

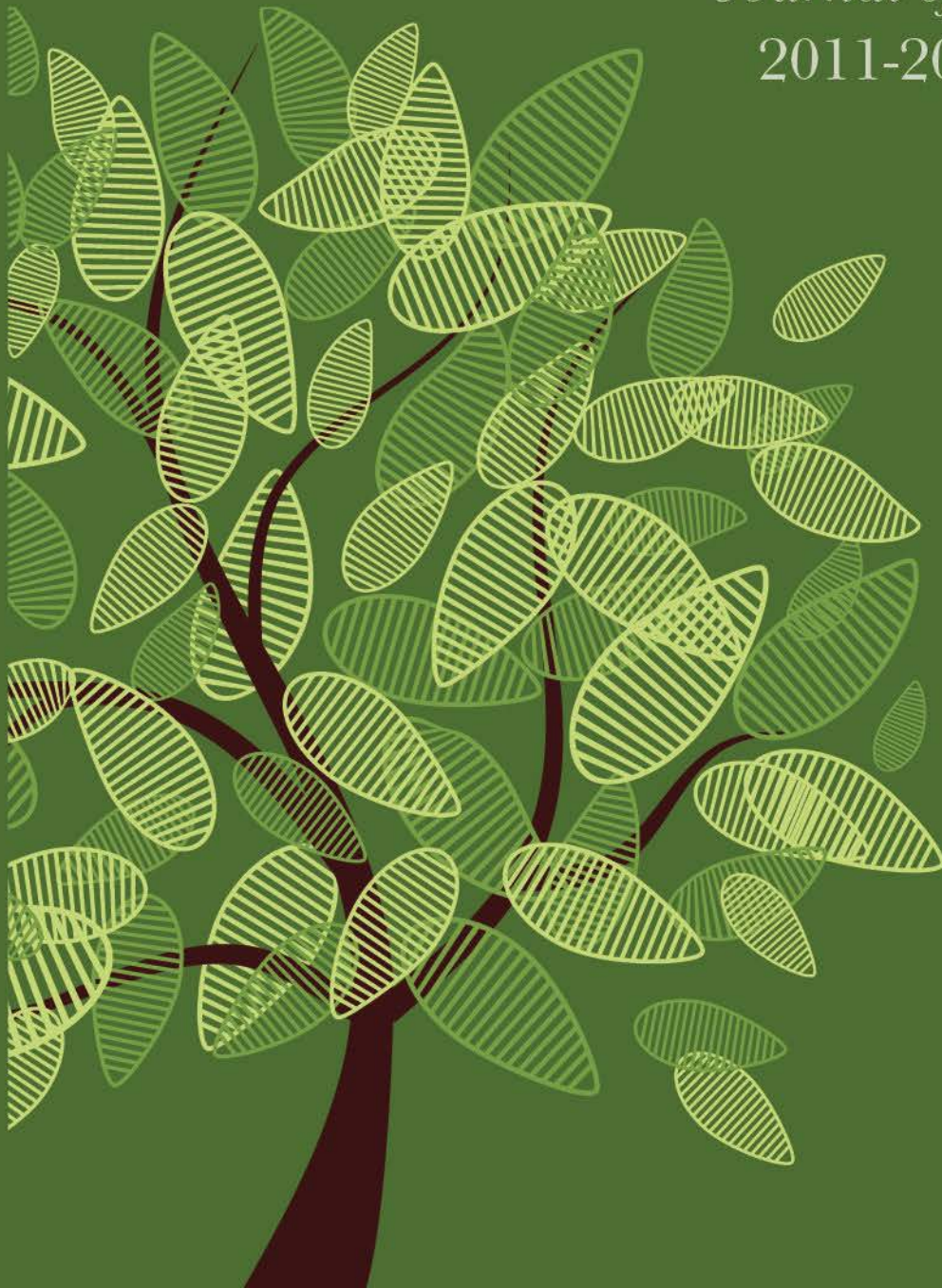
# ENHANCE

Your Knowledge with McNair

McNair Scholars Program

*Journal of Research Reports*

2011-2012 • Volume 17



.....  
WICHITA STATE  
UNIVERSITY

# McNair Scholars Program

*Journal of Research Reports*

2011-2012 • Volume 17



## **Editors**

*Shukura Bakari-Cozart*

*LaWanda Holt-Fields*

*Robynn Sims*

*Noah Trammell*

The *Journal of Research Reports*  
is published annually by the  
Wichita State University  
McNair Scholars Program  
1845 Fairmount  
Wichita, Kansas 67260-0199



# Administration

University President

Vice President for Campus Life and University Relations

Assistant Vice President for Campus Life

*Dr. Donald L. Beggs*

*Dr. Wade Robinson*

*Ms. Deltha Q. Colvin*

## From the Director

present volume 17 of the *Journal of Research Reports*, "Enhance Your Knowledge with McNair." The articles featured in this journal represent the work of Program participants from the 2011 – 2012 grant year. As one reads through these articles, it is clear that the breadth of research interests is as diverse as the students served, and the quality is outstanding as well. My staff and I could not be more pleased with the efforts that went into producing this meaningful and scholarly body of work. The Program could not achieve such great accomplishments without the support of the University faculty, staff and administrators who have mentored students over the past year. These mentors have not only guided the McNair & EPSCoR Scholars in completing their research manuscripts, but they have inspired them to work hard and produce scholarly material. Each mentor is to be applauded for the efforts in making undergraduate research a reality for the students in this Program.

As we complete our fourth grant cycle, we send our gratitude to the University Administration and the U. S. Department of Education for their support over these past 17 years. We look forward to continuing our relationship for many years to come.

Within this journal we showcase the works of thirteen (13) students from the campus of Wichita State University. Twelve (12) of these students are McNair Scholars and one (1) student conducted research through the National Science Foundation (NSF) KS EPSCoR Summer Research Program. There are three (3) full manuscripts and ten (10) summaries presented.

A special word of thanks is directed to our research coordinator, **Ms. RRobynn Sims**. With her dedication and support for the students, she was able to encourage them to go that extra mile and make sure their documents were publication ready. Appreciation is also given to our assistant director/counselor, **Ms. Shukura Bakari-Cozart**. Without her support and persistence in making sure that things are done correctly and in a timely manner, none of this would be possible. Dedication and commitment are rare qualities, and I feel fortunate to have found staff members who hold these qualities in such reverence. Finally, I would like to congratulate the students for going beyond the classroom and putting their critical thinking skills into practice. Their efforts will not go unnoticed and will prove to be something they can be proud of for many years to come. We are proud of our students and their accomplishments. This is a well-deserved acknowledgement for their hard work. These students are our future educators as they continue on this journey to reach their destination of obtaining doctorate degrees. Thank you for the opportunity to serve as your director.

LaWanda Holt-Fields, *Director*

# TABLE OF CONTENTS

## WSU Administration

2

Letter from LaWanda Holt-Fields, *Director*  
WSU McNair Scholars Program

## Research Papers

7

Rebecca Rodriguez Carey  
Gender Differences: An Examination of  
Career Choices and Constraints

27

Jamie C. Farrelly  
Peer Deviancy Training in the Development  
of Antisocial Behavior

35

Elka S. Garcia  
Progress Regarding In Situ Hybridization:  
Analysis of Micro RNA Expression in the  
Hamster Uterus

## Research Summaries

47

Courtney Berry  
Examination of How Health Professionals  
of Color Experience and Negotiate Race  
Within Their Workplaces

51

Sarah O. Cummings  
How Do I Text Thee: Effects of Frequent  
Texting on Relationships

55

Kristina Yvette Durham  
A Qualitative Study of the Effects of Peer  
Labeling on Juvenile Development

59

Ator Ighalo  
Effects of Patients' Preoperational  
Expectations Following Shoulder Surgery

63

Christina Johnson  
Only Time Will Tell: A Study of Deliberate  
Practice Methods and Strategies Used by  
Musicians

67

Tammy Lowe  
Phantom Limb Pain of Lower Extremity  
Amputees: A Case Study and Peripheral  
Mechanisms

73

Francis L. Nguyen  
The Ongoing investigation of the Central Fan  
Question Through Numerical Computations

75

Michelle Ofuokwu  
The Ones Left Behind: Delinquency in  
Children with Incarcerated Parents

79

Kia Porter  
Parent-Child Relationships and the Intensity  
of Adolescents' Romantic Relationships

83

Monica Williams  
From Dropped Out to Checked In:  
A Snapshot of Alternative Education



# RESEARCH PAPERS

---







# GENDER DIFFERENCES: AN EXAMINATION OF CAREER CHOICES AND CONSTRAINTS

Rebecca Rodriguez Carey, McNair Scholar

Ronald Matson, Ph.D., Sociology  
Wichita State University

## Abstract

This research project studied gender differences pertaining to career choices and constraints that influence college students' work decisions. Questionnaires were issued to students in order to explore their work, education, and family life. Demographic questions were also asked as a means of contextualizing the data. Three hypotheses about work were presented. Hypothesis one stated that employers are more flexible with women and their family needs than men and their family needs. Hypothesis two stated that women and men are equally satisfied with their jobs. Hypothesis three stated that men and women value their job characteristics differently. These three hypotheses relied on Spearman's Rank Correlation Coefficient because they utilized gender as an independent variable. All three hypotheses were rejected since statistical analysis demonstrated little to no relationship between gender and work characteristics. These results do not align with previous literature which highlights distinct gender differences regarding careers.

## Introduction

In the 1970s and early 1980s, the workforce in the United States of America was segregated by gender, as many roles and responsibilities were clearly defined between the sexes (Fernández, Castro,



Otero, Foltz, & Lorenzo, 2006; Schweitzer, Ng, Lyons, & Kuron, 2011). Men were referred to as *breadwinners* because they were the primary sources of income while women were labeled *homemakers* since they were responsible for the maintenance of the home and rearing of the children (Schweitzer, et al., 2011). Yet, in today's culture, more women than ever are obtaining higher education degrees and entering the workforce (Fernández, et al., 2006; Schweitzer, et al., 2011). Despite women's increased presence in these areas, careers remain segregated along gender lines leading to significant career differences between the sexes (Fernández, et al., 2006; Schweitzer, et al., 2011). These career differences are evident. For instance, evidence from a Canadian research study indicates that women represent only 22% of managers, and on average, women receive only 75% of men's earnings (Schweitzer, et al., 2011). These distinct gender differences warrant attention.

