for a structural health monitoring of aerospace systems. The focus of this paper is on the initial stages of the analysis for a health monitoring system.

2. Experiment

A thin, flat aluminum panel (Al 2024-T3 with thickness 0.032”) was used for experimentation. The panel was subjected to a uniaxial tensile load to initiate crack propagation. An initial edge crack was cut into the panel in the testing region and then the panel was
statically loaded on an MTS Sintech 5/G machine through a pin and clevis setup (Fig. 3). The loading was gradually increased until crack growth occurred. Two AE sensors continuously monitored for any crack growth during the loading process, allowing for measurements of crack propagation. The AE signals were used for an ANN at the conclusion of loading.

The Physical Acoustics Corporation (PAC) software [5] was used to record the strain waves of the specimen. A typical output for the experiment is shown in Fig. 4. The results shown in this figure indicate that crack extension occurred at approximately 465 sec into the loading, when more waves were detected.

For the ANN, a sliding time window of eight seconds was implemented. A histogram of the energy values contained within the time window was created (see Fig. 5) and sorted into groups of crack growth (‘yes’) or noise (‘no’). These were then used as input to an ANN with a self-organizing map architecture to determine groups. Each histogram then formed a data input set of eight points.

Fig. 6. Resulting maps from ANN

The results presented in Fig. 6 indicate that the combination of AE sensors and ANN can analyze the incoming detections of strain waves and distinguish crack extension from ambient noise.

Conclusion

The focus of this paper was the examination of the ability of an ANN to identify crack growth in flat aluminum panels, using signals from an AE system. Using a sliding time window of the AE sensor output with an ANN, the system could identify the instant that the crack extended. The self-organizing map architecture of the ANN proved capable of identifying the two categories. This ANN system could be used with a network of AE sensors monitoring a structural component of an aerospace system. Future study is required to isolate problem areas and determine the severity of the crack growth. The size of time window could be reduced, allowing for detection of crack growth to be faster, approaching real time.

Rendering Toxic Metal Oxides Inert

Joe Leonard*

Department of Studio Ceramics, College of Art and Design

Abstract: Ceramic glazes are composed of three primary components: a flux, an alumina- bonding agent, and a glass former. These three materials can be adjusted for firing ranges as low as 1213 degrees Fahrenheit, up to 2419 degrees Fahrenheit. However, some of the oxides used are toxic, and can leak through the glaze matrix rendering them unsuitable for functional ware. One oxide is Copper Oxide, applicable in different forms: Carbonate-CuCO3, Cupric Oxide- CuO, and Sulfate-CuSO4 5H2O. All three are toxic, and have been found in previous studies to leach to the surface of a glaze that contains more than 5% Copper Oxide by weight. When acidic liquids such as citric juices, vinegar, or wine come into contact with these surfaces, mild poisons are created. While these materials can create a beautiful array of colors, food safe glaze surfaces are very important to a contemporary ceramicist working in the vein of functional dinnerware. Approaching the composition of the glazes in a line blend series-where each material is incrementally adjusted in percentages of 5%- information has been obtained about the necessity of the proportions of each material present in the published glazes, arriving closer to an inert surface suitable for ceramic ware production.

1. Introduction: In my work as a studio artist, I focus mostly on the production of utilitarian pottery. In nearly eight years in the field of ceramics I have investigated the various methods of production as a student, a lab technician, and now as a teacher’s assistant. I have worked in five different ceramic studios and in each there are toxic materials used in the glazing process. The majority of the glazes I have come across at Community Colleges, and Universities are pre-developed glaze compositions that are used by others, years after initial development due to there predictable nature. Yet some recipes have been adjusted for a slight variation, sometimes leading to a dangerous mixture. Copper is a very pervasive glaze material due to its variable color development, but caution is not always applied. I have personally used “shop” glazes that were mixed for me, and have also mixed glaze batches for myself, only to discover after use their toxic nature. It would be negligent for me, or any other studio technician to allow students and others use of these non-food safe glazes.

2. Experiment, Results, Discussion, and Significance: As the vehicle for the test glazes I have used a slight iron bearing clay body for the test tiles, and fired them in a gas fueled kiln to 2430 degrees Fahrenheit. The presence of the iron in the body supplies an additional flux for the glaze during the firing. In what is termed a “reduction” firing, the atmosphere in the kiln is robbed of oxygen by restricting the air allowed into the firing chamber, or by introducing a surplus of fuel, both inhibiting complete combustion. This process pulls oxygen atoms from the clay body through the glaze, which helps fuse the materials while also creating variations in the development of color. In the initial tests this procedure made no discernible difference in the amount of Copper leached through the glaze surface. I then conducted a series of line blends where the fluxes-feldspar and feldspathic material nepheline syenite-and the subtraction and addition of auxiliary fluxes-whiting, bone ash, strontium carbonate, and talc- the glass former-silica- and the alumino silicates-kaolin- were all adjusted in an incrementally inverse manner in segments of 5%. In each of the glazes, at the maximum adjustment in proportions unusable results occurred. When the fluxes were at their minimal setting, and the silicates and alumina silicates were at their apex, the glazes took on a rough, immature surface which is not conducive to utilitarian ware. Oppositely, when the fluxes were maximized, and the silicates and alumino silicates were lesser, the composition became too fluxed, and without an adequate bonding agent from, the alumino silicates, or the presence of enough glass in the form of silica, the matrix fused and ran down the test tiles, in viscous puddles. Apparent success was found in the median investigations, where in the recipe for the “Turquoise”, with the feldspar content at 23.5%, the auxiliary flux Tale at 9%, Silica measure at 40.10, with Kaolin, Bone Ash, Strontium Carbonate and Whiting at their original percentages. This batch yielded an almost identical color and surface to the original, but seemed to inhibit rudimentary leaching tests. The leaching test was conducted in periods of 12, to 24 hours with acidic or basic foods such as vinegar, wine, pickled olives, and orange juice. Though originally this glaze showed halos from contact with the acidic food, or a metallic sheen on top of the liquids; at the medial batch listed above no discernible discoloration or metallic sheen could be observed. I am currently contacting the Geology and Chemistry departments in the effort of having a spectral analysis of the microscopic cross section for each glaze batch reviewed. A tight crystalline structure will depict a glaze matrix
quite resistant to leaching, thus having a glaze that can confidently be used in the production of utilitarian pottery for use in a domestic setting.

Initial Glaze Recipes: 1

<table>
<thead>
<tr>
<th>Glaze name</th>
<th>Copper Red/Green</th>
<th>Turquoise</th>
<th>Willie helix #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custer Feldspar</td>
<td>50%</td>
<td>28.50%</td>
<td></td>
</tr>
<tr>
<td>Nepheline Syenite</td>
<td></td>
<td></td>
<td>40%</td>
</tr>
<tr>
<td>Whiting</td>
<td>15%</td>
<td>17.90%</td>
<td>19%</td>
</tr>
<tr>
<td>Silica</td>
<td>20%</td>
<td>35.10%</td>
<td>30%</td>
</tr>
<tr>
<td>Kaolin</td>
<td>13%</td>
<td>3.20%</td>
<td>11%</td>
</tr>
<tr>
<td>Bone ash</td>
<td>2%</td>
<td>1.90%</td>
<td></td>
</tr>
<tr>
<td>Strontium Carbonate</td>
<td></td>
<td></td>
<td>9.40%</td>
</tr>
<tr>
<td>Tale</td>
<td></td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Colorants:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper Carbonate</td>
<td>8%</td>
<td>6.70%</td>
<td>1.20%</td>
</tr>
<tr>
<td>Copper Oxide</td>
<td></td>
<td></td>
<td>5.00%</td>
</tr>
<tr>
<td>Red Iron Oxide</td>
<td></td>
<td></td>
<td>1%</td>
</tr>
</tbody>
</table>

**Conclusion:** Further fine tuning in smaller amounts will be executed, but current findings are promising. This research will be beneficial to not only the six dozen students currently in the ceramic program at WSU, but any Ceramics department throughout the state and country. In the pursuit of surface and color, the availability of food safe glazes is not compromised.

**Acknowledgments:** Special thanks should be given to Ted Adler- Professor of Ceramics at Wichita State University.


Peer Review of Teachers: Are They Useful?

Masako Maeda*, Phillip R. Sechtem*, Rosalind Scudder

Department of Communication Sciences and Disorders, College of Health Professions

Abstract. Peer reviews of teachers are formal evaluations of faculty members performed by colleagues and peers in their college or university for promotion, tenure, and salary adjustment purposes. They are also used for development and improvement of teaching methods, techniques, and styles. However, little is known about their authenticity, practicality, and usefulness. This study aimed to learn more about methods and uses of information from peer reviews of teaching in Communication Sciences and Disorders programs. A national survey of 115 participants from 85 programs demonstrated that peer reviews were used in many programs with mostly positive results with varied use, format, and conduct of the reviews. Peer review results were meaningful to almost 80% of the respondents.

1. Introduction

The impetus for this study began with a discussion of peer reviews of teaching in the Communication Sciences and Disorders (CSD) doctoral seminar on University Teaching at Wichita State University. The discussion led to interest in peer teaching reviews related to their authenticity, practicality, and usefulness, specifically in CSD programs. Peer reviews of teachers are frequently used in higher education for summative and formative purposes; however, little is known about the authenticity, practicality, and usefulness of peer reviews of teaching (Chism, 1999).

Peer reviews in the literature, as well as in our study, have been defined as “formal evaluations of the efforts of a faculty member which are performed by the colleagues in his or her scholarly field, unit, school, or college” (Cavanagh, 1996, p. 236). Peer reviews have reportedly consisted of direct or indirect observations performed internally or externally by fellow teachers, administrators, or by teaching resource personnel (Morehead & Shedd, 1997). Summative reviews are conducted for assessment of teaching efforts, to compare or rank teachers within departments, and for personnel decisions such as appointments, promotions, tenure, or salary determinations. Formative reviews are conducted in an effort to develop and improve teaching methods, techniques, and styles (Smith & Tillema, 2007).

In general, peer reviews have drawn mixed reactions from university instructors for various reasons. They include issues focused on ever increasing accountability standards, increasing demands by administrators to perform, and the decreased amount of input regarding policies that affect teachers’ jobs and academic freedom. Manifestations of these include “suspicion, mistrust, and resistance” (Shortland, 2004, p. 220). Ultimately, this creates fear and conflicts in the review process (Conley & Glasman, 2008).

Little is known about the effectiveness or authenticity of peer reviews of teaching due to lack of evidence. Therefore, the purpose of this study was to learn more about methods and uses of information gained from peer reviews of teaching in CSD programs, which could assist faculty and administrators in determining if, when, and how to use peers as reviewers of faculty teaching. In addition, we hoped to learn more about the reliability and usefulness of the information gained from peer reviews.

2. Experiment, Results, Discussion, and Significance

An on-line survey of methods, findings, and uses of peer reviews of teaching in CSD was developed consisting of two sections. Section one was designed to collect straightforward demographic information. Section two was designed to collect information from faculty members regarding personal experiences of peer reviews and how the information was used at their institutions. Items included questions such as, “Do you think peer reviews regarding your teaching are authentic representations of your teaching skills, methods, and abilities?” and “Do you take peer reviews to heart and change or modify the way you teach based on the findings?” Once the survey was developed, it was sent online to individual faculty in approximately 200 CSD academic programs across the US. Target programs were identified from the American Speech-Language-Hearing Association’s (ASHA) Council of Academic Programs (CAA) in CSD. From the 200 programs, 115 individuals (M=26, F=89) from 85 CSD programs participated. Data were transferred into Excel and coded and analyzed accordingly.
Demographic results showed that respondents included faculty members (58%), Chair or Program Directors (38%), Clinic supervisors (2%) and others (2%). Seventy-one percent of the respondents had more than 10 years teaching experience, and 93% of the respondents were of White/Non Hispanic ethnicity. Responses to questions about the mechanics of conducting peer reviews included who completed the reviews, the primary methods used to conduct the reviews and the format used.

Questions about the use of the reviews, attitudes toward them, and usefulness of peer reviews were answered not only by selecting appropriate choices on the survey but also by the respondents providing many comments. Peer reviews were completed by others in the same department as the reviewee (15%), by persons from outside the department (18%), administrators (48%) or teaching center professionals (7%), and by peers chosen by the reviewee (31%).

The primary methods of peer review were conducted by direct observation in the classroom, syllabus reviews, and teaching portfolios, although 9% reported the use of review through video samples. Narrative formats for the reviews were the most frequently used, but some respondents reported using Likert scales or a combination of scales and narratives. We learned that peer reviews are used for a variety of purposes including merit pay determination, tenure and promotion decisions, and year-end reports. Interestingly, 67% of the respondents reported that they used the peer review of their teaching for their own personal use – to modify and improve their teaching.

Attitudes about peer reviews were assessed by respondents’ answers to the following questions:

1. Are the results of peer reviews meaningful to you?
2. Do you think you change your teaching style when you are directly observed for a peer review?
3. Do you take peer reviews to heart and change or modify the way you teach based on the findings?
4. Do you think peer reviews regarding your teaching are conducted authentically and genuinely reflect aspects of your teaching skills, methods, and abilities?
5. Have you ever changed or modified methods and strategies of teaching in your classes based on observation, findings, or suggestions when you conducted a peer review on a fellow teacher?

3. Conclusions

Nearly 80% of the respondents noted that the results of peer reviews were meaningful to them. The response rate to the survey (36%), and the individual responses and comments demonstrated an interest in the topic. Peer reviews are being used in many CSD programs with mostly positive results; and the use, format, methods, and conduct of peer reviews vary greatly among programs.

4. Acknowledgements

This project was supported in part by a Doctoral Fellowship from the U.S. Department of Education, Office of Special Education Programs, OSEP, Washington, D.C., and support and release time provided by Fort Hays State University. Thank you also to the faculty and administrators who participated in the study.

Blind Carrier Frequency Offset Estimator for Discrete Multi Tone System

*Qasaymeh M. M, Gami Hiren, Heba Shatnawi, Ravi Pendse, M.E. Sawan
Department of Electrical Engineering and Computer Science, College of Engineering
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Abstract—In this paper, a new blind Carrier Frequency Offset (CFO) estimation algorithm for Discrete Multi Tone (DMT) system is obtained by introducing the Propagator Method (PM) in conjunction with the well-known MUSIC based high resolution searching algorithm. Furthermore, the PM does not require the eigen value decomposition (EVD) or singular value decomposition (SVD) of the covariance matrix of the received signals; computer simulations are also included to demonstrate the effectiveness of the proposed method in comparison with other conventional methods.

I. INTRODUCTION
The principles of the Discrete Multi Tone (DMT), which is known as orthogonal frequency division multiplexing (OFDM) modulation [1] have been in existence for several decades. Also, it is expected to be used in multiple standards for wireless broadband multimedia communications. Even though the OFDM system is showing excellent performance against multipath fading, it is very sensitive to the carrier offset. Such offset estimation error leads to severe distortion in subcarrier orthogonality and causes inter channel interference (ICI) [2]. Hence Carrier Frequency Offset (CFO) must be estimated and compensated at the receiver to improve system performance. Consequently, there has been considerable work done in the area of CFO estimation. Several approaches have been proposed to estimate the CFO either by using periodic pilot tones [3] or blindly [4]-[5].

In this paper, we proposed a novel algorithm for estimating the CFO in an OFDM receiver without using reference symbols, pilot carriers or extra cyclic prefix. We employed the Propagator Method (PM) [6]-[7] in conjunction with the well-known multiple signal classification (MUSIC) algorithm [8] for estimating the carrier offset in the received signal. We have used the existing structure of OFDM system to form a propagator to explore the presence of carrier offset. The propagator is a linear operator which only depends on steering vectors and which can be easily extracted from the direct data set.

II. PROBLEM FORMULATION
We consider an OFDM system implemented by inverse discrete Fourier transform (IDFT) and discrete Fourier transform (DFT) each of size N for modulation and demodulation respectively. Only P subcarriers of total N subcarriers are used to avoid aliasing effect at the edge of the transmission spectrum. The N samples of IDFT output are given by \( x(k) := W_P s(k) \), where \( W_P \) consist of the first P columns of the \( N \times N \) IDFT matrix and \( s(k) = [s_0(k), s_1(k), ..., s_{P-1}(k)]^T \) is a QPSK or QAM data symbol to be transmitted through the kth block. An OFDM symbol is denoted as \( \{x_{N-G}, ..., x_{N-1}, x_0, x_1, ..., x_{N-1}\} \) of which the first G samples are guard samples to cancel ISI. The removal of the guard samples at the receiver end makes the received sequence the circular convolution of the transmitted sequence with the channel impulse response \( h(l), l = 0,1, ..., L_c - 1 \), where \( L_c \) is the channel length. Inside the kth block only the guard portion of the signal will be distorted since the channel length \( L_c < G \). The receiver input for the kth block given by

\[
y(k) = EW_p H s(k) e^{j(\text{CFO} + \phi)N + \phi_z} + z(k) \tag{1}
\]

where \( H = \text{diag}(H(0), H(1), ..., H(P - 1)) \), the \( H(l) = \sum_{l=0}^{L_c-1} h(l) \omega^{-il} \), \( E = \text{diag}(1, e^{j\phi}, ..., e^{j(N-1)\phi}) \), and \( \phi \) is the carrier offset. To maintain orthogonality among the sub-channel carriers and to avoid ICI, the matrix E must be estimated and compensated before applying the DFT to (1). The task now is to estimate \( \phi \) assuming that the k received noisy data blocks are the only measurements available.