The literature review analyzes this phenomenon as research attempts to explain labor market differences between men and women. First, this review examines the career selection process. Next, this research project discusses how careers are organized along gender lines. Attributes of occupations, such as salary, promotions, and job-tradeoffs for family needs, are examined. This topic has sociological importance because it helps to further explain profiles of American workers in a changing society.

Three research hypotheses about employer/employee interactions, job satisfaction, and job characteristics are presented. These hypotheses were rejected by researchers as all three hypotheses represented little to no statistical relationship between gender and career attributes. Despite this rejection, the findings are significantly valuable at the social and local level.

## Literature Review and Hypotheses

### Career Selections

In order to better understand gender differences in regard to careers, researchers must

first understand the career selection process students utilize to decide on a particular field of study. The perceived level of interest in a given field is the primary decision factor when selecting a college major (Fernández, et al., 2006; Morgan, Isaac, & Sansone, 2001). Interest is defined as "patterns of likes, dislikes, and indifferences regarding career-relevant activities and occupations" (Morgan, et al., 2001, p. 296). Thus researchers must explore why certain careers are more interesting to some people than others in order to better assess the pervasiveness of gender norms and roles regarding careers.

Interest derives from people's self-perceived competence and ability in a given career; this perceived competence varies between the sexes (Morgan, et al., 2001). For example, women tend to feel less competent in the physical sciences and mathematics compared to men (Morgan, et al., 2001). Males tend to exhibit more competence and technical sophistication in these fields; therefore, prior research suggests that males may outperform females in physical sciences and mathematics. Moreover, women rarely choose these male-dominated careers, and one of the reasons is because women are outnumbered (Heckert, Droste, Adams, Griffin, Roberts, Mueller, & Wallis, 2002). Regardless of the field, women tend to diminish their competence and ability at work while men boost their skills at work (Correll, 2004). The outward expression of career competence varies between the sexes, which is consistent with current research.

Vocational goals influence career choices. The Fernández study (2006) defines six vocational goals: having a career versus a job, receiving recognition, being the best at one's work, helping others, earning a lucrative paycheck, and ensuring leisurely family time (Fernández, et al., 2006). These vocational goals are then separated into two categories: extrinsic rewards and intrinsic rewards (Fernández, et al., 2006). Extrinsic career rewards are important to men because men often value recognition, high paychecks, and occupational prestige in order to uphold a hegemonic male stereotype (Morgan, et al., 2001). Conversely, women desire

intrinsic career rewards, and they are expected to enjoy helping others, working in a pleasant environment, and choosing flexible employers (Fernández, et al., 2006; Schweitzer, et al., 2011). Although gender differences are evident, men and women both indicated that spending time with family is their most-valued goal; the least-desired goal for both sexes was being the best at one's work (Fernández, et al., 2006; Schweitzer, et al., 2011). Based on previous studies, researchers anticipate distinct gender differences with regard to vocational goals.

## Gendered Careers

Since men and women's occupational preferences do not occur in a vacuum, career preferences are influenced by social norms and values (Correll, 2004; Fernández, et al., 2006). When pursuing a career, people consider existing career stereotypes because gendered stereotypes imply some careers are more appropriate for men rather than women or vice versa (Correll, 2004; Fernández, et al., 2006). As a result, women are more likely to pursue careers in the humanities, education, and social services (Fernández, et al., 2006; Morgan, et al., 2001). For instance, the Fernández study (2006) indicates that women receive three-fourths of the humanities, education, and social services degrees conferred (Fernández, et al., 2006). Men, however, are more likely to pursue careers in technology, physical sciences, and mathematics; further evidence notes that women receive only 25 percent of the degrees in technology, physical sciences, and mathematics (Fernández, et al., 2006; Morgan, et al., 2001). In the U.S., only 10.5% of women pursue math and science degrees compared to 31.3% of men, and 10.5% of women pursue education degrees compared to 2% of men (Morgan, et al., 2001). Current statistics concerning career choices appear to support these gender stereotypes.

Despite gendered norms, more women are purposely choosing careers in the traditional masculine sector (Fernández, et al., 2006; Morgan, et al., 2001). Females recognize that traditional masculine careers like medicine, law, and teaching offer greater status, power, and

recognition (Fernández, et al., 2006; Schweitzer, et al., 2011). Although women may enter male-dominated fields, many leave due to feelings of isolation, low self-esteem, and lack of support from both male and female colleagues (Schweitzer, et al., 2011). Existing literature states that further research is needed to better understand the treatment of women in male-dominated careers because, in large part, careers are still organized along traditional gender lines (Fernández, et al., 2006). Accordingly, researchers predict the questionnaire will suggest that men feel more comfortable pursuing jobs in male-dominated fields, whereas women feel more comfortable pursuing jobs in traditional female-dominated fields.

## Salaries and Promotion

Salary differences between men and women are present in both entry-level and peak-level positions (Kaman & Hartel, 1994, cited in Heckert, et al., 2002). Women have lower pay and promotion expectations than men (Schweitzer, et al., 2011). Participants in the Heckert Study were asked to indicate their desired income, and women's average desired income was 25% less than men's desired income (Keaveny & Inderrieden, 2000, cited in Heckert, et al., 2002). These desires align with actual income figures for the sexes (Keaveny & Inderrieden, 2000, cited in Heckert, et al., 2002). On average, women earn \$29.36 per hour at their career peak, and men earn \$46.23 per hour at their career peak (Tsui, 1998, cited in Heckert, et al., 2002). Salary differences are most prominent in the science and engineering fields because very few women enter these fields (Schweitzer, et al., 2011). Moreover, some women may encounter gender discrimination in the workforce, often resulting in smaller salaries and a limited number of employers that provide daycare and flexibility (Schweitzer, et al., 2011). Previous research suggests that women fare worse than men regarding pay scales.

Regardless of pay and gender discrimination, men still out-earn women based on their career fields alone because men tend to concentrate in higher-paying fields (Correll, 2004). Likewise, previous research indicates that men are

more emotionally attached to their salaries than women (Heckert, et al., 2002). Men also identify more with their occupational prestige and power than women (Heckert, et al., 2002). Among married women with considerable occupational prestige and income, women often downplay their economic power as an attempt to uphold their husband as the main provider (Mahoney & Knudson-Martin, 2009). This downplaying of economic power further highlights the notion that women are less emotionally connected to their careers than men.

Women may also experience more difficulties earning promotions; this is evident as women represent only 22% of senior management positions (Schweitzer, et al., 2011). Women often wait 1.7 months longer than men to earn a promotion (Schweitzer, et al., 2011). As a result, women are perceived as less aggressive than men in pay negotiations (Heckert, et al., 2002; Schweitzer, et al., 2011). Regardless of these differences, females are aware that they wait longer to receive promotions (Schweitzer, et al., 2011). Discrepancies in salaries and promotions further emphasize gender differences, and therefore, researchers anticipate that men have higher salaries and greater managerial positions than women. As a result, salaries and flexibility will be analyzed with hypothesis three, which assesses gender differences among job attributes.

Evidence suggests American workers also rely on salary and promotion information from their same-sex colleagues. Men benefit from a same-sex mentor as men aim to be competitive with their seniors in order to achieve the same occupational success (Heckert, et al., 2002). Women, however, do not benefit from this same-sex arrangement unless their female mentor is in a managerial position (Heckert, et al., 2002; Schweitzer, et al., 2011). Evidence indicates that more effort is needed to support women in the workforce, and women in managerial positions might aim to help junior employees better understand their career field, including providing information about average and optimal salaries of a given position, as well as information regarding promotions (Heckert, et al., 2002; Schweitzer, et al., 2011). These mentoring

practices may improve women's overall career positions. Therefore, researchers anticipate that supervisors and mentors influence people's overall work experience and job characteristics.

### Job Tradeoffs

Significant gender differences also occur with job tradeoffs, which are defined as limiting one's work for the sake of personal and/or family needs (Ferriman, et al., 2009; Heckert, et al., 2002). Based on intrinsic career rewards alone, women are more likely to desire flexibility as they may place greater emphasis on their family units (Correll, 2004; Maume, 2006). For example, women are more likely than men to leave work for their children's needs because female-concentrated careers allow greater flexibility (Ferriman, Lubinski, & Benbow, 2009; Correll, 2004; Maume, 2006). Similarly, men work longer hours than women making family leave more difficult (Ferriman, et al., 2009; Heckert, et al., 2002). As women and men age, however, they make fewer job trade-offs for the sake of their family because their children become more independent. People in professional or managerial positions also make fewer trade-offs as these careers demand more responsibility and hours (Maume, 2006). Job-tradeoffs will be explored through hypothesis one, which assesses employees' flexibility with females and males.

Although there are notable differences between the sexes in regard to employment attributes, both sexes are generally satisfied with their career and lifestyle preferences (Ferriman, et al., 2009). Thus these studies indicate that many career options lead to satisfaction (Ferriman, et al., 2009). Job satisfaction among men and women will be explored through hypothesis two which asks respondents to identify their level of satisfaction with their work.

### Hypotheses

Based on the literature review, I will present three hypotheses. These hypotheses may encourage a better understanding of gender differences as they pertain to careers because this project reveals important information about the American workforce, including employees' work needs

and desires. Hypothesis one states this premise: Employers are more flexible with women and their family needs than men and their family needs. The premise of hypothesis two is this: Women and men are equally satisfied with their jobs. Hypothesis three states: Women and men value their job characteristics differently. Variables for these hypotheses are the career difference outcomes, as indicated via the questionnaire.

## Methods

### Sample Statistics from Respondents

The sample statistics include demographic information from the respondents as well as the Wichita State University student population as a whole. Researchers analyzed both sets of students with the purpose of comparing demographic information and making correlations between the two sets. A survey questionnaire was administered to college students at Wichita State University in order to examine attitudes and behaviors regarding career differences between the sexes. College students provided useful, but limited, information for this research since many were actively making career decisions at the time they took the survey. The limitations of this sample will be discussed in a later section.