III. DEVELOPMENT OF PROPOSED METHOD
The K blocks of the noiseless received data are collected in matrix \( Y \) of size \( (N \times K) \)

\[
Y = [y(1), y(2), ..., y(K)] \tag{2}
\]

where the kth block of the received signal in (2) is given by

\[
y(k) = [y_0(k), y_1(k), ..., y_{N-1}(k)]^T \tag{3}
\]

Constructing \((N - M + 1)\) sub-matrices from \( Y \), each of size \( M \times K \) such as \( M \geq P \), the \( i \)th sub matrix is given by

\[
y^i = [y^1(k), y^2(k), ..., y^K(k)]^T \tag{4}
\]

where \( y^i(k) = [y_{i-1}(k), y_i(k), ..., y_{i+M-1}(k)]^T \)

\[
i = 1, 2, ..., N - M, k = 1, 2, ..., K
\]

Collecting \((N - M + 1)\) sub matrices calculated in (3) each of size \( M \times K \) to form matrix \( X \) such that

\[
X = [Y^1, Y^2, ..., Y^{N-M+1}] = [A \Phi^0, A \Phi^1, ..., A \Phi^{N-M}] \cdot S
\]

where \( A := E_M W_M \), \( W_M \) consists of the first M rows of \( W_P \), \( E_M = \text{diag}(1, e^{j\phi}, ..., e^{j(M-1)\phi}) \) and \( \Phi = \text{diag}(e^{j\phi}, e^{j(\omega+\phi)}, ..., e^{j(\omega(P-1)+\phi)}) \) including the information of carrier offset, with \( \omega = 2\pi/N \). Partitioning \( A \) into two sub-matrices \( A_1 \) and \( A_2 \). We defined a propagator matrix \( P \) satisfying \( P^H A_1 = A_2 \).
The dimension of matrix $P^H$ is $(M - P) \times P$. Similarly we can partition the received data matrix $X$ into two sub-matrices $X_1$ and $X_2$. The Propagator matrix $P$ can be estimated by

$$\hat{P} = (X_1X_1^H)^{-1}X_1X_2^H$$  \hspace{1cm} (4)

Matrix $E$ can be defined as

$$E = \begin{bmatrix} P \\ -I \end{bmatrix}$$  \hspace{1cm} (5)

where $I$ is the identity matrix of size. In the noisy channel the basis of $E$ are not orthonormal. Therefore we will use the projection $Q = E(E^HE)^{-1}E^H$, Applying MUSIC [8] like search algorithm to estimate the frequency offset using

$$\hat{\phi}_{MU}(\omega) = \frac{1}{A(\omega) A^H(\omega)}$$  \hspace{1cm} (6)

IV. SIMULATION RESULTS

Extensive computer simulations are done to validate our proposed method. In the first experiment, we considered OFDM system with $N=64$ carriers, of which $P=40$. Transmitted symbols are drawn from a QPSK constellation. The CP length was eleven symbols and frequency offset $\phi$ is assumed to be $0.1\omega$. The experiment was run under AWGN environment with $N_t = 1000$ independent monte-carlo realizations. We considered blocked data of length 10 and the structure parameter $M$ considered 60 for ESPRIT algorithm while it is 41 for the proposed PM based algorithm. The first figure plots the normalized MSE of the CFO as a function of SNR for the proposed algorithm and compares it with [5]. The experiment is evaluated with OFDM frame size is considered to be $N = 64$ while the number of block is assumed to be $K=10$. The structure parameter $M$ is chosen to be 41 for the proposed method and 61 for the ESPRIT algorithm [5]. It is obvious that an achievement of approximately 15 dB SNR with the proposed algorithm over [5] would obtain. The second figure evaluates the performance of both CFO estimators as a function of the number of block acquisition. Under 10 dB constant SNR and following same assumptions in experiment one, we can say our proposed method can achieve the same performance at $K=2$ while ESPRIT algorithm requires almost ten times data block collection.

V. CONCLUSION

A novel propagator based method in conjunction with the MUSIC based search algorithm or root-MUSIC based algorithm for estimating CFO for OFDM systems is projected. For the same experiment set up, almost 15 dB is achieved in SNR for the proposed PM based method over the ESPRIT one. The proposed method is showing equivalent performance in comparison with the well known ESPRIT type estimator at one tenth of the block acquisitions.

REFERENCES

Energy Transfer Followed by Electron Transfer in a Supramolecular Boron Dipyrrin-Zinc Porphyrin-Fullerene

Eranda Maligaspe *, Francis D’Souza

Department of Chemistry, Fairmount College of Liberal Arts and Sciences

Abstract. Photosynthesis, the process of converting light energy into chemical energy, involves two major steps, absorption and transportation of light energy of appropriate wavelength by the antenna light harvesting molecules to the reaction center, and photoinduced electron transfer (PET) to generate charge separated entities by using the electronic excitation energy. Mimicking the “antenna - reaction center” functionality in photosynthesis by using bio-inspired synthetic model compounds is essential to further our understanding the process of bioenergetics which also holds promise for technological advances in solar energy harvesting.

In the present study, supramolecular boron dipyrrin-porphyrin-fullerene constructs, in which covalently linked boron dipyrrin-porphyrin-crown ether compounds were self-assembled with alkylammonium cation functionalized fullerenes, have been designed to achieve sequential energy transfer followed by stepwise electron transfer. The presentation will focus on the synthesis, characterization, and electron donor-acceptor assembly formation. Further, photochemical results revealing charge separation in these novel systems will be presented.

1. Introduction

Developing an artificial light harvesting system with a reaction center mimic to produce a complex capable of absorbing light, transferring the resulting excitation to an energy sink, and using the captured energy to initiate PET is one of the major advancements in mimicking the photosynthetic functions by using synthetic model compounds. Our aim here is to employ a supramolecular approach to develop such a combined antenna reaction center model system (Figure 1) and to study sequential energy- and electron-transfer events.

The sequential energy transfer followed by electron transfer in the photosynthetic reaction centers realizes the efficient conversion of light energy into chemical energy. Here, building novel supramolecular donor-acceptor conjugates are ideal candidates for light harvesting devices (photovoltaic devices) to create a green environment.

2. Experiment, Results, Discussion, and Significance

In Figure 1, boron dipyrrin (BDP) acts as an energy absorbing and transferring antenna, and zinc porphyrin (ZnP) acts as an energy acceptor from the antenna and promotes electron transfer to the fullerene appended ammonium cation (PhC60NH3+) via benzo[18]crown 6.
3. Conclusions

Efficient energy transfer from the singlet excited boron dipyrrin to the zinc porphyrin and electron transfer from crown ether linked ZnP to the ammonium cation appended fullerene were observed in the triad.

4. Acknowledgements

We are thankful to N. Krishnan, M. E. Zandler and N.V. Tkachenko. The authors are thankful to donor of National Science Foundation for a PR fellowship.
Load Rate Effects on Interlaminar Fracture Toughness of Composite Materials

Pratap Nuggehalli Nandakumar*, K.S. Raju

Department of Aerospace Engineering, College of Engineering

Abstract. The energy dissipation due to the failure of composites is of particular interest for crash applications involving dynamic loading. Separation of layers or delamination which can occur in opening (mode-I) is one of the key failure mechanisms that dictates the energy absorption. In this investigation, the effects of load rate on the mode-I fracture behavior of laminated composites were studied using quasi-static experiments. The experiments were conducted on laminated beam type specimens with inserts to simulate delamination. The results showed an increasing trend on the fracture toughness for the corresponding increase in the crack extension rate for the Toray Carbon Unitape and scattered response for Newport Fiberglass.

1. Introduction

In the modern world, the composite materials have been utilized mainly for weight saving purposes and also for its load bearing strength. The laminated composites particularly have a poor impact resistance. They generally develop crack from the outer layer which starts extending to the subsequent layers thereby causing total fracture of the material in use. Here we study the behavior of these materials subjected to the opening mode (mode I). The Double Cantilever Beam (DCB) geometry used during this experiment is illustrated in Fig. 1. The fracture toughness which is the energy required to create new surface area is given by (1),

\[ G_I = \frac{3P\delta}{2a} \text{ [lb-in/in}}^2]\]  (Ref. 1)

where, \( P \) = Applied load [lb], \( \delta \) = Displacement [in], \( a \) = Crack length [in]

in the equation (1), the crack length is estimated using the strain gage readings in conjunction with Euler-Bernoulli beam theory. Assuming, the deformations are small, the following equation may be used for obtaining the crack length

\[ a^3 = \frac{3\delta eh}{2\varepsilon} \text{ [in}^3]\]  (2)

where, \( \delta \) = Displacement [in], \( e \) = Distance from the hinge center to the gage center [in],

\( h \) = Thickness of the half beam [in] and \( \varepsilon \) = Strain [in/in]

2. Experiments, Results and Discussion

The laminated specimens (6.25”x1” with \( a = 1.5" \), \( e = 0.5" \)) were fabricated using the Newport NB321/7781 Fiberglass and Toray T800S/3900-2B Carbon Unitape prepegs. A layer of DuPont Teflon Film 0.0005 in thick was laid in the middle to simulate the crack. The specimens were then bonded with a pair of piano hinges which were capable of sustaining the applied tensile load. MTS test frame was used to test the specimens at Quasi-Static rates of 0.05 in/min, 0.5 in/min and 5 in/min. The test arrangement as shown by Fig. 2, illustrates the specimen being loaded on the test frame. A load cell of 20lb capacity was used to acquire the values of load. The load, displacement and strain data were recorded during the tests at appropriate data acquisition rates. The delamination propagation and its speed under different loading rates were monitored using strain gage readings on the test specimen in conjunction with the Euler-Bernoulli beam theory. The load-displacement comparisons for NB321/7781 specimens at different test rates have been summarized by Fig. 3 (Ref. 2). The response exhibits a ductile-stable behavior. This data along with crack length measurements were used to determine the fracture toughness (1) and the crack tip velocity (2).
3. Conclusions

For the two materials investigated, the fracture toughness as a function of crack extension rate is plotted in Fig. 4. Based on the limited experimental data, for the range of crack extension rates experienced by the materials, the NB321/7781 material appeared to be insensitive to crack extension speed due the scattered response, while the T800S/3900-2B material showed an increasing trend (Fig. 4).

![Fig. 1. DCB specimen geometry](image1.png)

![Fig. 2. Experimental setup](image2.png)

![Fig. 3. Load vs. Opening Displacement](image3.png)

![Fig. 4. Rate Sensitivity of Mode I interlaminar Fracture Toughness](image4.png)

4. References


Abstract. Currently, there are over 25 million U.S. children who are overweight or obese [1 & 2]. Approximately 113 million or 80% of adult Americans regularly seek health information on the Internet [3]. Parents whose children are diagnosed as overweight or obese may look to the Internet for information about how best to manage this critical health issue. The quality of the information they receive may at times be misleading or inaccurate [4]. By examining websites containing information about obese and overweight children and confirming if the content meets standards set forth by the U.S. Health and Human Services Department (U.S.H.H.S.), the transparency of childhood obesity websites can be determined. Parents who obtain information about their child's health from websites need to know (1) the identity of the site's sponsor, (2) the purpose of the site, (3) information sources utilized, (4) privacy policy, (5) if the site is evaluated and (6) how it is updated [5]. To assess the transparency and clarity of websites containing information about the management of childhood obesity, 52 websites were examined to indicate the extent to which they followed the six criteria.

Introduction

Childhood obesity is a major health concern of many parents, The National Center for Chronic Disease Prevention and Health Promotion notes that the “prevalence of obesity among children ages 6 to 11 more than doubled in the past 20 years, increasing from 6.5% in 1980 to 17.0% in 2006. The rate among adolescents ages 12 to 19 more than tripled in this same time period, increasing from 5% to 17.6%” [6]. The financial costs of this epidemic are significant. The U.S. Government Accountability Office in October 2005 [7] concluded that obesity-related health expenditures accounted for more than 25 percent of the growth in health care spending between 1987 and 2001. In 2000, an estimated $117 billion was spent on health-related expenditures due to obesity with $61 billion in direct costs. These figures, along with the health risks associated with childhood obesity such as increased chances for Type II diabetes, high blood pressure and sleep disorders [8] reinforce the importance of obtaining correct and updated information on the Internet. Many Americans rely on the Internet as their primary source of information for topics such as childhood obesity therefore it is essential to examine the content of websites [3].

Experiment, Results, Discussion and Significance

This study reports the results of an examination of websites whose content provides information about childhood obesity. Because most people use a search engine to look for health information on the Internet, the top five search engines, Google, Yahoo, AOL, MSN and Ask.com [9] were use to pull websites for analysis. Search terms used to select sites were: childhood obesity, overweight child, overweight adolescent, obese child and obese adolescent. An extensive review of the literature resulted in a list of potential search terms. confirmed through comparison with The Cambridge Scientific Abstract, which identified the 10 most recently published journal articles on childhood obesity. The most recent published articles were selected to determine the most current terms being used to describe overweight and obese children. Articles came from the Journal of American Medical Association and other well-known journals within the medical field. To find the most common terms used in describing childhood obesity, the journal articles were copied into a Microsoft Word document where the find feature was used to determine how many times terms such as “childhood obesity” appeared in a document. The term "childhood obesity" was found 848 times, the word "child" was found 1400 times, the word "adolescent" was found 228 times, the word "overweight" was found 309 times and the word "obese" was found 214 times. The five terms that emerged most often were chosen as search terms in the search engines. Other terms that were searched but not utilized due to fewer results and included “youth”, “kid”, and “fat”. Using the terms childhood obesity, child, adolescent, overweight and obese, the first five sites identified by each search engine were selected. This resulted in 125 websites for preliminary analysis. Duplicate websites were considered only once and news and academic websites were removed from analysis because the standards set forth
by the U.S.H.H.S. did not apply. Websites were also scanned for appropriateness and to determine their readability and at what grade level they were written. Fifty-two websites were retained for analysis.

Number and Percentages of Websites that included criteria set by U.S.H.H.S.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>48</td>
<td>4</td>
<td>92% of the time Websites provided the identity of the developers</td>
</tr>
<tr>
<td>Purpose</td>
<td>11</td>
<td>41</td>
<td>21 % of the time Websites stated their purpose</td>
</tr>
<tr>
<td>Sources</td>
<td>36</td>
<td>16</td>
<td>69% of the time Websites named the sources of their information</td>
</tr>
<tr>
<td>Privacy</td>
<td>43</td>
<td>9</td>
<td>83% of the time Websites had a privacy policy</td>
</tr>
<tr>
<td>Evaluation</td>
<td>7</td>
<td>45</td>
<td>13% of the time Websites divulged if they were evaluated</td>
</tr>
<tr>
<td>Updated</td>
<td>33</td>
<td>19</td>
<td>63% of the time Websites gave the date it was last updated</td>
</tr>
</tbody>
</table>

Thirty-two of the 52 websites included statistics. Twenty of those had statistics at least five years old or older. One website had statistics dated 1994. Websites were also examined to assess readability and grade level of their information. The average U.S. adult reads at an eighth or ninth grade level [11]. Upon examining each Website only 16 had material at or below a reading grade level between the 8th and 9th grades.

Conclusions

Based on the findings of this study, the following conclusions are drawn. Many websites currently available do not meet the transparency criteria recommended by the U.S.H.H.S. Further, when websites display statistics, more than half the time they are over five years old. According to Goldfarb’s [11] explanation of reading levels, it may be difficult for some readers to understand or comprehend the material presented on the sites. In order to help establish better websites, developers should present more up to date material, update their sites more often, have sites evaluated and state the purpose of the site. NOTE: what in particular was hard to understand? Were there differences or trends regarding, say, government web sites or those from companies or organizations? Which groups had the best sides?

http://www.pewinternet.org/PPF/r/190/report_display.asp
Numerical Modelling of Boiling in Microchannels

Rohitha Paruchuri

Department of Mechanical Engineering, College of Engineering

Abstract:

Two-phase flows in microchannel heat sinks can increase heat removal capabilities in micro electronic devices. Two-phase flows include air-water flow and steam-water flow. An important aspect related to two phase flows in microchannels is the study of boiling phenomena and its characteristics. Flow boiling in microchannels raises a fundamental question on the manner in which the small channel dimension affect the bubble dynamics. Numerical analysis of boiling in two-phase flows is carried out by using Gambit and Fluent. The fluid flow and heat transfer characteristics of two-phase microchannel heat sinks are also determined. A review is carried out on flow boiling in both minichannels and microchannels.

Introduction:

The large scale integration of electronic devices has resulted in continuous increase of power dissipation requirements, thereby necessitating the development of highly efficient and new thermal dissipation solutions. Such type of cooling system which has gained importance is a microchannel [1-3]. The aim of this study is to analyse the two phase flow behavior and the boiling phenomena in channels when the hydraulic diameter of the channels is less than 1mm. Bubble dynamics plays a very important role in the heat transfer mechanism. Sometimes, the bubbles which are formed during the process may affect the heat transfer phenomena.

Numerical Analysis:

Numerical Analysis of boiling process in microchannels is carried out by using fluent and gambit. Gambit is a modeling software in which micro channel is modeled and required boundary conditions like type of fluid, velocity of fluid at the inlet and outlet of the micro channel can be specified. Meshing is done appropriately so that we can get the accurate values. Grid independence is achieved by considering different grid sizes. Then that model is exported to Fluent where the analysis is carried out [4].

Nucleation and two phase flows in microchannels:

Flow boiling is known for its ability to produce very high convective heat transfer coefficients, which is why it is used in many applications demanding high-flux heat removal. Two main regimes are possible with flow boiling, subcooled and saturated. In the subcooled region, liquid flow is more abundant and phase change occurs mostly by bubble formation at the wall shown in Figure 1[5].

Figure 1 : Schematic representation of subcooled boiling Zones.

Figure 1 show that subcooled boiling region which consists of two zones. The first one is highly subcooled zone whose upstream edge corresponds to the onset of boiling ZONB. Within this zone, bubbles are able to form but they
will show minor growth while still attached to the wall. Suppressed bubble growth in this zone is the result of a thermal balance between superheat effects at the wall and condensation along the bubble interface. A second developed subcooled zone begins at $Z_{bd}$ at which bubbles begin to detach into the liquid flow where they condense slightly but are able to endure and even coalesce with one another. The second zone extends downstream to the location where thermodynamic equilibrium quality defined as: $X_e = \frac{h_f - h_{f,at}}{h_{fg}}$ reaches zero. This location marks the upstream edge of the saturated boiling region. A key distinction between the highly subcooled zone and developed subcooled zone is that void fraction is a wall effect for the former and a bulk flow effect for the later. Existence of the two subcooled zones is verified by using the analysis.

**Review of heat transfer during flow boiling for minichannels and microchannels:**

Flow boiling heat transfer in 1–3 mm diameter channels has been a subject of investigation for a long time. Bergles et al. indicated that when the bubble diameter approaches the tube diameter, considerable non-equilibrium vapor volume exists in the evaporator section, and flow oscillations cause a premature burnout in the small diameter tubes [6].

Boiling curves for the two channels were obtained at nearly equal values of liquid Reynolds number. Their results are reproduced in Figure 2. Despite the large variation in the tube diameter, the two curves overlap in the boiling region. It is believed that these experiments fall under the fully developed nucleate boiling regime. The differences between the two boiling curves are only evident at low heat flux (near single phase region) and high heat flux values (approaching CHF condition). This indicates that in spite of the differences in the flow characteristics of the channels, the flow boiling behavior is quite similar in the two geometries.

![Figure 2: Flow boiling characteristics in minichannels and microchannels evaporator.](image)

Heat flux has a significant effect on the two-phase structure during flow boiling. A higher heat flux results in a more rapid bubble growth leading to quickly fill the channel with a vapor slug. The forces that are generated due to rapid evaporation become significant for microchannels, as the growing bubbles interact with the channel walls [7].

**Conclusion:**

Numerical analysis of boiling in two-phase flows in microchannels is carried out by using gambit and fluent. The fluid flow characteristics and heat transfer characteristics are determined. Existence of two subcooled zones is verified by using analysis. Review of boiling in minichannels and microchannels is carried out and the results show that boiling curves for both the channels are similar.

**Acknowledgements:**

The author would like to thank Dr. Ravigururajan of the Mechanical Engineering department at Wichita State University for his guidance and support throughout the entire project.

**References:**

[7]. Satish G. kandlikar, Heat Transfer mechanism during flow boiling in microchannels.
Cybernetic Answer to Who, What, Where, When and How: Comparative Analysis of Online and Print Newspapers in Serbia, Great Britain and the United States

Jelena Petrovic

Elliott School of Communication, College of Liberal Arts and Sciences

Abstract. In the last 8 years, the number of the Internet users worldwide increased by 305%, and the number of online newspapers has increased more than 50% since 2003. In the light of these developments, this study questions if online newspapers can be seen as a news genre distinct from its print parent. Built on the premises of genre theory, the study tests the applicability of Shepherd and Waters’ (1998) classification of news cybergenres. Data collected with content analysis of 223 front pages of the selected online newspapers from Serbia (17), Great Britain (108) and the United States (98), revealed current trends in online publishing and difference in the state of the online newspapers in these countries. Serbian online newspapers most closely resemble their print parent, while online dailies in the USA and GB are exhibiting features of a new news cybergenre.

1. Introduction

Since 2000, the number of the Internet users worldwide increased by 305%. Today it is approaching 1.5 billion [1]. The number of online newspapers increased more than 50% since 2003 [2]. These numbers exemplify changes in the newspaper business and profession. Although online and print newspapers have numerous characteristics in common, a few, such as globalization of the readership, content change and its 24/7 updating cycle, and interactivity tools, imply that online press could be defined as a new news genre.

This study analyzes some of these issues and it uses genre theory for its theoretical framework. Shepherd and Waters [3] proposed a cybergenre evolutionary model in which they argue that as the traditional news genres such as newspapers or magazines are moving to the Internet, a new class of news genre, which the authors named cybergenre, is emerging. According to the authors, online newspapers are developing from replicated subgenre (copying the content and format of the print newspapers), and variant (exploiting the capabilities of the new medium) extant cybergenres to emergent (exploiting the functionality of the new medium) and spontaneous (no counterpart in other media) novel cybergenres.

The scope of this research is narrowed to the forms of the online newspapers in Serbia, Great Britain and the United States. Considering different contexts in which these three online newspaper industries have emerged (socioeconomic status, newspaper histories, and overall cultures) it is safe to suggest that they are currently in different states of genre development.

RQ1: What are the cybergenre evolutionary stages of the online newspapers in Serbia, Great Britain, and the United States?

2. Results, Discussion, and Significance

The study uses content analysis as a method to examine 223 online newspaper front pages in three countries. The sample from Serbia includes all existing online newspapers: 17. The samples from GB (108) and the USA (98) are selected based on the 2008 Editor & Publisher Yearbook: complete list of GB newspapers and the top 100 highest circulated USA newspapers in 2007. The codebook is adapted from Van der Wurff and Lauf [4].

Table 1: Categories of cybergenre development

<table>
<thead>
<tr>
<th>Content</th>
<th>R</th>
<th>V</th>
<th>E</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio/visual</td>
<td>0</td>
<td>2</td>
<td>3.5</td>
<td>5</td>
</tr>
<tr>
<td>Visual</td>
<td>Some</td>
<td>Often</td>
<td>Often</td>
<td>Always</td>
</tr>
<tr>
<td>Video/sound</td>
<td>No</td>
<td>No</td>
<td>Some</td>
<td>Often</td>
</tr>
<tr>
<td>Timestamp story</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Timestamp all</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form</th>
<th>R</th>
<th>0</th>
<th>2.5</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edition</td>
<td>2</td>
<td>2</td>
<td>&lt;2</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Extra language</td>
<td>No</td>
<td>No</td>
<td>1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Technical change</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Content change</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The existence of the news/web site timestamp (news stream) is one of the main differences between print and online newspapers. Majority of the dailies in GB and Serbia don’t provide user initiated debates (readers have an opportunity to discuss any topic of their choice). The number of newspapers in the USA (55.10%) that do have this option, indicate that there may be a trend toward offering this service to the readers, which in turn can affect the gate-keeping role of the traditional press.

Shepherd & Watters [3] note that emergent and spontaneous cybergenres allow users to personalize the web page by changing its content and look. The study shows that only 8 newspapers allow readers to choose what stories will be displayed. On contrary, the technical personalization (font size, for example) is more common as 53.70% newspapers in GB, 35.71% in USA and 41.18% in Serbia have this as an option.

Finally, this analysis revealed that only three newspapers from all three countries can be classified as a pure replicated cybergenre. Every other title had at least hyperlinks and a search tool, which are both the elements of the variant cybergenre: they represent functionality enabled with the online medium.

3. Conclusion

Genre theory and cybergenre taxonomy are appropriate tools in analyzing online newspapers, as they emphasize essential differences between traditional news genres (print editions) and cybergenres (online editions). This analysis showed that online dailies in Serbia, United States and Great Britain are on different levels of the cybergenre evolution, with Serbia being on the lowest. The data also indicates that numerous trends (news stream, user initiated debates, personalization tools) that are characteristics of novel cybergenres, are present in numerous newspapers, therefore implying formation of a new news cybergenre.

4. Acknowledgement

Special thanks to Dr. Patricia Dooley for guidance and suggestions.

Physician Individual Differences Related to Willingness to Use a Computer-Based DSS

C. Adam Probst*, Victoria A. Shaffer, & Raymond Chan

Abstract. Computer-based diagnostic support systems (DSS) have been shown to reduce medication errors and treatment costs, aid in diagnosis, and assist in preventative medicine. While a large number of physicians have access to computer-based DSS, many physicians do not use all functions of the system. Therefore, the purpose of this study was to explore individual differences in physicians’ willingness to employ a computer-based DSS. 59 physicians in several different domains of medicine completed an online survey. The survey contained demographic information, classification (med student, intern, resident, or practicing physician), years in practice, and several individual difference measures including comfort/familiarity with computers attitudes toward statistics, and willingness to employ a computer-based DSS. We found that physicians believe DSS to be beneficial both general and specialized medicine. They are more willing to use computer-based DSS as information systems rather than diagnostic tools. In addition, confidence in one’s diagnostic ability, computer use, Internet use, and attitude toward statistics plays no major role in a physician’s willingness to use computer-based DSS.

1. Introduction

Medical errors are responsible for the loss of 98,000 lives annually and are considered to be the 8th leading cause of death [1]. The monetary expense of these errors is also noteworthy [2]. One type of medical error, adverse drug effects, is estimated to cost hospitals $2 billion annually [3]. Malpractice costs and the costs to patients and families are immeasurable [3]. Sadly, medical errors are much more common than many realize. It has been estimated that close to 25 percent of outpatients are subject to medical errors and, on average, a patient in an intensive care unit must endure one healthcare error per day [4].

Computerized diagnostic aids have been shown to reduce physician error. Physician order entry systems have reduced medication errors by 55% [3]. Management programs have reduced adverse drug reactions by over 70% [5]. And alert systems have reduced the time between reduction or cessation of medication by over 20 hours [6].

However, these aids are not well received by patients or physicians. Physicians believe that to use such aids is to employ “cookbook” medicine, and undermine years of schooling and training. The underuse of these aids is highlighted by the finding that even though large numbers of physicians have access to these aids, many do not use all functions of the system [6].

The goal of this research project was to explore individual differences in physicians’ willingness to employ a computer-based DSS. By understanding the differences among physicians that are willing to employ a computer-based DSS, special training programs can be instituted to maximize the use of these aids and thus enjoy their benefits.

2. Experiment, Results, Discussion, and Significance

Fifty-nine physicians, medical students, and residents located at Children’s Memorial Hospital in Kansas City, Kansas participated in the study. Participants were contacted via a hospital email system and were encouraged to complete the survey when in meetings by a staff physician.

The survey, which was taken online using MRInterview, was comprised of two sections. The first was a list of targeted variables asking physicians to answer questions ranging from years in practice to how often they used a computer. The second part of the survey was the “Field” subsection of Wise’s (1985) Attitudes Toward Statistics Survey. Physicians were asked to complete the survey online via email messages.
The majority of physicians indicated that they are not willing to use a computer-based DSS as a diagnostic aid: attitude toward statistics, familiarity with computers, nor the age of the physician were significantly related to willingness to use a computer-based DSS. However, physicians responded that they would be much more likely to use a computer-based DSS as an information tool (e.g. electronic health records, lab information) as seen in Table 1.

Table 1: Computer-based DSS as information tool

<table>
<thead>
<tr>
<th></th>
<th>Extremely Likely</th>
<th>Very Likely</th>
<th>Somewhat Likely</th>
<th>Somewhat Unlikely</th>
<th>Very Unlikely</th>
<th>Extremely Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>74.6%</td>
<td>23.7%</td>
<td>0%</td>
<td>0%</td>
<td>1.7%</td>
<td>0%</td>
</tr>
</tbody>
</table>

3. Conclusions

Although individual differences that were hypothesized to help predict which physicians would use a computer-based DSS were not found, it is interesting to note that physicians are mostly extremely likely or very likely to use a computer-based DSS as an information aid rather than a diagnostic tool. This finding helps to display in what faculty physicians believe computer-based DSS should be used in the field of medicine.


4. Acknowledgements

We would like to acknowledge Dr. Raymond Chan of Children’s Mercy Hospital in Kansas City who, without his help, the collection of this data would not have been possible.
Wichita “Twitters” about the 2008 Presidential Election:  
Fantasy Theme Analysis of Messages  
During Three Election Night Time Phases

Bobby L. Rozzell*
Elliott School of Communication

Abstract: The internet application Twitter, according to a description from its website is, "A free social messaging utility for staying connected in real time." [1] The number of users is estimated at more than one million. An average of three million messages is exchanged each day. This study, grounded in Ernst Bormann’s Symbolic Convergence Theory (SCT) [2], will utilize Glazer and Strauss’s (1967) constant comparative method [3] to analyze the themes that emerged in Twitter posts generated in Wichita, Kansas and the surrounding area (20 mile radius) for three time periods on election night November 4, 2008: three hours before John McCain’s concession speech, the time period between the beginning of McCain’s concession and the end of Barack Obama’s acceptance speech, and 3 hours after the close of Obama’s acceptance speech [1]. Analysis will emphasize themes that caught on and chained out through the three time periods.

1. Introduction

During the 2008 presidential campaign both the Republican and Democratic nominees put to use a number of social media applications. Along with email, blogs, MySpace and Facebook a relatively new communication tool, Twitter, was used by both the McCain and Obama camps. Twitter is unique among popular social media. Each message is limited to 140 characters. Its participants choose who they wish to communicate with and have the opportunity to interact with a large number of people in real time.

These unique properties allow for an analysis of ongoing computer-mediated communication among a large number of people during an event. Based on Symbolic Convergence Theory [2] Bormann’s Fantasy Theme Analysis [4] provides a framework to examine the themes that emerge and chain out in this conversation. Groups converge and diverge as the themes become a shared definition of an event or situation. The specific situation, in this case: Election Day 2008 and the concession and acceptance speeches that evening.

2. Experiment, Results, Discussion, and Significance

Artifact

Twitter was launched in 2006 and by April of 2007 had 94,000 users [5]. As of January, 2009 Twitter had 6 million subscribers [6]. Twitter limits its users to 140 characters per post [7]. Posts are made on the Twitter.com site and are called “tweets”. Users are called “Twitterers.” The conversation between users is limited. One can only see messages from people one chooses to “follow,” meaning they click the correct icon to allow that relationship. A follower can see all your tweets. You cannot see someone else’s tweets unless you are following them. In essence, Twitter is a self-moderating discussion group. Discussions on Twitter range from phatic communication to information sharing through updates and URLs to news reporting from professional and citizen journalists [8].

The artifact used for this research is a collection of all the Tweets by Twitter users in the Wichita area on the night of the election. Well over 100 different people were part of the conversation. The majority of area Twitterers were Obama supporters but McCain supporters, were represented as well as libertarians and some who were not interested in the evening’s events. The Tweets were divided into three groups for the purpose of analysis. The first group was all Wichita area Tweets posted on November 4, 2008 from 7:15 pm CST until just before 10:15 pm CST, the approximate start time of John McCain’s concession speech. The second group consisted of Tweets posted from 10:15 pm CST till 11:15 pm CST, the approximate time when Barack Obama ended his victory speech. The third group consisted of all Tweets posted after 11:15 pm CST until 2:15 am CST on November 5, 2008.
Fantasy-Theme Analysis

What kind of communication do group members share that creates and maintains their shared identity? This is the question Ernest G. Bormann was asking in the early 1970s. He formulated Symbolic Convergence Theory to account, “for those processes which create and sustain a group or organization’s consciousness” [9]. Bormann posited that significant symbols are shared by group members and referred to these symbols as fantasies, not as a judgment upon their existence but as recognition of the power they hold within a group. The fantasy of the group is based in reality as the members of the group experience it. They share a story that chains outward into the minds of others. A powerful fantasy can bind group members together and draw others to the group. The symbols converge to not only create reality for the group but to create a community consciousness that binds the group together [10]. This theory has been applied to small group settings, public speaking, organizational communication, as well as interpersonal, mediated and intercultural communication [11].