The sample consisted of students attending an urban, Midwestern university with a population of nearly 15,000 students. Sample demographic statistics indicated that 60.4% of respondents were female, 38.3% of respondents were male, and 1.3% of respondents did not identify with either gender. Blacks/African Americans represented 10.5% of respondents while 7.9% of respondents were Hispanic/Latino/a; 3.3% of respondents were Asian American; 69.6% of respondents were White/Caucasian; 0.4% of respondents were Middle Eastern; 0.8% of respondents were Native American/American Indian; and 6.3% of respondents identified with more than one race/ethnicity. Single/never married respondents comprised 83.3% and 9.6% of respondents were married, 4.6% of respondents were divorced, and 0.4% of respondents were widowed. Among respondents, 83.3% were 18-24 years old, 7.9% of respon-

dents were 25-30 years old, 5.9% of respondents were 31-40 years old, 2.1% of respondents were 41-50 years old, and 0.8% of respondents were 51 years old or older.

### Sample Statistics from WSU

The sample demographics generally aligned with the WSU student population as evidence from the Office of Institutional Research (OIR) indicates that 55.5% of WSU students are female, whereas 44.5% of WSU students are male. Further evidence suggests that 7% of WSU students are Black/African American, 7% of WSU students are Hispanic/Latino/a, 6% of WSU students are Asian American, 1% of WSU students are Native American/American Indian, and 2% of WSU students belong to more than one race/ethnicity. Although researchers listed Middle Eastern as a response category on the questionnaire, the Office of Institutional Research does not separately categorize Middle Eastern students for statistical information; however, the OIR indicates that 6% of students are international.

The participants were selected from a large, upper division gender course that meets on Tuesday and Thursday evenings. Since the respondents were selected from the same class, the participants were a convenience sample. Minors were excluded from participation due to the survey being issued at the time of consent. In the course, 333 students were enrolled, and 240 questionnaires were completed. Some respondents left certain questions blank.

### Questionnaire Format

The survey we developed focused on three main gender differences: educational attainment, career choices, and family aspirations. As such, the questionnaire was divided into three main sections, and each section was created by the researcher assigned to the particular sub-topic. The first section of the questionnaire focused on educational attainment, and thirteen questions related to this sub-topic were asked. Six of the thirteen questions were categorical, one question was yes/no, and six questions utilized a Likert Scale with the following response categories:

strongly agree, agree, disagree, and strongly disagree. However, two of the Likert Scale questions pertained to a specific gender. For instance, a question directed at females asked them to assess how comfortable they felt pursuing a degree in a more typically male-dominated program. A similar question assessing the comfort level of men pursuing a degree in a more typically female-dominated program was also asked.

The thirteen questions in the second section of the questionnaire focused on careers. Three questions in this section were categorical. Eight questions employed a Likert Scale with the following response categories: strongly agree, agree, disagree, strongly disagree, and not applicable (NA). One yes/no question was asked followed by one contingency question. This particular question asked respondents to assess whether one gender was more dedicated to family needs than the other. The contingency question then asked respondents to identify the particular gender that was more dedicated to family needs.

The third section of the questionnaire was about family life; nineteen questions related to this sub-area were asked. Eleven questions utilized a four point Likert Scale like the one used in the first section. Two of the Likert Scale questions also had "not applicable" as an option. One question had a yes/no response category, and this particular question also employed a contingency question. For example, one question first asked respondents to indicate whether they feel closer to one parent/guardian than the other. If the respondents marked "yes," they were then asked to identify the parent/guardian with whom they had a close relationship. Five questions were directed only to individuals who are also parents. Among the questions directed toward parents only, two questions were categorical and three used four point Likert Scale questions.

We asked demographic questions to contextualize the answers. Five demographic questions were asked about respondents' siblings, age, gender, race/ethnicity, and marital status. The questionnaire did not ask for any personal information. The questionnaire utilized only closed-ended questions, and 50 total ques-

tions were asked. Participants were only issued a questionnaire once because the research is cross-sectional, meaning data was collected once.

### Data Collection Procedure

We utilized the Institutional Review Board for the Protection of Human Subjects at Wichita State University (IRB) by specifying the research purpose, participant selection, explanation of procedures, discomfort/risks, benefits, confidentiality, refusal/withdrawal process, as well as contact information to protect confidentiality and further comply with the IRB's requirements for approval. In order to protect the privacy and confidentiality of the respondents, no record of participation exists; thus signed consent forms were not collected. The informed consent form also provided respondents with contact information if counseling was needed, as well as information about the IRB at Wichita State University. The IRB reviewed and approved this research project, and in the spring of 2012, we conducted our survey in a large lecture classroom at the university. We informed the participants that the research project was centered on collecting data about personal expectations regarding education, careers, and family life, as a means to better understand gender differences. We notified respondents of the participant selection process and the consent form process. Researchers informed respondents about the benefits of the research and respondents' rights of refusal and withdrawal from the project. We allotted approximately fifteen minutes to complete the questionnaire after which we thanked them for their cooperation and gave information about obtaining the results.

### Limitations

This research was limited by a small sample size; therefore, it is unclear whether the results could be generalized to other populations. Additionally, the researchers utilized a convenience sample rather than the preferred simple random sample. However, college students are a prime population due to their current experiences with education, careers, and family identity. Still, college students with children are the most desirable

participants since this group has experience balancing their education and work with their family life; moreover, there was a separate section on the survey for parents. Researchers were unable to obtain this type of participant in large numbers from a general education course. Additionally, because we selected participants from a gender course, the respondents were previously exposed to similar topics, such as gender roles, relationships, work, family relations, and education. This prior knowledge may have influenced responses. Moreover, researchers limited the project by focusing solely on heterosexual normative relationships. In the future, we would explore other types of relationships. Ideally, the researchers would have preferred a longer questionnaire to better assess personal aspirations. Time constraints limited the research project, as it took longer than anticipated to receive approval from the IRB.

## Results

### Univariate Analysis

**Mode: Gender.** This univariate analysis focused on gender because the research was centered on gender differences. Since gender is a nominal variable, researchers determined the mode. The questionnaire gave respondents three gender options: female, male, and neither. The mode indicates that women were represented in greater numbers as they represented 60.4% of respondents. Likewise, males represented 38.3% and individuals claiming neither gender accounted for 1.3% of the sample. These percentages equate to 145 females, 92 males, and 3 belonging to neither category (see appendices for table 1 and fig. 1).

**Median: Hypothesis One.** Three separate questions from the survey were analyzed and formulated into hypotheses. Researchers analyzed the following statement: "My employer is flexible with my family obligations (i.e., sickness, death, school functions, appointments)." We wanted to better understand employers' treatment of their employees' family obligations. Questionnaire response categories consisted of

the following: strongly agree, agree, disagree, and strongly disagree. These response categories are ordinal in measurement, so researchers determined the median. Statistical analysis indicates that the median response category was "agree." The majority of respondents "agreed" with the statement accounting for 37.1% of the sample or 89 individuals. In regard to the other response categories, 78 individuals "strongly agreed" with the statement; this accounted for 32.5% of the sample. Six respondents "disagreed" with the statement equating to 2.5% of the sample. Four respondents "strongly disagreed" with the statement; this equates to 1.7% of the sample. Lastly, 61 respondents indicated that the statement was not applicable to them totaling 25.4% of the sample (see appendices for table 2 and fig. 2).

**Median: Hypothesis Two.** The following is the second statement researchers analyzed: "Typically, I am satisfied at my job." This statement provided information about employees' satisfaction with their career choice. The statistical analysis indicates that the median response category was "agree." A significant number of respondents "agreed" with the statement, which accounted for 47.1% of the sample or 113 respondents. Thirty-eight respondents "strongly agreed" with the statement; this equates to 15.8% of the sample. Twenty-four respondents "disagreed" with the statement, which accounts for 10.0% of the sample. Seven respondents "strongly disagreed" with the statement, which accounts for 2.9% of the sample, and 57 respondents indicated that the statement was not applicable to them, which equates to 23.8% of the sample (see appendices for table 3 and fig. 3).

**Median: Hypothesis Three.** Researchers analyzed this statement from the questionnaire: "I value my flexibility over my salary." This statement from the questionnaire provided researchers with information about employees' value of certain job characteristics. The statistical analysis indicates that the median response category was "agree." Ninety-six respondents "agreed" with the statement, which accounts for 40.0% of the sample. The other response categories yielded the following results: 34

respondents “strongly agreed” with the statement, which accounts for 14.2% of the sample. Forty-two respondents “disagreed” with the statement, which represents 17.5% of the sample. Three respondents “strongly disagreed” with the statement; this equals 1.3% of the sample. Lastly, 63 respondents indicated that the statement was not applicable to them, which represented 26.3% of the sample (see appendices for table 4 and fig. 4).

### Bivariate Analysis

**Spearman’s Rank Correlation Coefficient: Hypothesis One.** Since the research is quantitative, researchers relied on a bivariate analysis in order to compare the association of two variables. Researchers created hypothesis one, which claims that employers are more flexible with women and their family needs than men and their family needs. Hypothesis one relied on the following statement from the questionnaire: “My employer is flexible with my family obligations.” The hypothesis was tested via Spearman’s Rank Correlation Coefficient since it relied on the nominal variable of gender and ordinal response categories, such as strongly agree, agree, disagree, and strongly disagree. Statistics indicated that this comparison yielded a value of .101. Spearman’s Rank relies on a scale of -1 to +1, and since .101 is very distant from +1, it can be determined that little to no relationship exists between gender and employers’ treatment of employees’ family lives. Thus, hypothesis one, which claims that employers are more flexible with women and their family needs than men and their family needs is rejected (see appendices for table 5 and fig. 5).

**Spearman’s Rank Correlation Coefficient: Hypothesis Two.** Hypothesis two states that women and men are equally satisfied with their job. Hypothesis two relied on the following statement from the questionnaire: “Typically, I am satisfied at my job.” We tested this hypothesis via Spearman’s Rank Correlation Coefficient since it relied on the nominal variable of gender and ordinal response categories, namely strongly agree, agree, disagree, and strongly disagree. Statistics indicated that the comparison yielded a

.038 value. Thus it can be determined that little to no relationship exists between gender and job satisfaction. Therefore, hypothesis two, which claims that women and men are equally satisfied with their jobs, is rejected (see appendices for table 6 and fig. 6).

**Spearman’s Rank Correlation Coefficient: Hypothesis Three.** Hypothesis three states that women and men value their job characteristics differently. Hypothesis three relied on the following statement from the questionnaire: “In regard to job characteristics, I value my flexibility over my salary.” The hypothesis was tested via Spearman’s Rank Correlation Coefficient, since it relied on the nominal variable of gender and ordinal response categories, such as strongly agree, agree, disagree, and strongly disagree. Statistics indicated that the relationship yielded a value of .002. Consequently, it can be deciphered that little to no relationship exists between gender and job characteristics for this study. Thus hypothesis three, which claims that women and men value their job characteristics differently, is rejected (see appendices for table 7 and fig. 7).

## Discussion

In regard to hypothesis one, the results were surprising as researchers anticipated a relationship between gender and employers’ flexibility with their employees’ family life. Previous literature indicated that employers were more flexible with women and their family needs than men and their family needs; therefore, other researchers hypothesized that employers are more flexible with women (Maume, 2006). Differences between the sexes are especially evident when women are pregnant or have young children, as employers are more lenient with their leave time in order to ensure family needs are met (Maume, 2006). Although the results were inconsistent with the previous literature, this can be explained through sample characteristics. The convenience sample was very small, and researchers were unable to assess the statistical significance between the variables as the sample was not random; therefore, hypothesis

one was rejected. Nevertheless, according to the frequency distribution, women and men both indicate that their employers are flexible with their family needs.

The results from hypothesis two were also surprising because researchers anticipated that both sexes would generally be satisfied with their job. Although previous literature makes many distinctions between the genders, the literature states that both sexes are generally happy with their work arrangement, which further illustrates that many career paths can lead to a satisfying lifestyle (Ferriman, et al., 2009). Still, in the future, researchers hope that analyzing a larger random sample could help us assess statistical significance because we felt the small convenience sample was not adequate to test this hypothesis. Thus the small convenience sample resulted in a rejection of hypothesis two. Regardless, the frequency distribution provides important insight into the statistical analysis.

Lastly, researchers anticipated a relationship between gender and job characteristics. Previous literature indicates that women are more likely to value intrinsic career characteristics, such as flexibility, while men are more likely to value extrinsic career characteristics, such as salaries (Fernández, et al., 2006). Therefore, researchers sought to explore relationships between gender and job characteristics. Researchers predicted women would value their flexibility over their salary, and men would value their salary over their flexibility. However, the small convenience sample rejected this hypothesis as it indicated that little to no relationship existed. Surprisingly, both sexes indicated that they valued their flexibility over their salary. As previously mentioned in the limitations, this may be due to the type of sample selected since respondents were enrolled in a gender class with a focus of bringing to light gender differences and inequalities.

## Conclusion

The purpose of this research was to analyze gender differences regarding career choices and constraints. Hypothesis one indicated that employers are more flexible with women and their family needs than men and their family needs; this was tested and rejected with Spearman's Rank Correlation Coefficient as it yielded a value of .101, accounting for little to no relationship. Hypothesis two indicated that women and men are equally satisfied with their jobs; this hypothesis was tested and rejected with Spearman's Rank Correlation Coefficient as it yielded a value of .038, representing little to no relationship. Lastly, hypothesis three indicated that women and men value their job characteristics differently; this hypothesis was also tested and rejected with Spearman's Rank Correlation Coefficient as it yielded a value of .002, which represents little to no relationship. Researchers were unable to determine statistical significance between the associations and generalize their findings to the larger population, due to the convenience sample. These results did not align with previous literature which maintains that employers are more flexible with women in comparison to men; this was analyzed in hypothesis one (Maume, 2006). Moreover, the results did not correspond with previous literature which indicates that both sexes are equally satisfied with their chosen careers; this was analyzed in hypothesis two (Ferriman, et al., 2009). Lastly, the third hypothesis was inconsistent with previous literature since previous studies highlighted sex differences, in regard to job characteristics and values (Fernández, et al., 2006). In the future, researchers would prefer to analyze a larger random population, as well as sample older adults, in order to further examine their careers and families. Since this research analyzed gender differences in terms of career choices, it has important implications for the American workforce.



# References

Correll, S. J. (2004). Constraints into preferences: Gender, status, and emerging career aspirations. *American Sociological Review*, 69(1), 93-113.

Fernández, M. L., Castro, Y. R., Otero, M. C., Foltz, M. L., & Lorenzo, M. G. (2006). Sexism, vocational goals, and motivation as predictors of men’s and women’s career choice. *Sex Roles*, 55(3/4), 267-272.

Ferriman, K., Lubinski, D., & Benbow, C. P. (2009). Work preferences, life values, and personal views of top math/science graduate students and the profoundly gifted: Developmental changes and gender differences during emerging adulthood and parenthood. *Journal of Personality and Social Psychology*, 97(3), 517-532.

Heckert, T. M., Droste, H. E., Adams, P. J., Griffin, C. M., Roberts, L. L., Mueller, M. A., & Wallis, H.A. (2002). Gender differences in anticipated salary: Role of salary estimates for others, job characteristics, career paths, and job inputs. *Sex Roles*, 47(3/4), 139-151.

Mahoney, A. and Knudson-Martin, C. (2009). Gendered equality and gendered power. *Couples, Gender, and Power: Creating Change in Intimate Relationships*. Springer Publishing Company. 3-29.

Maume, D. J. (2006). Gender differences in restricting work efforts because of family responsibilities. *Journal of Marriage and Family*, 68(4), 859-869.

Morgan, C., Isaac, J. D., & Sansone, C. (2001). The role of interest in understanding the career choices of female and male college students. *Sex Roles*, 44(5/6), 295-320.

The Office of Institutional Research-Wichita State University. Student Reports-Enrollment Characteristics 20<sup>th</sup> Day Spring 2011.

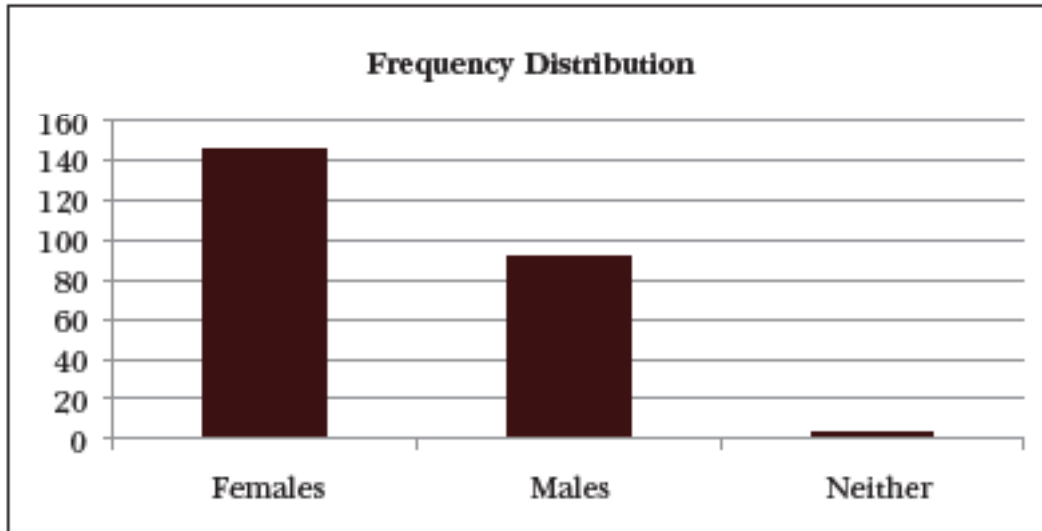
Schweitzer, L., Ng, E., Lyons, S., & Kuron, L. (2011). Exploring the career pipeline: Gender differences in pre-career expectations. *Relations Industrielles/Industrial Relations*, 66(3), 422-444.

### Appendices: Tables and Figures

This table and figure illustrate the mode for the univariate analysis of gender.

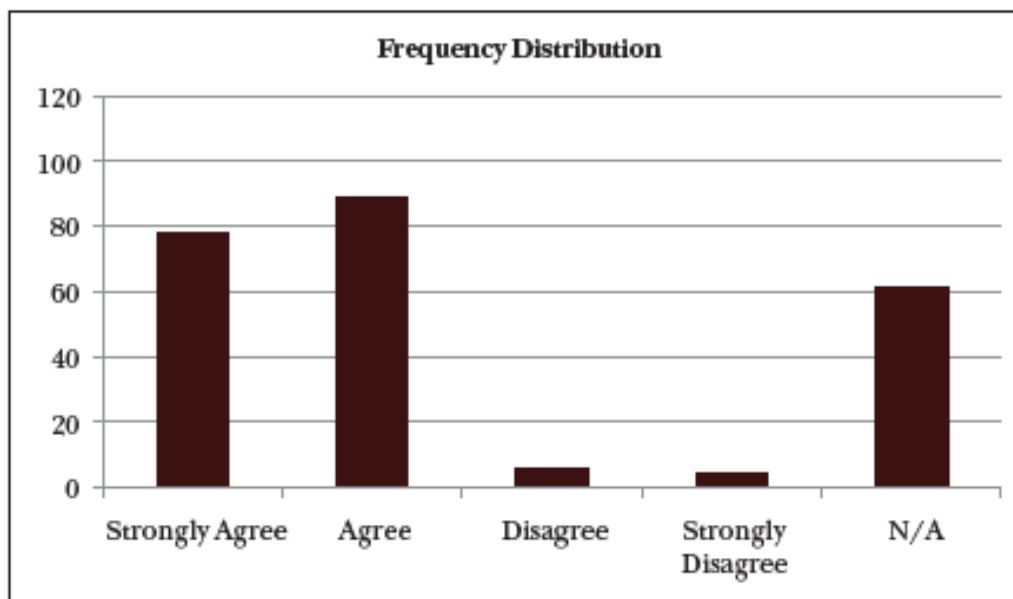
**Table 1: Univariate Analysis-Mode/Gender**

	Frequency	Percent
Females	145	60.4%
Males	92	38.3%
Neither	3	1.3%
Total	240	100.0%



	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	78	32.5%	32.8%	32.8%
Agree	89	37.1%	37.4%	70.2%
Disagree	6	2.5%	2.5%	72.7%
Strongly Disagree	4	1.7%	1.7%	74.4%
Not Applicable	61	25.4%	25.6%	100.0%
Total	238	99.2%	100.0%	
Missing	2	.8%		

This figure illustrates the median for the univariate analysis of hypothesis one.  
**Fig. 2: Univariate Analysis-Median/My employer is flexible with my family obligations.**