Fantasy-Theme Criticism is based on SCT and recognizes both the power of fantasy as well as the power of logic [11]. Its goal is to discover the rhetorical vision of a group by examining the artifacts produced by that group. The supposition is that the vision that brings a group together will be so powerful that it will be revealed by the artifacts they produce.

After these themes are identified a rhetorical vision is sought. This brings together the characters, actions and settings into a coherent drama that the group shares. When a rhetorical vision is discovered it means the group under consideration has formed a rhetorical community with bonds that are as strong as the vision they share.

3. Conclusions

Three main themes developed during the course of the evening: 1) A focus on history—Obama is viewed as maker and culmination of history. Four times the trope is repeated, “Rosa sat so Martin could walk. Martin walked so Obama could run. Obama ran so our children could fly.” 2) Return of the nice guy— The discussion of McCain, during his concession speech, becomes positive and appreciative. His speech is commented on more than Obama’s victory speech and is the most discussed event of the evening, after the election of Obama. 3) Supporters at the center—The personal pronoun “I” is used 115 times before Obama’s speech and 69 times after the speech. It is only during the speeches that the tone shifts to “we” and a sense of group accomplishment. The supporters report on their feelings during the evening. They talk of themselves more than anyone, including Obama. The campaign phrase, “yes we can” was interspersed with the phrase “yes we did” or “we did it.”

The rhetorical vision of the evening was the supporter’s belief that they were not only the witnesses of history; they had participated in and were the cause of history. “Yes we can” was not just a slogan but a shared belief. They did not just see their candidate elected; they “did it” and reported their feelings, their tears and the pride they felt, as central to the experience of the evening. Although they lived in a state won by John McCain, they still saw the election of Obama as their accomplishment.

4. Acknowledgements

Thank you to Dr. Deborah Ballard-Reisch for proofreading, encouragement and helping this project in countless ways.

Abstract. Children with autism spectrum disorders (ASD) lack the ability to share attention with others. This is a key symptom for diagnosing an ASD. The inability to reference the joint attention of another negatively impacts a child’s language and social skill development. This study investigated whether three preschool boys, diagnosed with ASD, could be taught to detect an adult’s eye gaze direction, to obtain a motivational item. Treatment improved all of the participants’ ability to reference the trainer’s eye gaze and use the trainer’s eye direction to locate a concealed reinforcer. If children with ASD can improve their ability to share attention, this may positively affect their language and social skill development.

1. Introduction

Children with autism have difficulties sharing attention with others. This deficit is recognized as a core feature of autism spectrum disorders (ASD). The lack of joint attention behaviors such as showing, pointing, and gaze-following is a key factor in early identification and diagnosis (Baron-Cohen, 1995).

Typically, the ability to follow another person’s head and eye direction is established by the time a child is 10-12 months of age (Butterworth & Jarrett, 1991). A basic understanding of persons as intentional beings is demonstrated by 18-24 months. This is observed when a child is able to actively transfer their attention to match that of an adult’s. Often, this requires the child to shift his/her own attention so that it aligns with the adult’s; thus, demonstrating recognition of differing points of view (Tomasello, 1995). The development of joint attention skills appears, then, to mark the development of the child’s awareness that other people can see objects or events they can see (Mundy, Sigman, & Kasari, 1990).

Children with autistic disorders demonstrate noticeable difficulties with these skills by approximately 10 months of age. Because these deficits manifest early in a child with ASD, it has been proposed, the subsequent development of both language and social skills is negatively affected. Evidence that impairments of joint attention behaviors lead to impaired social information processing has been provided by Mundy and Neal (2001).

Joint attention skills have also been closely associated to a child’s ability to develop language. For a child to correctly learn labels, they must be able to respond to the joint attention of the speaker to ensure both parties are focusing on the same thing. When a child is unable to coordinate their attention with both the speaker and a target object, appropriate word mapping fails (Dawson, 2004).

It has been suggested, that because children with autism have marked joint attention deficits which affects their ability to develop language skills and social relationships, that intervention strategies targeting the development of these skills would be appropriate. The purpose of this study was to determine if children with autism could be taught to reference a trainer’s eye gaze and use the trainer’s eye direction to locate a concealed reinforcer.

2. Experiment, Results, Discussion, and Significance

Three boys, diagnosed with autism were selected for this multiple base-line study. Two of the boys were 5 years old, one was 3 years old. They were enrolled in a university-based clinic. It was observed, these boys had difficulties initiating and responding to joint attention activities (e.g., directional eye gaze, pointing and showing). They struggled to establish social interactions with their peers and their language skills were significantly delayed for their age.

To begin, a reinforcement inventory assessment was administered to identify highly preferred items that would be reinforcing for each child. It was determined that each child responded best to food (e.g., M&Ms, chips). These preferred items were used to establish a baseline measure (Phase 1) for each child to verify if the participants were able to locate the food after: the trainer indicated they were hiding it under one of three cups, asked the child to hide their eyes, hid the item under a cup, established visual attention with the child, and directed them to look for the item under the cup.
while shifting their eye gaze in the direction of the appropriate cup.

During this activity, the child was placed 2 feet in front of the three cups on a child-size carpet square. The trainer was positioned 2 feet behind the cups, and lowered to the ground so that her head was at the approximated level of the cups. The trainer did not move the direction of her head toward the cup, but rather kept it straight forward and shifted only the direction of her eye-gaze. The cups were spaced approximately one foot apart on all sides so that it would be obvious to the child where the trainer’s gaze was being directed.

During baseline, for a response to be considered correct, the child had to establish visual attention with the trainer’s gaze prior to selecting a cup and retrieving their desired item. If the child moved to a cup, without referencing the direction of the trainer’s eye gaze, the response was considered incorrect, even if the child happened to “guess” the correct cup.

During the initial baseline series, the children did not reference the trainer’s eye gaze nor detect the trainer’s eye gaze direction. Even when the children did not immediately receive their preferred item, they did not appear to use a different strategy, other than guess, to assist them in locating the reinforcer.

Once baseline had been completed, verbal and visual prompts were provided by the trainer during Phase 2 (treatment), to help the child learn to use the trainer’s eye gaze to locate their preferred item. As each child began to respond appropriately, prompts were eliminated and the training continued until the child was able to consistently reference the trainer’s eye gaze direction to locate their motivators.

Treatment improved all of the participants’ ability to reference the trainer’s eye gaze and use the trainer’s eye gaze direction to locate the reinforcer (see Figure 1). During treatment, the orientation of the trainer relative to participants D & E was shifted so that the trainer was seated next to the child. D & E learned to shift their physical orientation to the trainer to detect the necessary visual information to locate the reinforcer.

Four weeks after the completion of the treatment phase, new trainers began Phase 3 (transfer). New eye direction detection tasks were presented to D & E in new environments, using new concealers, while alternating seating orientations.

3. Conclusions

Treatment improved all of the participants’ ability to reference the trainer’s eye gaze and use the trainer’s eye gaze direction to access information. Two of three participants maintained and generalized eye-direction detection in new environments, using new concealers, with new trainers (see Figure 1). Additional research is needed with a greater number of participants to determine if these skills will transfer into social learning situations.

![Figure 1](image_url)
Free-Time Literacy Activities

Kylea Schrag*, Kathy Strattman

Communication Sciences and Disorders, College of Health Professions

Abstract. While literacy continues to be important during the secondary school years, motivation to read in middle school declines [1, 2, 3, 4]. There is little research on adolescents free-time activities that could include reading [5]. Less is known about differences in urban or rural communities. The purpose of this study was to determine to what extent sixth graders in an urban and rural public school differ in their preferred types of literacy activities, amount of time spent engaging in literacy activities, and the effect of time spent doing homework on leisure reading. Survey results of students from urban and rural sixth grade classes indicated urban students spent more time reading for fun as well as the girls in the study.

1. Introduction

The transition from elementary school to middle school is very complex for sixth grade students. Reading becomes the primary tool for learning [5] and a skill critical to success in school. As school work changes, motivation and interest in reading begins to decline [1, 2, 3, 4]. Although motivation to read in school may decline, outside of school students do engage in other reading activities, e.g., reading magazines and surfing the Internet [4]. Understanding what types of reading materials middle school students are motivated to read can aid educators in improving reading instruction and help Speech-Language Pathologists to provide appropriate intervention methods. Unfortunately, there is little research on the leisure reading interests of adolescents. In addition, less is known about the amount of time sixth graders spend doing homework and the impact it has on their available time for leisure reading.

The purpose of this study is to determine to what extent sixth graders in an urban and rural public school differ in their preferred types of literacy activities, amount of time spent engaging in literacy activities, and the effect of time spent doing homework on leisure reading. A pilot study was conducted to construct and determine the effectiveness of a survey to address these questions.

2. Methodology and Results

Two sixth grade classes (45 girls; 33 boys), with approximately 35 students in each from two different communities, one urban and one rural, were selected to participate. These schools were chosen because demographics for each school were similar. Participants and their parents or caregivers provided signed informed consent.

Data were collected using a 16 question, multiple choice survey constructed to obtain information about students’ after school and weekend activities as they relate to time spent engaging in literacy activities and homework. Included in the survey was a reading vocabulary assessment that consisted of twenty-seven real words and nonwords to determine the similarity of each groups’ reading vocabulary knowledge. The survey and reading vocabulary list was administered during the students’ English class and took approximately fifteen minutes to complete.

Comparisons between the urban and rural students and the time they read for fun indicated that the amount of time the urban sixth graders read for fun ($M = 1.92$, $SD = 1.10$) was significantly greater than the time the rural sixth graders read for fun ($M = 1.36$, $SD = .826$), $t(2.550) = .221$, $p = .013$ (two-tailed). An independent sample t-test was used to analyze the data. There were no statistically significant differences between time spent on homework and time spent reading for fun.

The students in the present study were asked what types of activities they engage in during their free time. Both groups rated listening to music (Urban 76%; Rural 89%) and participating in group sports (U 80%; R 75%) highest. More students from the rural community rated hanging out with friends (89%) and watching TV/movies (68%) as most preferred free-time activities. Sixth graders from the urban community indicated a high interest in shopping and playing computer and video games. Both groups rated reading as a solo activity similarly (Urban 38%;
Rural 36%). Other free time activities which were potentially literacy related were rated similarly: texting (Urban 40%; Rural 43%), cooking (Urban 48%; Rural 46%), computer/video games (Urban 72%; Rural 68%). However, there was more than a 10% difference between groups in two other literacy related activities: instant messaging (Urban 26%; Rural 39%) and creative writing (Urban 22%; Rural 36%).

The urban students least favored activity was 4-H (10%) and individual sports (12%) and the rural students least favored activity was the Boys and Girls Club (7%), 4-H (14%), and individual sports (14%). Both urban and rural students preferred magazines (44%; 46%), nonfiction books (32%; 36%), and comics (46%; 29%). Students from the rural community reported liking novels (29%). The least preferred types of reading materials for both communities was newspapers (Urban 8%; Rural 4%) and plays (8%; 7%). Both boys and girls preferred magazines (39%; 49%). The girls preferred novels (42%), and non-fiction books (42%). Boys liked to read comics (58%), and articles from the internet (30%). The least preferred types of reading materials for boys and girls were also newspapers (Boys 6%; Girls 7%) and plays (Boys 0%; Girls 13%).

3. Conclusions

Results indicated a significant difference in the amount of time students in the urban community read for fun when compared to the students in the rural community. All of the students in the present study preferred activities that involved their peers. In addition, the most preferred type of reading materials were magazines. Incorporating activities using preferred media and peer interactions may facilitate continued interest in expanding literacy interests.

4. Acknowledgements

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An Improved Frequency Estimator

*H. Shatnawi, Qasaymeh M. M, Gami Hiren, M.E. Sawan

Department of Electrical Engineering and Computer Science, College of Engineering

Abstract— A novel method of estimating the differential delay of a sinusoidal signal is considered. The new method utilizes the Propagator Method (PM) which does not require the eigen-decomposition of the cross-spectral matrix (CSM) in estimating the signal frequencies. Such frequency estimation is based on the observation and/or covariance matrices. Computer simulation is performed to validate the new procedure.

I. INTRODUCTION

The estimation of time delay and frequencies [1] [2] has been a research topic of practical importance in many areas (Radar, Sonar, Ultrasonic, Seismology, Mobile communications etc.) by spatially separated sensors. Similarly frequency estimation [3] has been universally addressed in signal processing literature. We begin with the discrete-time sinusoidal signals \( x(n) \) measurements satisfying

\[
x(n) = s(n) + e_1(n), \quad n = 0,1, ..., N - 1
\]

where

\[
s(n) = \sum_{i=1}^{P} A_i \exp(j\omega_i n)
\]

The source signal \( s(n) \) is modeled by a sum of \( P \) complex sinusoids where the amplitudes \( (A_i) \) are unknown complex-valued constants, and the normalized radian frequencies \( (\omega_i) \) are different. Without loss of generality, we considered \( \omega_1 < \omega_2 < ... \omega_P \). To simplify the problem, we have assumed the number of sources \( P \) either known or pre-estimated [4]. The additive noise parameters \( e_1(n) \) and \( e_2(n) \) are uncorrelated zero-mean complex white Gaussian processes with variances \( \sigma_2^2 \). Also parameter \( N \) represents the number of samples collected at each channel respectively.

A subspace algorithm based on state-space realization has been proposed [5] for joint time delay and frequency estimation of sinusoidal signals received at two separated sensors. The frequency estimates are obtained directly from the eigenvalues of the state transition matrix; while the delay is determined using the observation matrix and the estimated frequencies. A generalized Yule–Walker solution is suggested in [6] literature to determine \( (\omega_i) \) separately.

The Propagator Method (PM) is subspace-based method [7], [8] which does not require the eigen-decomposition of cross-spectral matrix (CSM) of received signals. It is well known that the computational load of PM based method is significant as it does not involve eigenvalue decomposition (EVD) or singular value decomposition (SVD). We compared our frequency estimator performance with [5].

II. DEVELOPMENT OF PROPOSED METHOD

Using the \( N \) received data \( x(0), x(1), ..., x(N - 1) \) given by (1), we form the \( L \times (N - L + 1) \) Hankel Matrix

\[
X = \begin{bmatrix}
x(0) & x(1) & ... & x(N - L) \\
x(1) & x(2) & ... & x(N - L + 1) \\
... & ... & ... & ...
\end{bmatrix}
\]

\( X \) can be rewritten as

\[
X = [r(0) \ r(1) \ ... \ r(N - L)]
\]

where the \( i^{th} \) column of \( X \) is given by

\[
r(i) = A_L(\omega)(\varphi(\omega))^i s + n_{i1}, \quad i = 0,1,......,L-1
\]

\[
A_L(\omega) = \begin{bmatrix}
1 & 1 & 1 & ... & 1 \\
e^{j\omega_1} & e^{j\omega_2} & ... & e^{j\omega_P} \\
... & ... & ... & ... & ...
\end{bmatrix}
\]

\[
\varphi(\omega) = \text{diag}(e^{j\omega_1} e^{j\omega_2} ... e^{j\omega_P})
\]

We can formulate the received data matrix as

\[
X = [A_L(\omega)s \ A_L(\omega)\varphi(\omega)s ... A_L(\omega)(\varphi(\omega))^{L-1}s] + [n_{i1} \ n_{i2} \ ... \ n_{iL-1}]
\]

Partitioning \( A_L(\omega) \) into two sub-matrices \( A_{L1}(\omega) \) and \( A_{L2}(\omega) \) with dimensions \( P \times P \) and \( (L - P) \times P \) respectively. We defined Propagator matrix \( P \) satisfying following condition

\[
P^H A_{L1}(\omega) = A_{L2}(\omega)
\]
Where \((.)^H\) denotes hermitian transpose and dimension of matrix \(P^H\) is \((L - P) \times P\). From (5) \(P\) is calculated as
\[
P = (A_{L_2}A_{L_1}^H)^{-1}A_{L_1}A_{L_2}^H
\]
Similarly, partitioning received data matrix \(X\) into two sub-matrices \(X_1\) and \(X_2\) with dimensions \(P \times (N - L)\) and \((L - P) \times (N - L)\) respectively. The propagator can be estimated as
\[
\hat{P} = (X_1X_2^H)^{-1}X_1X_2^H
\]
Matrix \(E\) can be define as
\[
E = [P - I]
\]
where \(I\) is identity \((L - P) \times (L - P)\) matrix. Clearly here
\[
E^HA_L(\omega) = P^HA_{L_1}(\omega) - A_{L_2}(\omega) = 0
\]
In a noisy channel, the basis of matrix \(E\) is not orthonormal. By introducing orthogonal projection matrix \(Q\) we have
\[
QA_L(\omega) = 0
\]
where \(Q = E(E^HE)^{-1}E^H\). Apply MUSIC [1] like search algorithm to estimate the frequencies using following function
\[
f(P) = \frac{1}{A_L(\omega)^HQA_L(\omega)}
\]
### III. SIMULATION RESULTS

Extensive computer simulations had been done to validate our proposed methods. The first experiment is comparing the performance of the PM Method with the State-Space realization. The scenario considered similar to [5]. The source signal \(s(n)\) was a sinusoidal signal of the form (2) with \(A_1 = A_2 = 1/\sqrt{2}\), \(\omega_1 = 0.3\pi\) rad/s and \(\omega_2 = 0.6\pi\) rad/s. We simulated estimator performance under AWGN environment with different SNRs and 500 independent monte-carlo (MC) realizations. The numbers of signal samples were 150 and the value of \(L\) was chosen to be 100. The mean square error defined below is employed as a performance measure of the frequencies estimator

\[
MSE_{dB} = 10log_{10}\left(\frac{1}{N_fP}\sum_{i=1}^{N_f}\sum_{j=1}^{P}(\omega_j - \hat{\omega}_j)^2\right)
\]
where \(\hat{\omega}_j\) is the estimate of \(\omega_j\) and \(N_f\) is the number of Monte Carlo (MC) trials. Fig. 1 plots root mean square error (RMSE) of the frequencies estimate and compared with state-space realization method [5]. Significant improvements in performance were achieved by the proposed method in an estimation of frequencies, especially SNR \(\geq -5\) dB.

![Fig.1. MSE of all frequencies Vs SNR](image)

### IV. CONCLUSION

We proposed a new technique for frequencies estimation of received sinusoidal signals by applying the PM based method. The frequencies estimated either by observation matrix or through covariance matrix of received data matrix. The frequency estimator is showing outstanding performance compared with state space realization illustrated in [5]. In terms of future directions, it would be an interesting to explore computation load behavior of these algorithms.

### REFERENCES

Impact of the First Step to Active Aging on Older Adult’s Functional Fitness, Balance and Daily Activity

Mindy L. Slimmer*, Eun Young Park, Nicole L. Rogers

Gerontology, College of Liberal Arts & Sciences

Abstract. To determine how the First Step to Active Aging (FSAH) program impacts functional fitness (FF), balance, and daily physical activity (DPA) in older adults. The FSAH group consisted of 18 women. FSAH group met at a senior center for 11 wk, 2d wk for a 50 min. training program (flexibility, strength, balance, aerobic). The control group consisted of 15 women. Program effectiveness was assessed using measures of FF (chair stand, arm curl, sit & reach, up & go, scratch test, and 12-min walk), balance (movement velocity (MVL), endpoint excursion (EPE), maximum EPE (MXE), and directional control (DCL) for forward (F), right (R), left (L) and back (B) movements), pedometer measured DPA, and weight. No baseline difference existed between groups. Repeated measures ANOVAs revealed group x time interactions (p<.05) on all measures except flexibility. After 11 weeks, FF improvements were noted in the FSAH group: Chair Stand 46%, Arm Curl 25%; Up-&-Go 8%; 12-min Walk 13%. With respect to LOS, MXE improved in all directions (F 18%, R 14%, B 23%, L 10%) and DCL improved in the F direction 9%. DPA also increased from 3,108 to 5,077 steps (38%). The control group did not change in any variable. Participating in a FSAH program improves FF.

Introduction

Functional fitness is a concept that reflects an older adult’s ability to perform physical activities of daily life with relative ease [1]. This concept accounts for traditional physical fitness parameters such as muscle strength, cardio-respiratory endurance, and flexibility, but also includes balance. Even in healthy adults, each component of functional fitness declines with advancing age, negatively affecting quality of life [2]. For example, the age-associated decline in muscle strength is a major cause of physical disability in older people and decreased muscular strength and poor balance are major risk factors for falls.[3] Furthermore, impaired joint flexibility can negatively affect the ability to perform self-care activities such as bathing and dressing. Therefore, the purpose of this project is to determine how the First Step to Active Aging (FSAH) program impacts functional fitness, balance, and daily physical activity (DPA) in older adults.

Experiment, Results, Discussion, and Significance:

Recruitment

Older adults were recruited through newspaper and newsletter advertisement. Potential participants were screened using the EASY (Exercise and Screening for You) tool to ensure a population of able adults.

Assessment

Eligible participants underwent a variety of assessments including a functional fitness battery (FF), balance measures, and measurement of daily physical activity. Functional Fitness was measured using the following assessments: 1. lower body strength was assessed by the chair stand (participants stood and sat repeatedly for 30s); 2. upper body strength was assessed by the arm curl (participant performs elbow flexion and extension with a 5 lb for 30s); 3. lower body flexibility was assessed by the sit and reach (participants sat on the edge of a chair, extended one leg and bent the other while reaching toward their extended leg’s toes - the measurement was the distance between the middle finger and the toes); 4. upper body flexibility was assessed by the scratch test (participants placed their preferred hand over their corresponding shoulder and their other arm was placed behind their back - the measurement was the distance between the tips of each hand’s middle finger with plus scores indicating overlap between the fingers and minus scores indicating the distance short of the fingertips touching); 5. physical mobility was assessed by the up and go (participants sat in their chair and were timed as they walked as quickly as possible around a cone, stationed 8 ft. away, and returned to their chair); 6. Aerobic endurance was
assessed by the 12-min walk (participants walked a 50m course for 12 minutes – distance was recorded); 7. DPA was assessed using pedometers (participants wore a pedometer during the program and record their daily step counts. A force platform (Balance Master Platform, NeuroCom International) was utilized to obtain the dynamic balance measure called Limits of Stability. Participants were familiarized with all postures and procedures. The Limits of Stability assessment quantified the maximum distance a participant could lean in a given direction without losing balance. The participant’s center of gravity appeared as a point in the middle of a computer screen. Targets appeared at distances around this point. The participant leaned toward each of 4 targets (front, back, left, and right) holding this position for 10s. Measured parameters were reaction time, sway velocity, directional control, endpoint excursion, and maximum excursion. Body weight was measured using a standard medical scale.

**Intervention**

The physical activity program was offered at a local senior center twice per week for 50 minutes. The intervention program consisted of: (a) flexibility training; (b) strength training, using elastic resistance bands; (c) balance training, using firm and pliable foam pads surfaces; and (d) increasing cardio-respiratory activity as measured by a pedometer.

**Results**

The experimental FSAH group consisted of 18 women (X=73±7 yrs). The control group of 15 women (X=75±6 yrs) was drawn from a waiting list for a similar program at a second area senior center. No baseline difference existed between groups. Repeated measures ANOVAs revealed group x time interactions (p<.05) on all measures except flexibility. After 11 weeks, significant FF improvements were noted in the FSAH group: Chair Stand 46%, Arm Curl 25%; Up-&-Go 8%; 12-min Walk 13%. With respect to LOS, MXE improved in all directions (F 18%, R 14%, B 23%, L 10%) and DCL improved in the F direction 9%. DPA also increased the equivalent of 1 mile, from 3,108 to 5,077 steps (38%) and Ss lost 2.3lbs (2%). The control group did not demonstrate change in any variable. Based on these results the authors conclude that participating in a FSAH program improved Functional Fitness. These improvements may allow older adults to continue to perform daily tasks and ultimately live independently longer. The distance a participant could lean in all directions also improved as a result of the FSAH program. As evidenced in literature, improving strength and balance is linked to the reduction of fall incidence. Although not measured, participation in this project may reduce the likelihood of a fall. Results of this project also suggest that older adults are capable of utilizing pedometers as a means to increase their daily activity. Overall, it appears the FSAH program is effective in improving functional fitness, balance, and daily physical activity.

**Conclusions**

Regular physical activity substantially delays the onset of functional limitations and loss of independence. The benefits of regular physical activity and exercise can enhance the quality of life for the older adult, improve their capacity for recreation, and alter the rate of functional decline.

Electropolymerization of Triphenylamine appended Zinc Porphyrin to form Porphyrin-Fullerene dyads at the electrode surface for photochemical studies

Navaneetha K. Subbaiyan*, Francis D’Souza

Department of Chemistry

Abstract: Porphyrins with their attractive chemical properties qualify to seek potential technological applications including solar energy conversion, sensors, catalysts, biomedicine, molecular electronics, and photonics. Many of these applications require the Porphyrin to be on a surface, preferably in a conducting polymer matrix. Electro polymerization is a convenient method to produce such a conducting porphyrin polymer on the electrode surface. Compared to chemical methods, an electrochemical method is simple, and ensures good electrical conductivity across the interface.

In the present study, we report electro polymerization of tetrakis N,N-diphenylaminoporphyrinatozinc(II) on the electrode surface. Subsequently, porphyrin-fullerene dyad is formed via axial coordination of a phenylimidazole appended fullerene. The film formation was monitored by electrochemical quartz crystal microbalance, and characterized by surface and optical methods. The newly formed donor-acceptor dyad was further utilized in photoelectrochemical applications to convert light energy directly into electricity.

Introduction: Exponential increase in energy requirements and environmental concern make research on renewable sources inevitable. Of all available resources solar energy is powerful and eternal. The importance of solar cells has been felt recently in many ways to reduce to cost of production per watt. With advent of Dye sensitized solar cells the future of low cost solar cells is not far. In addition to low cost, the flexibility in organic solar cells, despite their slow start in the energy efficiency race, is still a potential competent.

Light harvesting polymer systems utilizing the photoinduced energy and/or electron transfer mechanisms are becoming more and more attractive. Among the different approaches, the donor-acceptor route has received significant attention because of the available broad range of synthetic procedures. By appropriate selection of both the donor and acceptor, it is possible to tune the magnitude of the band gap and the absolute energies of the frontier orbital, as well as the solubility and processing of the resulting polymer making them suitable for photovoltaic applications. In photovoltaic devices, the conjugated polymer film plays one or more crucial roles including light absorption, electron donation, and hole transportation.

Experiment, Results and Discussions: In the present study, we have exploited rich spectral and electrochemical properties of both porphyrin and TPA to develop a hybrid polymer. To accomplish these tasks, tetrakis(4-(N,N-diphenylamino)phenyl)porphyrinatozinc(II), ZnP, was electropolymerized on the Pt and Au disk as well as on conducting glass made of indium tin oxide (ITO) surface to obtain the ZnP polymer film modified electrodes(Fig 1b). Using Electrochemical Quartz Crystal Microbalance (ECQM), simultaneous measurement of decrease in resistance (green in fig 1b) and frequency (blue in fig 1b) indicates formation of a conducting film surface.

Fig 1a. Scheme of the complex, 1b formation of film by electro polymerization, 1c formation of complex confirmed by EQCM, 1c scheme of the complex.
These electrodes were subsequently allowed to bind, via metal-ligand axial coordination, a fullerene derivatized with an imidazole moiety (Fig 1a). According to Sauerbrey’s equation, decrease in frequency is a sign of increase in mass and so for each addition of C60 imidazole clearly seen in EQCM as shown in Fig 1c. Thus, using a supramolecular (via axial-ligand coordination) approach, the (ZnP polymer film)-fullerene donor-acceptor hybrids have been constructed for photoelectrochemical applications. This approach resulted in the electron donor-acceptor hybrid, in which the acceptor is coordinated to the surface accessible zinc porphyrin sites. That is, the donor-acceptor pair is suitably positioned to enable vectorial electron transfer. We have intentionally chosen fullerene as an electron acceptor because of its appreciable electron accepting properties, including favorable reduction potentials and relatively low re-organization energy.

Further, our optical absorption and fluorescence studies revealed, the presence of the Soret and Q bands of ZnP indicates that the studied porphyrin system is intact, i.e., it is not destroyed during electrochemical polymerization. In the absence of C60im, the ZnP polymer film peaks at 443, 565, and 610 nm are seen (Trace 1 in Fig. 2a). These peaks were broader than those for monomeric ZnP used for electropolymerization. Upon binding C60im, the entire spectrum was red shifted by 3-4 nm (Trace 1 in Fig. 2a) typical of that induced by axial coordination of a nitrogenous base to the zinc central metal atom of porphyrin.

The steady-state fluorescence spectrum for the ZnP polymer film also supports the polymer retaining its genuine porphyrin system. Two weak emission bands, located at 613 and 678 nm in the spectrum, (Trace 1 in Fig. 2b) and coordination of C60im results in quenching of both bands (Trace 2 in Fig. 2b), indicating occurrence of excited-state photochemical events.

Photoelectrochemical studies were conducted using the (ZnP polymer film)-fullerene modified ITO electrode as working electrode, platinum foil as counter electrode aided with mediator solution of 0.1 M TBAI and 0.101 M I2, in acetonitrile as shown in fig 3a. This study revealed generation of higher cathodic photocurrent (fig3b) upon putting light and increase in quantum efficiency of the (ZnP polymer film)-fullerene electrodes (fig 3c) higher than those without coordinated fullerene, signifying the importance of formation of the donor-acceptor hybrids and the resulting vectorial electron transfer upon illumination.

**Conclusion:** A Tetrakis(4-(N,N-diphenylamino)phenyl)porphyrinatozinc(II) monomer bearing electroactive triphenylamine substituents was successfully electropolymerized to form thin films onto the Pt, Au, and ITO electrodes. Further, fullerene derivatized with an axially coordinating imidazole addend was allowed to coordinate by self-assembly to the zinc atom center of the ZnP moiety of the polymer film. The present study unambiguously revealed the importance of the fullerene in elevating the photogeneration. An ICPE at the Soret region of the maximum absorption was nearly 2 % for the present (ZnP polymer film)-fullerene hybrid film photoelectrochemical cell was calculated.

**Acknowledgement:**
Prof. Kutner and Prof. Zandler for their contribution in this project. NSF and WSU for funding and support.
Physician Assistant and Physician Assistant Student Exposure to and Perceptions of Pharmaceutical Representatives in the Clinical Setting: A Pilot Study at Wichita State University

Matthew A. Swanson*, Cathryn Caputo*, Timothy Quigley, Elizabeth Ablah

Department of Physician Assistant, College of Health Professions

Abstract. A physician assistant (PA) exercises considerable autonomy in diagnosing and treating illnesses, along with the responsibility of prescribing medication. In 2006, PAs transmitted approximately 286 million prescriptions. Pharmaceutical companies thus market to physicians, medical students, PAs, and PA students to promote the use of their products. The purpose of this study was to fill a literature gap by conducting a survey that assessed WSU PA and PA student exposure to and perception of pharmaceutical representatives. Subjects completed a 45 question survey based upon a previous study among medical students at UCLA. All respondents verified having at least one type of interaction with the pharmaceutical industry. A majority of respondents reported being less likely to be influenced by marketing strategies than would their colleagues, a finding similar to previous studies conducted on physicians and medical students. PAs and PA students are exposed to the same influences as their MD counterparts. This implies that interventions used for MDs should also be applied to PAs.

1. Introduction

Physicians have long been studied in regards to their interactions with the pharmaceutical industry. These studies have illuminated many problems including: making formulary requests for medications that rarely held important advantages over existing ones, irrational prescribing behavior, increasing prescription rate, and prescribing fewer generic and more expensive medications at no demonstrable advantage. Studies also suggest problematic attitudes and habits of medical students in regards to their interactions including: thinking that their colleagues would be more influenced by pharmaceutical marketing than they would be themselves, receiving gifts less than $50 yet thinking that such gifts were inappropriate, and eating a sponsored lunch even though believing that it was inappropriate. These actions and attitudes have the potential to influence the quality of care received by patients.

In a survey completed in 2000 by Scott-Levin Associates, more than half of PAs polled reported that they saw more pharmaceutical representatives per week than their supervising physician. However, after conducting a literature search, no research on PA perceptions and attitudes towards the pharmaceutical industry was found. Since current research has indicated that promotional activities can influence treatment decisions of MDs, residents, and medical students, perhaps these behaviors are also practiced by PAs. Medical students in a previous study indicated they did not feel adequately educated on pharmaceutical industry/medical professional interactions and suggested that possible guidance from their school would help improve appropriate interaction. Similarly, interventions during a PA student’s education may help alleviate some of these behaviors as well.

2. Methods and Results

For this pilot study, a survey was obtained with permission from previously published research that assessed interactions of first and second year medical students at UCLA with the pharmaceutical industry. Upon WSU Institutional Review Board approval, all WSU second year PA students and WSU postgraduate first year clinicians were invited to participate in a 45 item, anonymous, online survey through surveymonkey.com between May 2008 and June 2008. The survey contained questions relating to the following: evaluating PA opinions towards marketing strategies, frequency of exposure to pharmaceutical representatives, perceptions towards accepting pharmaceutical gifts, and self-reported influence on prescribing behaviors. Responses were available in multiple choice, likert scale, and open ended question format.