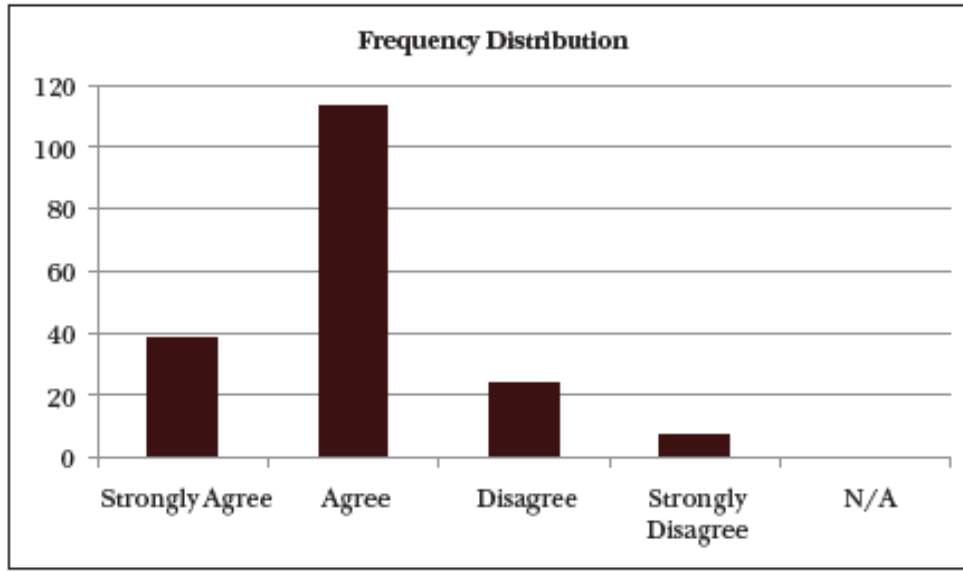
This table illustrates the median for the univariate analysis of hypothesis two.  
**Table 3: Univariate Analysis-Median/Typically, I am satisfied at my job.**

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	38	15.8%	15.9%	15.9%
Agree	113	47.1%	47.3%	63.2%
Disagree	24	10.0%	10.0%	73.2%
Strongly Disagree	7	2.9%	2.9%	76.1%
Not Applicable	57	23.8%	23.8%	99.9%
Total	239	99.6%	99.9%	
Missing	1	.4%		

# An Examination of Career Choices and Constraints

This figure illustrates the median for the univariate analysis of hypothesis two.

**Fig. 3: Univariate Analysis-Median/Typically, I am satisfied at my job.**



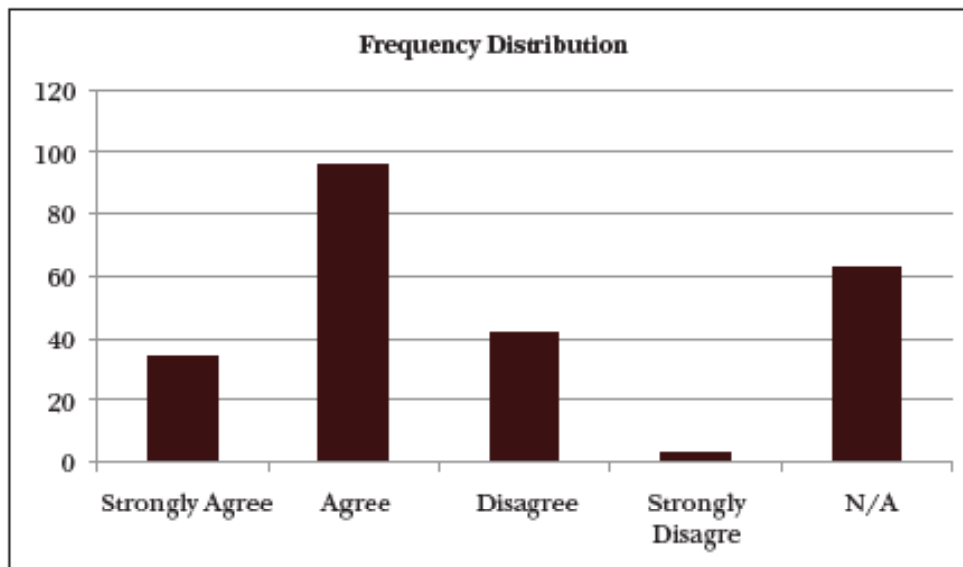
This table illustrates the median for the univariate analysis of hypothesis three.

**Table 4: Univariate Analysis-Median/In regard to job characteristics, I value my flexibility over my salary.**

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	34	14.2%	14.3%	14.3%
Agree	96	40.0%	40.3%	54.6%
Disagree	42	17.5%	17.6%	72.2%
Strongly Disagree	3	1.3%	1.3%	73.5%
Not Applicable	63	26.3%	26.5%	100.0%
Total	238	99.3%	100.0%	
Missing	2	.7%		

This figure illustrates the median for the univariate analysis of hypothesis three.

Fig. 4: Univariate Analysis-Median/In regard to job characteristics, I value my flexibility over my salary.



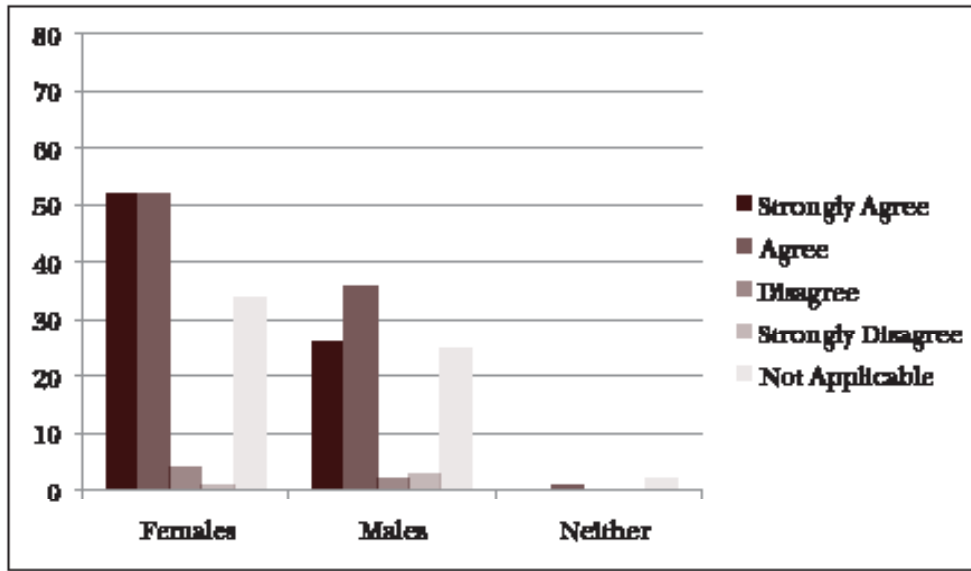
The following table illustrates the results from the bivariate analysis of hypothesis one.

Table 5: My employer is flexible with my family needs.

	Strongly Agree	Agree	Disagree	Strongly Disagree	N/A	Total
Females	52 36.4% 66.7%	52 36.4% 58.4%	4 2.8% 66.7%	1 0.7% 25.0%	34 23.8% 55.7%	143 100.1% 60.1%
Males	26 28.3% 33.3%	36 39.1% 40.4%	2 2.2% 33.3%	3 3.3% 75.0%	25 27.2% 41.0%	92 100.1% 38.7%
Neither	0 0.0% 0.0%	1 33.3% 1.1%	0 0.0% 0.0%	0 0.0% 0.0%	2 66.7% 3.3%	3 100.0% 1.3%
Total	78 32.8% 100.0%	89 37.4% 99.9%	6 2.5% 100.0%	4 1.7% 100.0%	61 25.6% 100.0%	238 100.0% 100.1%

The following figure illustrates the results from the bivariate analysis of hypothesis one.

**Fig. 5: My employer is flexible with my family needs.**



The following figure illustrates the results from the bivariate analysis of hypothesis one.

**Table 6: Typically, I am satisfied at my job.**

	Strongly Agree	Agree	Disagree	Strongly Disagree	N/A	Total
Females	23 16.0% 60.5%	70 48.6% 61.9%	15 10.4% 62.5%	3 2.1% 42.9%	33 22.9% 57.9%	144 100.0% 60.3%
Males	15 16.3% 39.5%	42 45.7% 37.2%	9 9.8% 37.5%	4 4.3% 57.1%	22 23.9% 38.6%	92 100.0% 38.5%
Neither	0 0.0% 0.0%	1 33.3% 0.9%	0 0.0% 0.0%	0 0.0% 0.0%	2 66.7% 3.5%	3 100.0% 1.3%
Total	38 15.9% 100.0%	113 47.3% 100.0%	24 10.0% 100.0%	7 2.9% 100.0%	57 23.8% 100.0%	239 99.9% 100.1%

The following figure illustrates the results from the bivariate analysis of hypothesis two.

Fig. 6: Typically, I am satisfied at my job.