Of the 80 subjects invited to participate in the survey, 76% (61/80) responded. The response rate for the second year PA students was 92% (35/38) and 62% (26/42) for the WSU postgraduate first year clinicians. Participant ages
ranged from 24 to 51 years with a mean age of 28 years and a standard deviation of 6 years. Our sample was comprised of 82% (50/80) females and 18% (11/80) males. Approximately 92% reported having received more than five small, non-educational gifts (pens, mugs, etc.), and half (51%) of respondents reported having received more than 15 small, non-educational gifts. Seventy-seven percent (77%) reported having eaten food provided by pharmaceutical reps more than 15 times. Thirty percent (30%) reported having received more than 15 journal reprints or glossy brochures, and 31% reported having received more than 15 drug samples. Although 92% of respondents reported being members of the AAPA and 51% reported being members of the KAPA, seventy-seven percent (77%) and eighty-five percent (85%) were unaware of the AAPA and KAPA policies, respectively. Less than half (44%) of respondents reported that their school/employer should teach them more about drug company-PA relationships.

Regarding influence on prescribing habits, fifty-six percent (56%) of respondents reported that their prescribing habits would not be affected by gifts from pharmaceutical companies. However, less than half (38%) of respondents reported that their colleagues would also be unaffected by the influence of gifts from the pharmaceutical industry. When ranking the appropriateness of gifts, ninety percent (90%) of respondents deemed that receiving a textbook or other educational material was appropriate, and 87% indicated that accepting a meal appropriate. One third (33%) of respondents reported that it was inappropriate to accept a gift worth less than $50, and 79% reported that receiving a gift worth more than $50 to be inappropriate.

3. Conclusions

This survey is the first glimpse into the influence of the pharmaceutical industry on PAs and PA students. It revealed results similar to previous studies done on physicians and medical students.

**Exposures** - A majority of the subjects did have interactions with the pharmaceutical industry. All respondents reported receiving food brought by pharmaceutical representatives, and approximately nine out of ten respondents also reported receiving more than five non-educational gifts. This indicates that any intervention implemented to decrease the number of physician-pharmaceutical industry interaction should also be applied to PAs.

**Attitudes** - Results revealed that PAs reported they thought they were less likely to be influenced by pharmaceutical influence than their colleagues. Fein et al. revealed that physicians and medical students reported similar attitudes regarding their prescribing practices. Inconsistency regarding the appropriateness of receiving gifts was evident. Ninety-two percent (92%) of respondents had accepted more than five non-educational gifts, however, one third of respondents deemed accepting a gift worth less than $50 inappropriate. These actions reveal inconsistencies in medical provider opinion and behaviors they practice.

**Implications for Medical Education** - A large percent of respondents who are members of AAPA and/or KAPA were unfamiliar with the policies regarding appropriate interactions with the pharmaceutical industry. In fact, 52% wanted more education about these relationships, while 32% were undecided. This illustrates an educational opportunity for these policy makers to better inform their constituents.

Design and Implementation of a Web Service for LiteOS-based Sensor Networks

Masaaki Takahashi, Basit Hussain, Bin Tang

Department of Electrical Engineering and Computer Science, College of Engineering

Abstract. This project presents the design and implementation of a web service for LiteOS-based wireless sensor networks (WSNs) to remotely monitor the light, temperature, magnet, and acceleration of the physical world. LiteOS is a newly developed operating system for the sensor motes. Taking advantage of UNIX-like shell commands and C programming language supported by LiteOS, this proposed web service enables the users to remotely query and visualize the sensor readings. Web service system is equipped with secure membership, a visualizer for sensor readings, and accepts parameterized queries.

1. Introduction

Wireless Sensor Networks (WSNs) enables users to interact with the physical world and receive real time information. The applications include agriculture and environmental monitoring, manufacturing and industrial sensing, battlefield, and disaster recovery. Connecting sensors to the Internet gives users more flexibility to manage and use WSNs. Since sensors have very limited memory and power supply, it is difficult to provide users with rich user interface and extensive data processing. Web services, which provide a mechanism for distributed sensor applications to share sensor deployments, are good solutions.

Web services were recently proposed to support interoperable and evolvable sensor networks [1]. However, the study of the architecture of web services for sensor networks is still in its infancy and remains unclear due to the lack of a standard middleware. This work proposes a web service architecture and implements a web service middleware for wireless sensor networks. The layered architecture, shown in Figure 1, is comprised of an application layer, a web service middleware layer, and a WSN layer. The web service middleware interacts with the front-end web application as well as the WSNs such that users can remotely request and view the sensor readings.

LiteOS [2], a new operating system for sensor motes developed by UIUC, is used in the project. A simple front-end web application to query and compare light, temperature, magnet, and acceleration sampled from sensors is developed. The queries can be parameterized in terms of number of the sampling nodes, intervals, and comparison type (e.g., comparing by nodes and networks).

Fig 1: Web service architecture for LiteOS-based sensor networks.

Web services for sensor networks have been developed in both research and commercial fields, such as Tiny Web Service [1, 3] and Arch Rock’s web service [4]. They are both based on TinyOS [5] operating system. TinyOS adopts NesC and the event-based programming model, which introduce a learning curve for most traditional programmers. On the other hand, LiteOS supports C programming and provides a UNIX-like abstraction for wireless sensor networks, which greatly improve its compatibility with other development platforms and simplify the sensor network programming. LiteOS includes three subsystems: LiteShell, LiteFS, and LiteOS Kernel. These subsystems provide several desirable features: (1) a hierarchical file system, (2) multi-threading, (3) Unix-like shell interface. These features are handy for the design and implementation of web services for sensor networks.

2. Experiment, Results, Discussion, and Significance

An experimental design and implementation in the project consists of three layers: an application, a web
service middleware, and a WSN layer. Application layer is responsible for handling client requests and sending the appropriate requests to middleware. It is implemented using Microsoft ASP.NET, and provides two basic functions: a membership system for login, and a visualizer for sensor results. The visualizer enables users to view the sensor readings by a simple chart and table. Figure 2 shows the light reading comparison of two sensor nodes using the visualizer. The communication between application layer and middleware is done by standard XML using SOAP and WSDL specification. Thus, web service system can be easily accessed by users via standard interface.

For middleware, Apache Axis-2, a core engine for web services is used. For WSN Layer, we use Crossbow IRIS motes. Compared with previous generation motes, IRIS demonstrates three times longer radio frequency range, half lower sleep current, and double program memory (8KB), which makes IRIS an ideal platform for web service development. A base station sits between middleware and WSN to facilitate the communication of these two layers.

As a result, several challenges exist in the integration of the middleware with the LiteOS: (1) how to handle multi-threading when multiple sensor responses are expected, (2) how to interact with LiteOS programmatically. For multi-threading, LiteOS's multithreaded kernel is used to run multiple applications concurrently. LiteOS supports Thread class in LiteC++ to perform multi-threading. For programmatic purpose, LiteShell, a subsystem of LiteOS, provides a practical schema such as Unix-like command-line interface to sensor nodes. Java is chosen as the development language for middleware since LiteShell uses Java communication API. As shown in Figure 3, an Event Handler is developed in the middleware to handle the requests of the web services, and to communicate directly with the Command Processor, which interprets user commands into internal forms and communicates with the sensor network.

After solving these challenges, system has the following features: (1) Middleware accepts parameterized requests through an front-end application, (2) Front-end application visualizes sensor readings, (3) Multi users request sensor readings simultaneously. More significantly, an easy-to-program approach to deploy web service on sensor networks is demonstrated.

3. Conclusions

A web service for LiteOS-based wireless sensor networks to remotely monitor the physical world is designed and implemented, and the feasibility of deploying web services using LiteOS-based sensor networks is demonstrated. Current phase of design and implementation is still in prototype level. The future works includes synchronous radio communication, remote application deployment, and multi-hopness.

4. Acknowledgements

The authors would like to thank Dr. Qing Cao of UIUC for his valuable suggestions.

5. References

Attitudes of United States Physician Assistants Toward Persons with HIV/AIDS

Anja K. Talley*, Kyrie G. Webster*, Richard D. Muma

Department of Physician Assistant, College of Health Professions

Abstract. Several studies have shown that a large number of healthcare workers have negative attitudes toward persons infected with HIV early in the epidemic, but a more positive shift has occurred in these attitudes over the last decade. These studies focused mostly on the perceptions of physicians, surgeons, and nurses. However, recent surveys about attitudes of mid-level providers, such as Physician Assistants (PAs), a large purveyor of health care services, are missing. Methodology: This cross-sectional survey was completed to determine the current attitudes of practicing PAs concerning individuals with HIV/AIDS. A nationwide randomized sample of 1,500 PAs was surveyed through the United States (U.S.) mail. The AIDS Attitudes Scale (AAS) developed by Froman, Owen and Daisy in 1992 was used as a self-reported measure of attitude toward persons with AIDS. In the scale, avoidance is described as fear of contracting the disease, and empathy is described as supportive attitudes towards persons living with HIV/AIDS. Results: The response rate was 16% (n=246). A majority had high empathy, low avoidance, and positive general attitude scores. Respondents living in the South had the highest avoidance and lowest general attitude scores compared with those living in other regions (ANOVA, p<.05). Conclusion: The results were consistent with similar current studies of healthcare workers, which demonstrated supportive attitudes towards persons with HIV/AIDS.

1. Introduction

Deaths due to HIV/AIDS in the U.S. have been declining in the past decade due to advances in management of the disease. The decrease in mortality is attributed to the improvement of testing, multi-drug treatments, and the preventative education that has been provided throughout the U.S. Additionally, the outpatient treatment has improved, moving the majority of management out of the hospitals. Therefore, the number of clinicians managing HIV/AIDS patients has increased dramatically. Historically, negative attitudes towards persons living with HIV/AIDS have affected the quality of care they received. There have been several studies investigating the attitudes of physicians, surgeons and nurses towards HIV-infected patients throughout the world, although studies on Physician Assistants (PAs) were limited. The purpose for conducting this study was to evaluate the current attitudes of PAs in regard to persons with HIV/AIDS.

2. Experiment, Results, Discussion, and Significance

Methodology

A nationwide randomized sample of 1,500 PAs was surveyed through the U.S. mail. The AIDS Attitudes Scale (AAS) developed by Froman, Owen and Daisy in 1992 was used as a self-reported measure of attitude toward persons with AIDS. [1,2] In the scale, avoidance is described as fear of contracting the disease, and empathy is described as supportive attitudes towards persons living with HIV/AIDS. Avoidance and empathy sub-scores were computed by determining mean scores from responses to the Likert-scale questions. Thus, it was expected that the avoidance and empathy scores would range from 1 (strongly disagree) to 5 (strongly agree). A high avoidance score would indicate strong avoidance or negative attitudes towards persons with HIV/AIDS; a high empathy score would suggest strong empathy or positive attitudes towards persons with HIV/AIDS. The general attitude score was computed by creating a difference score: empathy score minus avoidance score. The total score was expected to range from -5 to +5. Positive scores were to indicate a supportive attitude and negative scores were to indicate an intolerant, non-therapeutic attitude. The results were analyzed using descriptive, t-test, and ANOVA statistics.

Results

Respondents had a mean avoidance score of 1.78 with a standard deviation of +/- 0.51 and a mean empathy score of 4.55 with a standard deviation of +/- 0.46. A mean general attitude score was 2.78 with a standard deviation of +/- 0.82. A summary of these scores can be found in Table 1.
Table 1

<table>
<thead>
<tr>
<th>Avoidance, Empathy and General Attitudes Scores in Regard to the Care of HIV/AIDS Patients (n=237)</th>
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<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Avoidance              1.79</td>
</tr>
<tr>
<td>Empathy                4.55</td>
</tr>
<tr>
<td>General Attitudes      2.78</td>
</tr>
</tbody>
</table>

Avoidance, empathy and general attitude score were compared to demographic characteristics. The survey population was divided into two age groups 25 to 38 and 39 to 72. The mean avoidance score for the 25 to 38 year olds was 1.88, while the score for 39 to 72 year olds was 1.70 with a standard deviation of +/- 0.49 (p<.01). The mean general attitude score of the respondents between the ages of 25 to 38 was 2.67, while the group of 39 to 72 was 2.89 with a standard deviation of +/- 0.75 (p<.05).

Males had an avoidance score of 1.93 and females 1.72 with a standard deviation of +/- 0.54 (p<.01). Males had a mean empathy score of 4.46 while females 4.61 with a standard deviation of +/- 0.56 (p<.05). Males also had a mean general attitude score of 2.56 and females 2.89 with a standard deviation of +/- 0.91 (p<.01).

Married respondents had a mean avoidance score of 1.85 while single respondents had a score of 1.65 each with a standard deviation of +/- 0.52 (p<.01). Married PAs had a mean general attitude score of 2.70 while singles had a score of 2.95 each with a standard deviation of +/- 0.83 (p<.05).

Further analysis by state of practice (recoded into the four United States Census Bureau regions [Northeast, Midwest, South and West]), revealed a significant difference between the Northeast and South regions (Table 2). Means and standard deviations of avoidance, empathy, and general attitude scores were calculated based on these census regions. The South had the highest avoidance scores, 1.91 with a standard deviation of +/- 0.49.

Table 2

<table>
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<tr>
<th>Means and Standard Deviations of Avoidance, Empathy, and General Attitude Scores Based on Census Regions (One-Way ANOVA)</th>
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<tbody>
<tr>
<td>Census Region</td>
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<tr>
<td>Northeast</td>
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<tr>
<td>Midwest</td>
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<tr>
<td>South</td>
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<tr>
<td>West</td>
</tr>
</tbody>
</table>

Overall, the respondents had high empathy and low avoidance scores. Additionally, the respondents had a positive general attitude score. However, those that were younger and married and male were less supportive in their attitudes towards patients with HIV/AIDS while those who were older and single and female were more supportive in their attitudes towards these individuals.

The overall scores suggest a supportive and therapeutic attitude towards persons with HIV/AIDS, which was different from what was seen earlier in the epidemic among most health care providers. [3] Martin stated that one reason for a shift from negative to more positive attitudes was the fact that health care providers were becoming more knowledgeable and experienced with the management of persons with HIV/AIDS. [3]

3. Conclusions

The importance in this study is reflected by the fact that this is one of the first known studies conducted recently to assess the attitudes of practicing PAs towards persons with HIV/AIDS. This study appears to reveal that PAs who responded to the survey express supportive attitudes towards persons with HIV/AIDS. This finding is consistent with other health professionals. [2, 3, 4]

4. Acknowledgements

We would like to acknowledge Richard Muma, PhD, MPH, PA-C, Research Advisor. Also, Robin Froman, RN, PhD, Steven Owen, PhD and Carol Daisy, RN, MSN for giving permission to use their survey.

The Anatomy of Teenage Cliques: Communication Behavior at the 2008 Kansas State Fair and in Popular Media

Chigozirim Utah*

Elliott School of Communication

Abstract: Assumptions are often made about teenagers, and how they interact with one another within groups. These stereotypes are influenced largely by how teenagers are portrayed in the media and popular culture, and are indicative of how teenagers are viewed and characterized by society [1]. This paper reports on a grounded observational study conducted at the 2008 Kansas State Fair. The researcher observed verbal and nonverbal teen relationship behavior within the self-contained, unrestricted context of the Freak Out ride, where there was minimal presence of parents, teachers, and older authority figures. This context was chosen because it was designed to appeal to teenage participants through the use of popular music, young, attractive carnival workers, targeted games, and daring rides. Comparisons and contrasts will be made between the teenage clique and group relationships observed at the Kansas State Fair, and teenage clique representations in popular media, specifically TV shows and movies. Findings from this study will also be applied to academic research on teenage friendships, clique behaviors and stereotypes.

1. Introduction

The hypodermic needle theory characterized humans as media customers, who passively received, accepted and acted upon messages disseminated through an omnipotent media. The theory has long since been disproven and is now considered obsolete, due in part to the work of Lazarsfeld, Berelson, and Gaudet (1944) [2] who advanced a reciprocal influence between media and society. Gerbner (1967) [3] concluded that there is no doubt that the media exerts great influence on society; however, society’s effect on the media is just as powerful. Utilizing ethnographic research findings from the observation of teenage cliques at the Kansas State Fair, this study attempts to demonstrate the reciprocal influence of society and media, specifically social behavior displayed by teens at the Kansas State Fair, and popular TV shows and movies.

2. Experiment, Results, Discussion, and Significance

This research project was a grounded qualitative study, utilizing the tool of unobtrusive observation [4] for field research and content analysis for TV and movie assessments.

Experiment

Unobtrusive observation was the most appropriate method of data collection because if teen subjects had been aware that an older person was observing them, their behavior could have been altered [4]. Secondly, the goal was to observe verbal and nonverbal dynamics of teenage group behavior. As a result, while physical proximity to subjects was critical, it was not necessary for the researcher to engage as a participant observer. Upon arrival at the research site (the Kansas State Fair) the framework and site best suited to the research topic were selected. An hour and a half was spent selecting the most naturalistic context possible. Observational data was gathered in the vicinity of a ride called Freak Out, including the areas and walkways surrounding it. The observation site was chosen due to the high proportion of teenagers in the area, relative to adults. There was also a constant flow of teenagers passing through the area. A variety of events were observed. Even though the Freak Out ride contained the highest concentration of teenagers, the surrounding areas such as the Tilt-a-Whirl ride, and the food stands were also observed. These areas also contained teenage groups who were either passing through or lingering in the area. Ethnographic data was collected over a period of five hours. Special attention was made to collect data in as much detail as possible. It was important to preserve the context of the teen’s verbal and nonverbal interactions in order to yield accurate analysis.
Results

A thematic analysis to uncover patterns in the ethnographic data was conducted. Observations were not guided by pre-established categories, but these categories were inductively generated.

A content analysis of teen TV shows and movies like Gossip Girl and Mean Girls, selected post hoc, was conducted to uncover patterns in teenage group representation. The teen TV shows and movies selected for content analysis are widely known, and highly rated, with large teenage and non-teenage followings. The patterns uncovered from both the thematic and content analysis allowed for response to the research question, “What roles do the media and society play in the enactment of teen group and clique behavior?”

3. Conclusions

The predominant theme that emerged from both Kansas State Fair and media analyses was “group homogeny.” All groups observed at the Kansas State Fair and portrayed in the TV shows and movies examined exhibited high levels of homogeneity in three major areas:

- Teenage groups are predominantly racially homogenous.
- Each teenage group and clique was dressed in similar brands and styles of clothing.
- Each teenage group and clique was homogenous with respect to communication style.

Due to the above observations, stereotypical images of highly homogenous teenage groups on TV and in movies seem to be reflections of actual teen group and clique behavior that occur in naturalistic settings.

4. Acknowledgements

I would like to give special thanks to Dr. Deborah Ballard-Reisch for supervising this whole project, and my colleague, Jeffery Preston. I would also like to thank my classmates for their academic support and input.

Tensile Stress Concentration Due to Counter Sunk Holes in Adhesively Bonded Layered Aluminum

Bharadwaj Veera Raghavan* and K.S. Raju

Abstract: The adhesively bonded layered aluminum is used in aircraft structures to avoid knife edge situations when flush head fasteners are used with minimum gage skins. A 3-D finite element model was used to estimate the location and magnitude of stress concentration under remote tension for aforementioned. The influence of the countersunk depth and adhesive properties on the stress concentration was investigated for a counter sunk angle of 100 º. The stress concentration was found to be maximum at the countersink edge for $E_{adh}/E_{al} > 0.1$ whereas it is slightly below the countersink edge in straight shank portion for $E_{adh}/E_{al} < 0.1$. Stress concentration was found to be minimum when the adhesive is positioned in the countersunk section.

1. Introduction

Riveting is the most common process used to join aircraft structures. Countersunk holes are used in aircraft structures to accommodate flush head fasteners to attain aerodynamically smooth surface. Due to the countersunk holes, skins with minimum gage thickness are subjected to heavy localized stresses. To support these structures, a doubler is bonded to the skin using adhesives. The adhesively bonded layered aluminum is also used to avoid knife edge situation when the flush head fasteners are used with minimum gage skins.

Definition of stress concentration. Stress concentration $[1] K_t(z)$ is defined as the ratio of hoop’s stress $\sigma_{yy}(z)$ to the applied remote tension $\sigma_0$, as shown in the Figure 1.

2. Analysis

A quarter symmetry model of the geometry was modeled using ABAQUS. A detailed evaluation of present finite element model with available data [3][4][5] was done to validate accuracy of the model. The test of convergence was carried out on one of the models with fine tuning of mesh and no. of elements to ensure if the solution will converge as shown in the Figure 2. FE model for a range of configurations such as ratio of young’s modulus of adhesive to aluminum, different positions of adhesive ($C_a$) for different $C_s/t$, ratio of thickness to radius and ratio of width to radius by maintaining the loading far off from the hole by using $h/r=15$. The thickness of adhesive was maintained constant for all simulation as $T_{adh}=0.005$in. The investigation was conducted for $\sigma_0=1000$ psi and stress along the nodal line A-B-C were taken which gave the stress concentration $K_t(z)$. A constant countersink angle of 100 º was used in all simulation, as the effect of counter sunk angle can be ignored for small change in angle as published by Shivakumar et.al [3].

3. Results

Simulation was carried out for different modulus ratio such as $E_{adh}/E_{al}= 0.1, 0.2, 0.4, 0.5$ and $0.8$ for a configuration of $C_s/t=0.5$, $C_a/t=0.5$ and $w/r=15$. The results were presented in the Figure 3. The value of $K_t(z)$ is observed to be monotonically decreasing with increasing ratio of $E_{adh}/E_{al}$. For higher ratios (such as $E_{adh}/E_{al} > 0.1$) the maximum stress concentration is observed to be at the countersink edge, whereas for the smaller ratios...
(such as \( E_{adh}/E_{al} < 0.1 \)) the maximum \( K_t(z) \) was observed to be in the straight shank portion slightly below (5% of thickness) the countersink edge.

The value of \( K_t(z) \) decreases with increasing width of the plates. These results were in concurrence with the experimental results of Shivakumar et al. [3]. For very wider plates (such as \( w/r > 15 \)), \( K_t \) value for monolithic specimen is higher than that of the bonded specimen as shown Fig. 4.

The value of \( K_t(z) \) increases monotonically with increase in ratio of thickness to radius for various sets such as \( t/r = 0.5, 1, 2 \) and 4. The results obtained are in agreement with the trend obtained by Shivakumar et al. [3] and Young et al. [5]. The shear stress \( \sigma_{\theta z} \) along the circumference of adhesive was found to be minimum at \( x = r \) and \( y = r \) and it is maximum at an angle 45º from the \( x = 0 \).

Different configurations were made by altering the position of \( C_b/t = 0.2, 0.5, 0.6 \), and 0.8 for different \( C_s/t = 0.5 \) and 0.25 respectively. The value of \( K_t(z) \) is lowest when the adhesive layer is positioned in the countersunk section far from the countersunk edge.

4. Conclusion

The results established that the stress concentration value is higher for bonded specimens when compared with monolithic sheets as shown in the fig. 4 and fig. 5. Ratio of young’s modulus adhesive to aluminum, position of adhesive, countersunk sunk depths, and radius and width are the factors which affect \( K_t(z) \) in bonded layered specimens.

![Fig 2 Mesh sensitivity](image1.png)

![Fig.3 Effect of young’s modulus of adhesive to aluminum](image2.png)

![Fig4. Finite width effects](image3.png)

![Fig 5 Effect of thickness to radius ratio](image4.png)

![Fig.6 Altering the position of adhesive](image5.png)


PEM Cells- Performance, Durability and Role in Energy Storage

Yaamunan Venkatesan*
Department of Mechanical Engineering, College of Engineering

ABSTRACT

Energy storage to reduce peak-load demands on utilities is emerging as an important issue to address the intermittency of renewable energy resources. Wind energy produced in the middle of the night may be wasted unless it can be stored, and, conversely, solar energy produced could be used after the sun goes down if we had an efficient way to store it. The role of fuel cells in energy storage is an emerging issue and it is being compared with regular batteries for the advantages of fuel cells over the latter. PEM (Polymer Electrolyte Membrane) fuel cell is one of the technology/tools being looked into for its effectiveness and durability in energy storage. PEM fuel cell uses an electrochemical process to convert hydrogen gas into electricity. But the performance and durability of PEM fuel cells are significantly affected by the various components used in them. This paper attempts to investigate those issues and tries to provide information regarding the various factors affecting its performance and durability.

INTRODUCTION

A fuel cell is an electrochemical conversion device. It produces electricity from fuel (on the anode side) and an oxidant (on the cathode side), which reacts in the presence of an electrolyte. The reactants flow into the cell, and the reaction products flow out of it, while the electrolyte remains within it. Fuel cells can operate virtually continuously as long as the necessary flows are maintained. A fuel cell works by catalysis, separating the component electrons and protons of the reactant fuel, and forcing the electrons to travel through a circuit, hence converting them to electrical power. The catalyst typically comprises of a platinum group metal or alloy. Another catalytic process takes the electrons back in, combining them with the protons and oxidant to form waste products. These fuel cells have many advantages over conventional batteries yet they are not widely used. They can play a major role in energy storage as well as being a cost effective technique. The fact that they have some drawbacks is a major setback in commercializing these fuel cells. There are five parameters which affect the performance and durability of fuel cells the most. If measures are taken to overcome these drawbacks, fuel cells can be effectively used in place of conventional batteries.

LITERATURE SURVEY/REVIEW

W. Smith [1] has investigated extensively the role of fuel cells in energy storage. When used as an energy storage device, the fuel cell is combined with a fuel generation device, commonly an electrolyzer, to create a Regenerative Fuel Cell (RFC) system, which can convert electrical energy as a storable fuel and then use this in a fuel cell reaction to provide electricity when needed. The key to the effectiveness of an RFC system is the ability to separate the energy storage function from the power conversion function allowing each to be optimized. PEM cells are cost effective when compared to the regular batteries (as shown in Figure 1).
Schmittinger et al. [2] reviewed the various parameters affecting the performance and durability of fuel cells. They are water management, degradation of components, cell contamination, reactant starvation and thermal management. Berg et al. [3] have looked into the intricate aspects of water management in PEM cells. Flooding occurs in the PEM cells due to accumulation of water both in the anode and cathode side. Paquin et al. [4] analyzed the cathode flooding and dry out scenario in PEM fuel cells. Cathode flooding occurs due to the following reasons: oxygen reduction reaction, electro osmosis, saturated and humidified reactant gases. This can be overcome by water evaporation and water back diffusion method. Anode flooding is caused due to low current density and temperatures, liquid water injection and humidification for cooling purposes. Wu et al. [5] studied the durability of PEM cells based on the degradation of its components. Degradation of components occurs due to repeated usage of the PEM cell, high temperatures and humidification level. Electrolyte membrane degradation takes place both chemically and mechanically. This is overcome by removing the weaker end groups in the polymer. Baschuk et al. [6] studied the poisoning of fuel cell by carbon monoxide. Contamination of PEM cells take place due to carbon monoxide formation on the anode side. Some pollutants like metal, alkaline metal and ammonium ions, silicon and catalyst particles as well as carbon monoxide (CO), nitrogen oxides (NOx) or sulfur dioxide (SO2) can be present in the cell. CO is formed on the platinum catalyst and this avoids hydrogen from reaching the catalyst. This results in the degradation of fuel cell performance. But this contamination is only on the anode side. Reactant gas starvation occurs when excess water blocks the pores of the gas diffusion layer in PEM cells. This results in the formation of hydrogen in the cathode or oxygen in the anode side. PEM cells find its application at various ranges of temperatures. Yu et al. [7] analyzed the thermal management in PEM fuel cells with large surface area. When used at sub zero temperatures the residual water freezes and causes thermal stresses. Its performance decreases as the temperature decreases but still it was found that at elevated temperatures its durability is affected.

**CONCLUSION**

The literature review focuses on the papers that are related to energy storage in fuel cells and parameters affecting the performance and durability of fuel cells. Energy storage plays a vital role in supplying electricity at times of peak demand. The comparison of fuel cells and conventional batteries show that fuel cells are cheap and efficient. Various fuel cell technologies were compared and two of the most widely used ones (PEM cells and SOFC) were looked into. Various parameters affecting the performance and durability of fuel cells were well defined and their drawbacks were thoroughly studied. Future research would look into the advantages and disadvantages of PEM and SOFC fuel cells over each other. Also research on this could lead into looking at hybrid systems which can use different fuel cell technologies and test them via simulations.

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**PARTIAL REFERENCE**

Synthesis and Biological Evaluation of Drug-Carrying Magnetic Nanocomposite Particles for Targeted Drug Delivery

Wamocha, H.L*, Misak, E.H. and Asmatulu, R.

College of Engineering, Department of mechanical Engineering

Abstract. Drug-carrying magnetic nanocomposite spheres were synthesized using \( \text{Co}_{0.5}\text{Zn}_{0.5}\text{Fe}_{2}\text{O}_{4} \) nanoparticles and poly (D, L-lactide-co-glycolide)(PLGA) for the purpose of magnetic targeted drug delivery. Magnetic nanoparticles (MNP) (~10 nm) were prepared by a chemical co-precipitation of Sulphate salts in the presence of sodium hydroxide. Oil-in-oil emulsion/solvent evaporation technique was conducted at 7000 rpm and 1.5-2 hrs agitation for the synthesis of nanocomposite spheres. Specifically, PLGA and the cancer drug 5-Fluorouracil were first dissolved in Acetonitrile (oily phase I) and combined with MNP. The drug, MNPs and polymer solution was added drop-wise into viscous paraffin oil combined with Span 80 (oily phase II). 10%, 15% and 20% of MNP in the nanocomposite spheres were evaluated in terms of particle size, morphology and magnetic properties using X-ray and SQUID, Fluid flow and Biological trials were carried out to determine their effectiveness in targeted drug delivery.

1. Introduction

To help meet the goal of eliminating cancer, the national Cancer institute (NCI) is engaged in efforts to use nanotechnology to change the way we diagnose, image and treat cancer [1] through funding research aimed at integrating the new ideas in nanotechnology with biomedical applications. Nanotechnology has the potential to offer solutions to these obstacles in cancer therapies, because of its unique size (1-100nm) and large surface to volume ratios [2]. There is an increase in the use MNP [3] by embedding in biodegradable polymers which deliver drug to the target site thus increasing drug efficiency, maximizing patient compliance and increase drug options[4, 5]. The drug is guided by an external magnet to the target site and released [4].

MNP are prepared by ceramic, sol gel and co-precipitation techniques and exhibit super paramagnetic properties allowing them to gain magnetism easily with an applied magnetic field and lose when the applied field is removed [10]. In this research, mixed ferrites of cobalt and zinc (\( \text{CO}_{0.5}\text{Zn}_{0.5}\text{Fe}_{2}\text{O}_{4} \)) were prepared while previous experimental studies have been done on the fabrication and characterization of these ferrites in various concentrations at nanoscale and in bulk [7-13], a comprehensive study has not been done on the suitability of cobalt substituted zinc ferrite for targeted drug delivery.

2. Experimental methods, Results, Discussion and Significance

Magnetic nanocomposite preparation. This process involves the preparation of magnetic nanocomposite by emulsion- solvent evaporation method. The polymers PLGA 50:50 m (wt 40,000 -75,000) are dissolved solvent Acetonitrile placed in a conical flask in the first phase. The flask is then placed on a mixer operating at 7000rpm for about 30 minutes. The MNP and the Drug are then added to the solution until the nanoparticles are fully dispersed. The second phase on the other hand is prepared by adding paraffin to a surfactant in a separate beaker. The first phase is then added to this phase drop wise under a mixer operating at 7000rpm, using a centrifuge running at 1700rpm for 20 minute at 10 degrees, magnetic polyspheres are separated, washed, filtered and dried at room temperature.

Magnetic characterization and Fluid flow studies. Figure 1 shows the XRD patterns of the MNP prepared and dried at room. The broad peak at \( 2\theta \) equal to 35° consistent with (311) plane observed confirms the formation of spinel oxides with a cubic structure and small particle size. The average particle size is about 10 nm. Figure 2 shows typical saturation magnetization curve for three different samples of magnetic nanocomposite. With constant PLGA concentration the MNP concentration was added in three concentrations of 10%, 15% and 20%. As could be seen from the figure 2, the saturation magnetization increased with MNP concentration. The hysteresis loop is consistent with super paramagnetic behavior of MNP existing as single domains. The temperature dependence of the magnetic field in figure 3 shows an increase in the blocking temperature (Tr)
with an increase in the MNP concentration. Above $T_B$ the magnetization decreases in all cases with increasing temperature. Figure 4 shows the MNP characteristics when made to flow within a magnetic field of 0.47 T. A decrease in the percentage of MNP captured with increasing speed and also increasing tube size is observed. Biological trials were carried out on normal cell cultures using magnetic nanocomposite, the polymer, the medium and the drug. Figure 5 shows a low activation index implying a decrease in the number of normal cell in the samples when the cells were exposed to the nanocomposite and the drug. the effectiveness of the additions were all affected by the concentration in the individual wells.