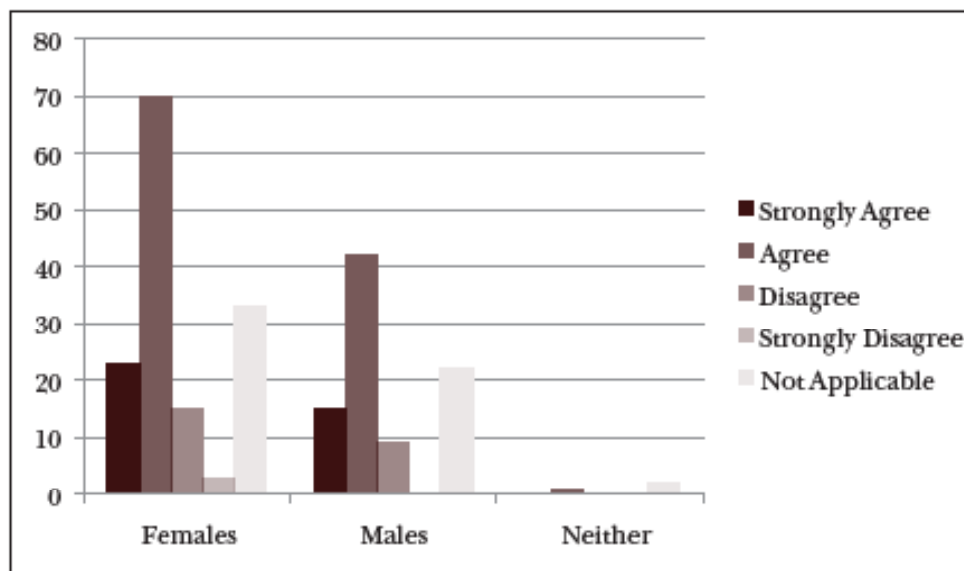
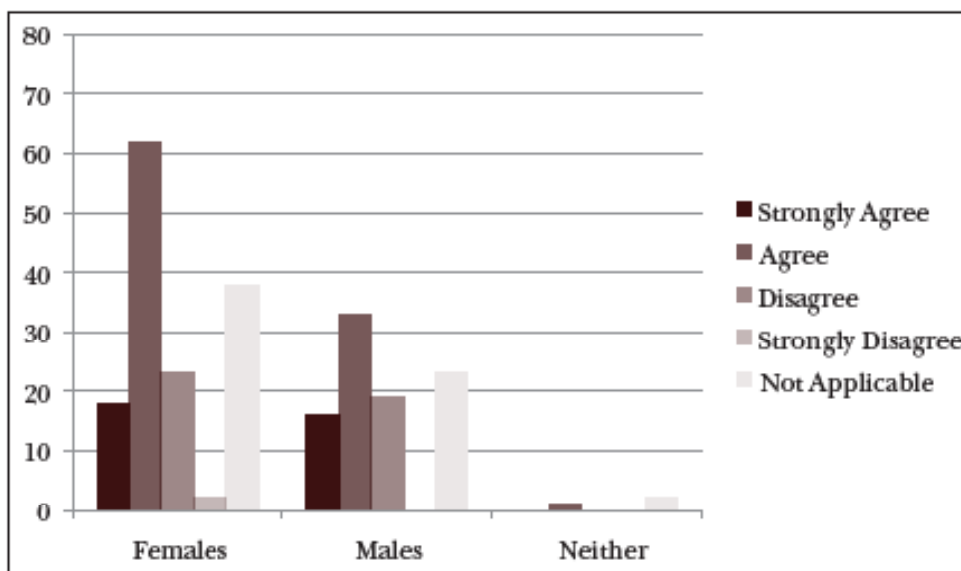


Table 7: I value my flexibility over my salary.

	Strongly Agree	Agree	Disagree	Strongly Disagree	N/A	Total
Females	18 12.6% 52.9%	62 43.4% 64.6%	23 16.1% 54.8%	2 1.4% 66.7%	38 26.6% 60.3%	143 100.1% 60.1%
Males	16 17.4% 47.1%	33 35.9% 34.4%	19 20.7% 54.2%	1 1.1% 33.3%	23 25.0% 36.5%	92 100.1% 38.7%
Neither	0 0.0% 0.0%	1 33.3% 1.0%	0 0.0% 0.0%	0 0.0% 0.0%	2 66.7% 3.2%	3 100.0% 1.3%
Total	34 14.3% 100.0%	96 40.3% 100.0%	42 17.6% 109.0%	3 1.3% 100.0%	63 26.5% 100.0%	238 100.0% 100.1%

The following figure illustrates the results from the bivariate analysis of hypothesis three.

Fig. 7: I value my flexibility over my salary.



Below is a segment of the questionnaire that was focused on careers and demographic information.

This questionnaire will ask you about educational attainment, careers, and family aspirations. Please mark the corresponding answer. It will take approximately 10-15 minutes to complete this questionnaire. Your answers are very important to us. Your answers will remain *anonymous and confidential*. When you are finished completing the questionnaire, please return it to the front of the classroom. Thank you.

*The second section of the questionnaire is about careers.*

14. The sex of my direct supervisor is:

- Female
- Male
- I do not have a supervisor
- Unsure

15. How many children (including step-children) does your supervisor have?

- None
- 1-2
- 3 or more
- I do not have a supervisor
- Unsure

16. On average, how many hours do you currently work outside of the house per week?

- I do not work outside of the home
- Less than 20 hours
- 21-40 hours
- 41 or more hours

17. Typically, I am satisfied at my job.



- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
18. I have an ideal job.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
19. In regard to my job characteristics, I value my flexibility over my salary.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
20. Employees at my organization are viewed as less dedicated to their careers when they take leave to care for their children.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
21. My employer is flexible with my family obligations (i.e. sickness, death, school functions, appointments).
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
22. My significant other/spouse spends more time at work than I do.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
23. When I get home from work, I have enough energy to take care of my family needs.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
24. I feel that my family life puts constraints on my career.
- Strongly Agree      Agree   Disagree      Strongly Disagree      N/A
25. The females and males at my work are equally dedicated to their family needs.  
Yes  
No
26. If you answered "no" to the previous question, please indicate what sex is more dedicated to their family needs. If you answered "yes," please skip to # 27.  
Males  
Females

*The following section is about demographics, in order to contextualize the information. Please be assured that your answers will remain anonymous and confidential.*

46. How many siblings do you have?

## An Examination of Career Choices and Constraints

---

- 0
  - 1
  - 2-4
  - 5-7
  - 8 or more
47. What is your age?
- 18-24
  - 25-30
  - 31-40
  - 41-50
  - 51 or above
48. What gender do you identify with?
- Female
  - Male
  - Neither
49. What race/ethnicity do you identify with?
- Black/African American
  - Hispanic/Latino/a
  - Asian American
  - White/Caucasian
  - Middle Eastern
  - Native American/American Indian
  - More than one race/ethnicity
  - Other-Please Specify\_\_\_\_\_
50. What is your marital status?
- Single, Never Married
  - Married
  - Divorced
  - Widowed

Thank you for participating in this survey. The researchers appreciate your time and willingness. The answers that you provide will help researchers to better understand educational attainment, careers, and family aspirations among the sexes. Rest assured, your answers will remain *anonymous and confidential*.





# PEER DEVIANCY TRAINING IN THE DEVELOPMENT OF ANTISOCIAL BEHAVIOR

**Jamie C. Farrelly, McNair Scholar**

James Snyder, Ph.D., Psychology  
Wichita State University

## Abstract

**B**ased on previous studies conducted by Dr. James Snyder, the research investigated the influence of peers on the development of problem behavior in elementary school children. These children were categorized by socio-metric status groups, which included popular, rejected, and controversial children. The hypothesis was that children with the controversial social status will engage in more deviant talk, a common form of problem behavior, than children with a popular social status. Peer deviancy training, where students often learn deviant talk, was measured by observations between children from fall to spring of their kindergarten year. Deviant behavior among children was coded using Antisocial Content Code (ACC, Oeser & Schrepferman, 2002). Furthermore, classmate social preference ratings were privately obtained from each child. Additionally, we obtained teacher ratings of conduct problems not only in kindergarten, but also in first grade. Despite theorizing that the controversial students would engage in more deviant talk, the results showed a consistent level in all three groups. Since a sizable mean difference in delinquency and aggressive behavior between controversial children and the popular children is present, but not between controversial and rejected children, the data suggests deviant talk had a stronger impact on the adjustment of controversial children than on the adjustment of popular and rejected children.

*Keywords:* Socio-metric, peer deviancy training, dyadic

## Introduction

Relationships with family and friends are powerful influences on people's lives. These relationships define how people develop socially, and this process is called socialization. Through the process of socialization, young people learn from those to whom they are affiliated with and from whom they receive reinforcement. For children and adolescents, socialization may shape both pro-social and antisocial behavior. Peers in particular have a more influential role as children move into adolescence, and socialization by parents is decreased (Snyder et. al., 2005). Many factors, like greater access to transportation and mandatory education, make spending time with parents "less obligatory" and increase the child's freedom to choose his or her own friends (Snyder, 2002). Children and adolescents not only learn during interaction with other peers, but actively seek out peers with traits similar to themselves. This phenomenon begins in early grade school and is a predictor of future behavior and development. Exposure to peers with similar traits significantly influences how youth behave and how they are perceived, which may result in either positive or negative developmental outcomes in areas such as grades, behavior, and attitudes.

In this study, we, the researchers, looked at the influence of peers on the development of problem behavior during childhood. A factor that appears to play a central role in peer socialization is general peer group status, which begins to evolve in early elementary school (Snyder et al., 2004). The behaviors of children influence peer judgments about the preference or likeability of certain children. Socio-metric status indicates a degree to which children that are nominated as popular, rejected, average, or controversial by their peers (Snyder, 2002). Children who are popular are well liked by many peers and disliked by few peers; they are socially skilled and are actively sought out and included by others. On the other hand, children whose social status is average tend to neither be liked nor disliked. These average peers are modestly skilled and have good relationships with peers. In contrast, rejected children are disliked by

the majority of peers and receive few positive nominations. Unlike the popular and average children, these children tend to be unskilled and show a significant amount of aggression towards others; furthermore, rejected peers are often excluded by others and are treated negatively. The controversial group is both greatly liked and disliked by other peers. Controversial children generally participate in deviant talk and other aggressive types of behavior and impact their peers significantly by their behavior.

Socio-metric status influences the quality of day-to-day interaction with peers. For our research purposes, we will focus on these groups: popular, rejected, and controversial. Essentially, students quickly define themselves by how they treat others, how others treat them, and how those in authority respond. Popular children receive much positive attention and are actively sought out, while rejected children receive much negative attention from peers. Controversial children gain positive and negative attention, and they often impact and influence their peer group (Snyder, 2002). The socio-metric status phenomenon continues throughout adolescence and is a huge predictor in adolescent behavior.

Children do not spend an equal amount of time with all other peers. They actively seek out and are sought out by children who are similar to themselves because children are avoided by peers who are dissimilar behaviorally (Snyder et al., 2005), which means "[f]riendships are selected on their similarity, and similarity is an outcome of successful relationships" (Dishion, 1996). This process of avoiding those who are different is known as *homophily*. For example, children who tend to perform well in school and enjoy playing sports affiliate with others who do the same. In the same manner, children who tend to perform poorly in school and engage in aggressive or antisocial behavior seek out others with these same traits. Homophily can be seen in gender segregation as well, as boys mostly affiliate with other boys and girls tend to affiliate with other girls. This kind of peer selection in itself presents a division in aggression since boys generally engage in a greater amount of aggressive behavior than girls (Hanish et al., 2004). Overall, people

tend to affiliate with others who are like minded or share similar traits; this affiliation often begins at a young age.