3. Conclusion

Drug-load magnetic nanocomposite spheres were fabricated, characterized and tested to determine their suitability in magnetic drug delivery. Mixed ferrites of cobalt and zinc ($\text{CO}_0.5\text{ZN}_0.5\text{Fe}_2\text{O}_4$) at the concentrations identified ($X=0.5$) were prepared by co-precipitation and magnetic nanocomposite by emulsion-solvent evaporation method. The samples showed super paramagnetic behavior with MNP approximately 10nm in size. the magnetic saturation and the locking temperature increased with increasing concentration.
Evaluating a Community Health Center’s Diabetes Project: A Strategy to Reduce Health Disparities

Shoshana Wernick*, Rhonda Lewis-Moss

Department of Psychology, College of Liberal Arts

Abstract. Diabetes poses a serious health problem in the African American community who experience significantly higher rates of diabetes and diabetes complications when compared to Caucasians. The current study evaluated a Diabetes Project implemented by a local community health care center. The goal of the evaluation was to determine the effectiveness of the Diabetes Project in lowering clinical outcomes. There were 216 participants – 143 African Americans, 55 Caucasians, and 18 Other. Twenty one (9.3%) had Type 1 diabetes, and 195 (90.3%) had Type 2 diabetes. The HbA1c, blood pressure (BP - systolic and diastolic), LDL cholesterol, and body weight was measured at baseline and at the last visit. The results showed that three of the five pairwise comparisons were significant – HbA1c, and BP (systolic and diastolic). There were also significant within-in group differences for females and males.

1. Introduction

Although the past 2 decades has witnessed an improvement in the overall health of the U.S. population, there are still significant disparities in the health outcomes and mortality rates in racial and ethnic minorities [1]. In the quest to reduce health disparities by the year 2010, the former Surgeon General, Dr. David Satcher, identified six core areas in need of special attention -- diabetes was identified as one of the top six priority health problems [2]. The Centers for Disease Control and Prevention [3] reported that the prevalence of diabetes has continued to rise in the 21st century and was ranked as the 6th leading cause of death in 2005. The rates of type 2 diabetes have now reached epidemic proportions. African Americans have a greater prevalence of diabetes with an estimated 50 to 100% higher rates of diabetes when compared to Caucasians [4]. A major concern with diabetes is that if left uncontrolled, it can result in many serious health complications and premature death. Diabetes is a major cause of heart disease and stroke, kidney failure, lower limb extremity amputations, and blindness. The focus of this paper will be on a community-based agency’s effort to evaluate their Diabetes Project that treats predominantly low income and underserved populations as a strategy to reduce health disparities.

2. Experiment, Results, Discussion, and Significance

Participants

Participants in this evaluation were obtained from archival data collected at the Center for Health and Wellness (CHW) from patients who attended the CHW and were diagnosed as suffering from diabetes during the period January 1, 1998 – June 30, 2008. The total number of participants was 216 of which 147 (68.5%) were females and 69 (31.5%) were males. Their ages ranged from 19 to 101 (M = 53.39, SD = 14.77). The ethnicity of the participants consisted of 143 (66.6%) African Americans, 55 (25.5%) Caucasians, and 18 (8.3%) Other. Of the participants, 22 (10.2%) had Type 1 diabetes, and 195 (90.3%) had Type 2 diabetes. BMI levels: 18 (8.3%) Normal, 33 (15.3%) overweight, 142 (65.75%) were obese, and 1 (.5%) was underweight. One hundred and seventy two participants (79.6) had high blood pressure and 43 (19.9%) had normal blood pressure levels. Thirty participants (13.9%) reported that they had intentions of self-managing their diabetes, 136 (63%) reported they had no intentions of self-managing their diabetes, and 50 (23.1%) chose not to answer the question.

Setting

The Center for Health and Wellness (CHW) is located in northeast Wichita, Kansas. The CHW is a community-based clinic formed to provide primary health care to all the community members as well as placing
a strong emphasis on prevention and wellness education. Monthly free screenings for hypertension, diabetes, and other chronic diseases are offered to the community. The CHW incorporated a Diabetes Project into their programs due to the fact that the majority of their patients are African Americans who suffer a disproportionate burden of diabetes. Outreach workers, viewed as the connectors between the underserved or vulnerable communities to health care services, play a vital role in the functioning of the CHW. These outreach workers share the same cultural and ethnic characteristics as the community members and are able to provide social and emotional support to the community members through their community outreach efforts as well as providing encouragement and instruction on the need to self-manage their diabetes.

Results

A paired-samples t test was conducted to evaluate whether the Diabetes Project resulted in changes in the means from baseline and last measure for HbA1C, BP, LDL, and BMI. Results showed that 3 of the comparisons were significant: 1) HbA1c (M = .45, SD = 1.97), *t*(215) = 3.33, *p* < .01, *d* = .23; 2) BP systolic (M = 5.35, SD = 21.97), *t*(215) = 3.58, *p* < .01, *d* = .24; and BP diastolic (M = 4.23, SD = 13.23), *t*(215) = 4.23, *p* < .01, *d* = .32.

A paired-sample t test, stratified by gender, was conducted to further investigate within-group differences between females and males. Females reduced the HbA1c from 8.10 to 7.66 (.44, *p* < .01); systolic blood pressure from 136.30 to 132.32 (3.98, *p* < .02); and diastolic blood pressure from 83.63 to 79.71 (3.92, *p* < .01). Males reduced the HbA1c from 8.25 to 7.77 (.48, *p* < .04); systolic blood pressure from 134.29 to 126.00 (8.29, *p* < .01); diastolic blood pressure from 82.83 to 77.93 (4.9, *p* < .01); and LDL from 114.94 to 105.71 (9.23, *p* < .01).

Unexpected Findings

At baseline measurement, 30 (13.9%) participants reported that they intended to practice self-management (SM) of their diabetes, 136 (63%) reported they had no intentions of self-managing their diabetes, and 50 (23.1%) chose not to answer the question. At the date of the last visit, 110 (50.9%) participants were practicing self-managing their diabetes, 67 (31%) were not engaging in SM, and 39 (18%) were not recorded. There was a significant increase in self-management practices from baseline to last visit (13.9% to 51.4%, *p* < .01).

3. Conclusions

The purpose of this evaluation was to determine the effectiveness of the Diabetes Project conducted at a community-centered clinic that serves predominantly a low income and underserved population. The results showed that there was an overall improvement in the HbA1c and systolic and diastolic blood pressure measures. This was encouraging as these are two important risk factors that need to be controlled in order to avoid diabetes-related complications and premature mortality. The unexpected finding was the significant improvement in the self management behaviors. Patient self-management is an important component for controlling chronic diseases resulting in improved clinical outcomes, reduced health care costs as well as improved psychosocial outcomes for the patient. This finding reinforces the concept that interventions using community outreach workers can have an impact on improving health outcomes, especially with traditionally underserved communities. Community health care centers, such as the CHW, have been identified as an important avenue to close the gap. It is, therefore, important to conduct collaborative participatory research between universities and community-based agencies to demonstrate outcomes and build capacity to function as effectively as possible to reduce health disparities.

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Molecular Triads Comprised of Boron dipyrrin-C₆₀ Dyad Connected to Either an Energy or Electron Donating Entity to Probe Sequential energy/electron Transfer Events

Channa A Wijesinghe*, Francis D’Souza

Department of Chemistry

Abstract. In natural photosynthesis two major processes, absorption of light energy by antenna system and transportation of that light energy to the reaction center take place efficiently. There is a growing interest to mimic these processes in artificial systems with an ultimate aim of harvesting solar energy.

In the present study, we wish to report novel molecular triads comprised of boron dipyrrin-fullerene dyad covalently linked to either an energy donating entity (En-D1-A type triads) or a secondary electron donating entity (D2-D1-A type triads) to probe sequential energy/electron transfer events. Anthracene, pyrene, fluorene and naphthalene are chosen to be energy donating (En) entities while ferrocene and triphenylamine entities are chosen as secondary electron donors (D2 - hole transfer agents) (see Scheme 1 below). Systematic spectral, electrochemical and emission studies are performed to probe sequential energy transfer followed by electron transfer events in the newly synthesized triads. Computational studies using B3LYP/3-21G* are performed to arrive at the geometry and electronic structures. Photochemical study using time-resolved emission is performed to probe electron transfer events. Further, organic photocells are being built to directly convert light energy into electricity.

Scheme 1

Experiment, Results, Discussion, and Significance.

Absorption and emission (ex 345 nm) spectra of pyrene & toluayl appended BDP compounds in DCB.
Absorption and emission (ex 350 nm) spectra of ferrocene phenyl appended BDP compounds in DCB

**Summary:**

1. Novel supramolecular triads featuring boron dipyrrin and fullerene as primary donor-acceptor pair are designed, synthesized and characterized by using various physico-chemical methods.
2. Electrochemical studies followed by free-energy calculations suggested possibility of photoinduced electron transfer in the triads.
3. The calculated geometry and electronic structures reveal closely spaced donor and acceptor entities in the triads.
4. The triads of the type En-D1-A reveal efficient singlet energy transfer upon excitation of En entity to the D1 entity followed by electron transfer events.
5. The triads of the type D2-D1-A show efficient fluorescence quenching suggesting occurrence of photoinduced electron transfer.
6. Further studies involving time-resolved emission and transient absorption are in progress.

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Nitrofurantoin-Induced Pulmonary Toxicity

Ryan Todd Wilkin*1, LaDonna S. Hale1, Richard A. Claiborne2

1Department of Physician Assistant, College of Health Professions and 2Pulmonary Medicine, Wichita Clinic

Abstract

Background: Nitrofurantoin is commonly prescribed to treat and prevent uncomplicated urinary tract infections. Although generally considered safe, one rare but serious side effect is chronic pulmonary toxicity. Purpose: Describe a single incident of chronic nitrofurantoin-induced pulmonary toxicity that was nearly overlooked, in part, due to poor chart documentation of home medications. Case Report: An 89 year old female presented to the emergency department (ED) with a one month history of fatigue, nonproductive cough, and weakness. Chest radiograph demonstrated extensive interstitial changes with bilateral cyst formation or possible cavitation. Because of incomplete medication histories documented in nursing, ED, and pulmonary consult records, prior chronic nitrofurantoin use was not recognized. On day two of hospitalization, a complete home medication list was obtained and all medications resumed. It was then that the use of nitrofurantoin was recognized and a diagnosis of chronic nitrofurantoin-induced pulmonary toxicity was made. A chest radiograph performed 22 months later demonstrated resolution of toxicity. Conclusion: Poor documentation of home medications coupled with the rarity of occurrence of this adverse reaction and slow insidious onset of symptoms created a diagnostic dilemma for clinicians. Describing this relatively rare adverse reaction to a commonly prescribed antibiotic may remind clinicians to consider drug toxicity in patients who develop new onset of pulmonary symptoms while taking nitrofurantoin. This case also highlights the importance of thorough documentation and awareness of home medications in making accurate diagnoses.

1. Introduction

Nitrofurantoin is an antibiotic commonly prescribed for the treatment and prevention of uncomplicated urinary tract infections. Although generally considered safe, one rare but serious side effect is pulmonary toxicity.[1] Because of the rarity of occurrence and slow, insidious onset of symptoms, chronic nitrofurantoin pulmonary toxicity may be overlooked as a cause of new onset respiratory symptoms.

2. Case Presentation

An 89 year old Caucasian female presented to the emergency department with a one month history of fatigue, nonproductive cough, and weakness, progressing over the past three days to the point where she was unable to attend meals in her assisted living facility’s cafeteria. Her nonproductive cough is exacerbated with deep inspiratory effort. The patient denied fever, chills, night sweats, shortness of breath, nausea, vomiting, weight loss, syncope, or chest pain. Past medical history included hypertension, cystocele (fallen bladder), mild dementia and recurrent urinary tract infections. The patient could only recall taking a blood pressure medication, metoprolol, and a sulfa agent for chronic urinary tract infections.

Physical examination: On admission the patient was alert and oriented, pulse was 74 beats per minute; respirations 20 breaths per minute; blood pressure 153/70 mmHg; and room air pulse oximetry saturation was 90%. Pertinent physical exam findings revealed bilateral rales and cough with deep inspiratory effort. Extremities were without clubbing or cyanosis and one centimeter pedal edema was present on the left with tenderness to palpation.

Testing: Chest radiograph demonstrated extensive interstitial changes with bilateral cyst formation or possible cavitation. These findings were not present on previous chest radiographs dated three years prior. Hospital Course: Because of inconsistencies between medication histories documented by nursing, the ED physician and pulmonology physician assistant, the patient’s assisted living facility was contacted to reconcile the home medication list. The patient was restarted on her home medications including nitrofurantoin 100 mg once daily. During unrelated medication monitoring, a pharmacist recognized the possibility that nitrofurantoin could be the cause of the pulmonary symptoms and alerted the pulmonologist. The nitrofurantoin was discontinued. A high resolution chest computerized tomography (CT) was obtained which demonstrated extensive septal thickening and periseptal areas of infiltrate throughout all lung fields. Flexible bronchoscopy was performed; airways appeared normal. No malignant cells were identified and all cultures were negative. Transbronchial biopsy revealed chronic interstitial pneumonia, thickened alveolar septa, and increased alveolar macrophages.
The injury pattern was compatible with nitrofurantoin toxicity.

**Discussion:** Nitrofurantoin-induced pulmonary toxicity is categorized either as acute or chronic in presentation. Pulmonary toxicity is rare; the incidence of acute toxicity is estimated in 1/5000,[2] with the acute presentation out numbering the chronic 9:1.[3] The presentation of acute pulmonary toxicity can be alarming and may include fever, chills, cough, shortness of breath, elevated erythrocyte sedimentation rate, eosinophilia, and chest pain and diffuse pulmonary infiltrates on chest radiograph.[1-3] Development of acute toxicity most often occurs within 3 – 8 days of nitrofurantoin initiation.

Unlike the acute form, chronic nitrofurantoin-induced pulmonary toxicity has a slow, insidious onset, often presenting months to years after treatment is initiated.[1,4] Middle aged and older women dominate the patient population likely due to the susceptibility to recurrent urinary tract infections in this sex and age group.[1,4] As in this case, patients typically present with gradually increasing shortness of breath and nonproductive cough with bilateral, scattered crackles on physical exam.[3] and diffuse bilateral interstitial infiltrates on chest radiograph and bilateral patchy ground glass attenuation on chest CT.[4] It does not appear that acute toxicity leads to chronic toxicity or that chronic lesions follow an acute reaction to nitrofurantoin.[5] Currently, the mechanism of chronic nitrofurantoin–induced pulmonary toxicity has not fully been elucidated but it is thought to be related to direct oxidative damage to the lungs.[6]

Primary treatment for chronic pulmonary toxicity begins with discontinuation the medication. Early diagnosis and discontinuation of nitrofurantoin is important in preventing irreversible pulmonary fibrosis.[4,5] The majority of patients with chronic pulmonary toxicity will experience improvement in symptoms after cessation of nitrofurantoin.[4,5] In patients with reversible disease, there appears to be a correlation between the duration of symptoms and amount of improvement. There does not appear to be any correlation between the length therapy and the severity of the illness, or its reversibility.[5]

**Clinical Significance.** Home Medication Documentation upon Hospital Admission: Although adverse drug reactions are a frequent cause of emergency department visits and hospital admission, they are commonly over looked. In order for the possibility of adverse drug reactions to be adequately considered in making any clinical diagnosis and treatment decision an accurate medication history must be obtained and clearly documented. This case highlights the importance of recording an accurate and complete medication history as part of the initial patient assessment at hospital admission. Discrepancies in home medication lists at hospital admission occur for a variety of reasons and are not unique to this case. In this case, the pulmonology consultants were unaware of the patient’s prior history of nitrofurantoin use due to poor documentation of home medications and therefore, the diagnosis was nearly overlooked. Had the medication not been clarified and restarted days later, it is unknown when the diagnosis would have been made. Thoroughly investigating any vagueness or inconsistencies in the patient’s home medication list upon admission to the hospital is important but can be difficult, especially when the patient is unknown to the clinician or is an unreliable historian. Resources to help clarify a patient’s home medications include family members and caregivers, other medical records, the patient’s retail pharmacy, and the hospital pharmacist.

3. Conclusion:

This case created a diagnostic dilemma for clinicians. The combination of poor documentation of home medications and the slow insidious onset of symptoms associated with chronic nitrofurantoin-induced pulmonary toxicity delayed accurate diagnosis and discontinuation of nitrofurantoin. It remains critical that clinicians carefully document all home medications and remain suspicious of this adverse reaction in patients taking nitrofurantoin, particularly in those who present with pulmonary symptoms. Medication histories upon admission to the hospital are frequently incomplete. This case highlights the importance of thorough documentation and awareness of home medications in making an accurate diagnosis.