One peer social process that is associated with risk for conduct problems is peer deviancy training (PTD). Deviancy training is a social process that may encourage antisocial behavior during peer interaction (Snyder et al., 2008). PTD is played out in the example of deviant talk in which peers create elaborate scripts that guide antisocial behavior. Deviant talk encourages rule-breaking behavior and also acts as a guide to avoid punishments from adults. In adolescence, PTD occurs when rejected and aggressive youth affiliate with one another. This affiliation may result in higher risks of early drug use, early sexual behavior, and delinquency (Snyder et al., 1997). Yet, apparently peer deviancy training begins as early as kindergarten when children first begin to have regular social contact with one another.

In other words, socio-metric status and deviancy training are linked. Both rejected and controversial children engage in more aggressive and deviant behavior than their counterparts. When they seek out peer affiliates, they select the children who are also aggressive and who engage in deviant behavior. Controversial children receive many positive nominations and many negative nominations. More than likely those positive nominations come from unskilled and rejected children. The nominations of dislike are more likely to come from skilled (popular) children. These controversial children are sought out by the rejected children and shunned by the skilled children.

Peer groups comprised of controversial and rejected children are likely to engage in high rates of deviant talk, and these high rates increase the risk of conduct problems. As peers reach adolescence, they have an opportunity to increasingly affiliate with peers similar to themselves during unsupervised time. Rejected or controversial adolescents often participate in more negative behavior such as stealing, substance abuse, risky sexual behavior, and violence. Controversial peer status leads to a profound involvement in deviancy training, and is a predictor of anti-social behavior. Our research predicts children of

popular social status will speak less deviantly than children of controversial status. If we further document these traits, we hope to provide data that could help prevent negative behavior engendered by negative peer influence. These findings could lead to an established system of early identification so as to discourage negative, risky behaviors and may even protect potential victims by preventing bullying or school shootings. Furthermore, since we know "[e]xposure to peers can affect who we are and what we become," early detection is crucial to understanding the triggers for deviant behavior (Hanish, 2005).

## Method

Archival data was the main source for our study. We analyzed the information using the Statistical Package for the Social Sciences (SPSS). We found the standard deviations between the controversial, rejected, and popular children. After analyzing the data, we calculated our results (see *Table 1*).

## Participants

The participants were 133 girls and 134 boys whose mean age was 5.3 years at the first data collection point (entry to kindergarten) and 7.2 years at the last data collection point (exit from first grade). We took a sample by targeting all kindergarten children ( $n = 352$ , participation rate = 76%) who enrolled in one elementary school for three years consecutively. Participants were reimbursed for their involvement at approximately \$10 per hour. The school served a low socioeconomic neighborhood in a city with a population of 450,000. Seventy-one percent of the children were European American, 19% African American, 5% Hispanic/Latino, 3% Native American, and 2% Asian American. Two-thirds of children had received large-group childcare or preschool experience. At initial recruitment, 43% of children lived with two biological parents, 28% lived in a predominantly single-parent household, and 7% lived in other family configurations. The median family income was \$8,300; 28% of students lived in families with incomes below the poverty line. Forty-six percent of parents com-

pleted their high school education, 34% had beyond high school education, and 20% had less than a high school education. Dual wage earner families comprised seventy-five percent of the total, while 9% of the families were without an employed adult.

### Measures

Observations of children's interactions with same-gender classmates were made on three separate occasions during the kindergarten year. These observations included the two variables of games and free time, which provided the context for defining *peer deviancy training*. The target child and two of his/her classmates were taken to a small room and asked to engage in two tasks: 15 minutes of interactive age-appropriate games and 15 minutes of free play time. Same-gender classmates were sampled in randomly based on availability.

Videotapes of peer interaction were coded using Antisocial Content Code (ACC, Oeser & Schrepferman, 2002), an age-appropriate adaptation of the TOPIC code (Poe, Dishion, Greisler, & Andrews, 1992) which has been applied to adolescent interaction. The ACC provides a real-time interval coding of the occurrence of five different forms of deviant language used by young children: sex, alcohol/tobacco, stealing, aggression, and authority defiance. This deviant talk occurred at an average rate of once every 5 minutes: the mean rpm = .19, SD = 0.22, and only 13% of children displayed no deviant talk (Snyder et al., 2005). Responses of peers to deviant talk and rehearsal by target children (the participants) were also coded by ACC. These responses were coded dichotomously as *positive*, i.e., laughter or other forms of positive attention, or as *not positive*, i.e., ignoring, disapproval, correction, threats to tell adult. The mean of positive peer responses was 38% (SD = 20%). ACC coders also completed a Likert rating scale after each 15 minutes of peer interaction indicating the degree to which each child was exposed to peers' deviant talk and rehearsal (M = 1.52, SD = 0.52) on a 1 [did not occur] to 4 [occurred a lot] scale.

Estimated coder agreement was 33% of the sessions. Percent agreement and Kappa indices of coder reliability for the occurrence/nonoccur-

rence of deviant talk/rehearsal were 91.2% and .73 respectively. Percent agreement and Kappa coder reliability for positive peer responses to deviant talk or rehearsal were 77.1% and .60. Average intra-class correlation for ratings and exposure to peer deviant talk was .76. Two indicators were derived from ACC coding by averaging across two sessions and used to define peer deviancy training. The first indicator was the odds ratio representing the rate at which children's deviant relative to normative talk resulted in positive peer responses. The second indicator was the mean rating of children's exposure to peers' reinforcing and display of deviant talk and rehearsal.

### Peer Social Preference Ratings

Classmate social preference ratings were obtained privately from each child using a picture socio-metric procedure described and validated by Asher, Singleton, Tinsley, and Hymel (1979). The children were asked to categorize pictures of classmates. They placed a "happy face" on the photos of the three children they liked to play with most and placed a "sad face" on the three they liked the least. Prior to making these ratings the children were asked to use happy, neutral, and sad "faces" to rate how much they liked various foods shown on pictures to develop their understanding of the rating procedure. Similar to Coie and Dodge (1983), the number of "like" or "dislike" nominations each child received from classmates was summed separately, and then standardized by the classroom. Social preference ratings derived using this procedure has a 2-week test-retest stability of .73 (Snyder et al., 1997).

### Child Outcomes: Conduct Problems

Teacher ratings of conduct problems were obtained in the fall and spring of kindergarten, and the fall and spring of first grade, using the aggression and delinquency scales of the Teacher Report Form (TRF) (Achenbach, 1991). Different teachers completed these scales. The same time frame correlations between aggression and delinquency exceeded .62 at all developmental points for boys and girls. A composite score for conduct problems was derived at each developmental point using the mean of 34 items (e.g. argues, cruel/

bullies, disobedient, teases, tantrums, lies, steals) comprising the aggression and delinquency scales. The alpha internal reliability of the composite scale exceeded .95 at each assessment point. The scale was square root transformed to prevent the data from being skewed.

## Results

The hypothesis predicted that children of a controversial social status will engage in more deviant talk than children of a popular social status. The findings in the table below show no difference in any category of deviant talk between the controversial, rejected, and popular children. One interesting finding is that controversial girls engaged in more deviant talk than popular girls. This finding was not true for males (not shown on *Table 1*). A sizable mean difference in delinquency

and aggression is revealed through the data. The findings show that controversial children are seen as more aggressive and delinquent than popular children. No differences were found in reinforcement of deviant talk by peers (top row, *Table 1*) or seeing peers reinforced by deviant talk (2nd row, *Table 1*). The same was true for exposure to deviant talk and the rate of deviant talk (3<sup>rd</sup> and 4<sup>th</sup> row, *Table 1*). Although there are no group differences in involvement in deviant talk, the development of children in each socio-metric group were impacted differently. Controversial children were most strongly impacted with a correlation average of .29 between involvement in deviant talk and TRF aggression and TRF delinquency. This correlation was much smaller for the other two groups; for rejected children the mean correlation was .16, and for popular children the mean correlation was .19.

**Table 1:** Results of Deviant Training Analysis

Analysis Variables	Controversial Children		Rejected Children		Popular Children		T-test (C v. R)	T-test (C v. P)
	Mean	SD	Mean	SD	Mean	SD		
Reinf. for deviant talk by peers	0.001	0.863	0.024	0.88	-0.018	1.019	0.09	-0.16
Exposure to reinf.	1.869	0.744	1.74	0.706	1.757	0.888	-0.19	-0.15
Exposure to DT	1.345	0.29	1.322	0.262	1.304	0.293	-0.38	-0.67
Rate of DT	0.238	0.238	0.223	0.255	0.216	0.206	-0.17	-0.46
TRF delinquency fk-sq rt	0.356	0.378	0.364	0.322	0.116	0.202	-0.92	-3.82
TRF delinquency sq-sq rt	0.576	0.354	0.406	0.312	0.35	0.374	-0.81	-2.88
TRF aggression fk-sq rt	0.591	0.492	0.51	0.462	0.267	0.233	0.18	-4.16
TRF aggression sq-sq rt	0.639	0.38	0.601	0.314	0.219	0.36	-0.43	-5.5

*Key:* C v. R= controversial versus rejected, C v. P= controversial versus popular. Reinf.= reinforcement, DT= deviant talk, TRF= teacher report form, fk-sq= fall to spring, sq-sq= spring to spring, Mean= average, SD= standard deviation.



This table represents the data collected on controversial, rejected, and popular children. The data includes analysis of Teacher Report Forms (TRF), video observations, classroom observations, and classmate social preference ratings. We analyzed the data using mean (average), SD (standard deviation), and the T-test, a mathematical formula.

### Gender Differences

Our findings show controversial girls were more involved in deviant talk than popular girls. This was not found to be true for males. Children are usually known to segregate themselves by gender, as young boys typically associate with other boys and young girls typically associate with other girls. Furthermore, young boys generally engage in greater amounts of deviant talk than young girls. Girls tend to engage in more dyadic relationships while boys associate in large groups. Therefore, boys will often be involved in deviant talk because of their contagion in large groups. Involvement in deviant talk is different for girls because popular girls will affiliate in dyadic relationships with other popular girls, and may be less exposed to deviant talk.

## Discussion

Controversial and rejected children seem to differ in their susceptibility to deviancy train-

ing. Controversial children seem to be more affected by peer deviancy training than rejected children. Children from all socio-metric groups were equivalently involved and exposed to deviancy training. There is a contagion of deviant talk in this particular peer group. Though there were no group differences in deviant talk, there were differences in delinquency and aggression. Controversial and rejected students showed similarly high levels of delinquency and aggression, more than popular children. These similarly high levels are explained by certain students' susceptibility to deviant talk as the exposure to deviant talk by controversial children had a stronger effect, leading to more delinquency and aggression. Controversial and rejected children are less resistant to the negative impact of deviant talk.

These findings provide important information because they can be used to shape the lives of children as they mature and become adolescents. If we can limit the negative effects of aggression and other forms of deviant behavior in the school system at an early age, then we can reduce these negative effects in middle and high school. Limiting these effects will hopefully reduce behaviors such as stealing, substance abuse, risky sexual behavior, and violence. Early prevention is critical to alter pathways to more serious delinquent behavior and violence as youth move into adolescence and young adulthood.

# References

- Cillessen, H.N.A., & Mayeux, L. Sociometric status and peer group behavior: Previous findings and current directions. *Sociometric Status and Peer Group Behavior*. 3-20.
- Dishion, T.J., Andrews, D.W., Patterson, G.R., & Spracklen K.M. (1996). Deviancy training in male adolescent friendships. *Behavior Therapy*. 27, 373-390.
- Hanish, L.D., Martin, C.L, Fabes, R.A., Herzog, M & Leonard, S.(2005). Exposure to externalizing peers in early childhood: Homophily and peer contagion process. *Journal of Abnormal Child Psychology*. 33, 267-281.
- Snyder, J., Barner, S., Johnson, K., McEachern, A., Provines, J. & Schrepferman, L. (2008). Peer deviancy training and peer coercion: Dual processes associated with early-onset conduct problems. *Child Development*. 79, 252-268.
- Snyder, J., Johnson, K., Oeser, J., Patterson, G., Stoolmiller, M. & Snyder, A. (2005). Deviancy training and association with deviant peers in young children: Occurrence and contribution to early-onset conduct problems. *Development and Pathology*, 397-413.
- Snyder, James, Patterson G.R, & Reid J.B (2002). *Antisocial behavior in children and adolescence: A developmental analysis and model for intervention* (pp.101-15). Washington, DC: American Psychological Association.
- Snyder, J., Childs, J. & Horsch, E. (1997). Peer relationships of young children: Affiliate choices and the shaping of aggressive behavior: *Journal of Clinical Child Psychology*, 26, 145 156.





# PROGRESS REGARDING IN SITU HYBRIDIZATION: ANALYSIS OF MICRO RNA EXPRESSION IN THE HAMSTER UTERUS

**Elka S. Garcia, McNair Scholar**

William J. Hendry, Ph.D., Biological Sciences  
Wichita State University

## Abstract

During the 1970s, the synthetic estrogen diethylstilbestrol (DES) was administered in the mistaken belief that it would prevent miscarriage and other pregnancy complications. In the first trimester of pregnancy, DES treatment was linked to neoplastic lesions in the adult female reproductive tract (Alwis et al., 2011; Li et al., 2003; Mericskay, Carta, & Sassoon, 2005; Newbold et al., 2007). Inappropriate prenatal and/or neonatal exposure to endocrine disruptors can alter normal female reproductive tract development and adult function (Hendry III et al., 2002; Mericskay, Carta, & Sassoon, 2005). Subsequent animal studies found that neonatal DES exposure induces a direct and permanent change in the developing hamster uterus (initiation stage). As a result, the mature uterus responds abnormally to stimulation with estrogens (promotion stage) and thus often progresses to neoplasia, a formation of cancerous tumors. Despite the clinical and experimental evidence for DES-induced disruption, further investigation is needed to define the mechanism(s) responsible for it at the different endocrine regulatory and target organ levels (Alwis et al., 2011). In the lab, we investigated the altered expression of micro RNAs (miRNAs) that are now known to drive various disease states, including cancer (Stefano et al., 2006). My project involved the development and optimization of a procedure to analyze the expression of specific miRNAs at the cell level in hamster uterine tissue sections using in situ hybridization (ISH). We used this protocol to examine

miRNA targets previously analyzed at the whole organ level and assessed if they are differentially expressed at the tissue/cell-specific level in control versus neonatally DES-treated hamster uteri at both the initiation and promotion stages of the organ neoplasia phenomenon. Our findings indicate that further modifications to our procedure are needed to obtain conclusive results.

## Introduction

Currently, the scientific community has expressed concern that inappropriate exposure to endocrine disruptors during and/or shortly after pregnancy can disturb normal reproductive tract development and adult function (Hendry III et al., 2002; Mericskay et al., 2005). One of the possible disruptions is vaginal cancer, which usually occurs in older women; however, in 1971, seven young girls were diagnosed with a rare cancer: vaginal clear-cell adenocarcinoma (Alwis et al., 2011; Herbst, Ulfelder and Poskanzer, 1971). Further investigation revealed that their mothers were all treated with the synthetic estrogen, diethylstilbestrol (DES), during their first trimester of pregnancy in the mistaken belief that such treatment would prevent miscarriage. That was the first report linking transplacental DES exposure of the developing female fetus with the development of benign and neoplastic lesions in the adult female reproductive tract (Alwis et al., 2011; Li et al., 2003; Mericskay et al., 2005; Newbold et al., 2007). Subsequent reports found a low incidence of clear-cell adenocarcinoma in young women as well as other common abnormalities such as vaginal adenosis, an abnormal development of glandular tissue in the vagina (Herbst, Ulfelder and Poskanzer, 1971).

DES is no longer prescribed to women, but it is used in animal studies as a prototypical estrogenic chemical that causes "endocrine disruption" of normal hormonal signaling in the body (Mericskay et al., 2005; Newbold et al., 2007). Numerous animal studies showed that perinatal DES exposure results in infertility and neoplasia, a growth of malignant tumors, in the reproductive tract of females (vagina, cervix, uterus, oviduct, ovary) and males (tes-

tis, epididymis, seminal vesicles) (Alwis et al., 2011; Hendry III et al., 2002; Newbold et al., 2007). Moreover, hormone dependence and the developmental period during which DES is administered greatly influences how and to what extent each area of the reproductive tract is disrupted. Despite the clinical and experimental evidence, further investigation is needed to define the mechanism responsible at different endocrine regulatory and target organ levels (Alwis et al., 2011).

Research confirms that high-dose perinatal exposure to DES causes reproductive tract developmental anomalies and neoplasia (endometrial adenocarcinoma). We used hamsters to analyze the influence of agents considered to be perinatal endocrine disruptors to determine their mechanism(s) of action. An important advantage of using hamsters rather than mice or rats for such studies is that the hamsters have much shorter and more predictable gestation periods. Thus the hypothesis was that, given the relatively more immature state of hamster neonates, they would model well the developmental stage of fetuses in DES-treated pregnant humans. We determined that neonatally DES-treated animals developed reproductive tract abnormalities later in life. Adult females had larger uterine horns and inflammatory lesions in the oviduct and ovarian bursa. Analysis of the hamster uterus showed that DES directly and permanently alters development of the hamster uterus (initiating event) such that it responds abnormally to later sustained estrogen stimulation (promoting event) (Hendry III, Branham and Sheehan, 2002; Hendry III et al., 2002; Newbold et al., 2007). Observations of the hamster data supports clinical and experimental evidence that perinatal DES induces teratogenesis and neoplasia in estrogen-target tissues throughout the reproductive tract (Hendry III et al.). Observations in the hamster match clinical and experimental evidence indicating that perinatal DES induces teratogenesis and neoplasia occur in estrogen-target tissues throughout the reproductive tract (Hendry III et al., 2002).

The objective of this project was to develop and optimize a protocol that would evaluate the expression of specific miRNAs at the cell

level in formalin-fixed and paraffin-embedded (FFPE) hamster uterine tissue sections using *in situ* hybridization (ISH). Once the protocol is developed and optimized, we can then use the protocol for miRNA targets previously analyzed at the whole organ level. This protocol will allow us to further assess if these targets are differentially expressed at the tissue/cell-specific level in control versus neonatally DES-treated hamster uteri during both the initiation and promotion stages of the uterine neoplasia phenomenon.

While the original paradigm of events driving carcinogenesis (DNA mutations) still holds, researchers now recognize new paradigms. These paradigms include epigenetics that involves heritable changes in histone protein modifications and DNA methylation. Recently, researchers have been investigating the altered expression of non-coding-protein gene products such as microRNAs (miRNAs) in various disease states including cancer (Stefano et al., 2006). Those studies are not surprising since those gene products are involved in important biological processes including development, differentiation, proliferation, and apoptosis (Calin & Croce, 2006).

The expression patterns of specific miRNAs can classify human cancers according to developmental lineage and their differentiation stage. Currently, every tumor analyzed had differences in miRNA expression compared to normal tissues. MiRNAs can either function as tumor suppressors or as oncogenes. One explanation is that a particular miRNA can be involved in various pathways and have differing effects on cell survival, growth, and proliferation dependent upon cell type and developmental state. Different cell types show different miRNA to mRNA interactions because a particular miRNA can interact with different target mRNAs and a particular mRNA can be targeted by different miRNAs. Such findings suggest that miRNAs are involved in common regulatory processes that are altered in various types of tumors (Calin & Croce, 2006). With the newly discovered involvement of miRNAs in cancer, it is important to clarify their targets and mechanisms of action (Stefano et al., 2006). Since miRNAs play important roles in oncogenic signaling pathways, they can be used

as clinical tools for the diagnosis and prognosis of cancer. Scientists are currently exploring such avenues (Calin & Croce, 2006).

Neonatal DES exposure induced both early and prolonged effects in the hamster uterus. The prepubertal uterus exhibited changes in mitotic activity, organization, individual tissue compartment dimensions, and endometrial glands. The postpubertal uterus exhibited endometrial hyperplasia of which 40% progressed to neoplasia. When neonatal DES versus  $E_2$  exposure was compared, Hendry et al. (2002) observed more rapid growth of the prepubertal tract uterus in the DES treated hamsters than in the  $E_2$  treated hamsters. During adulthood, the reproductive tract in the neonatally DES-treated group weighed more than that in the neonatally  $E_2$  treated group. Furthermore, in the neonatally DES-exposed animals, they observed increased uterine mass and inflammation in the oviduct/ovarian bursa. Additionally, sustained  $E_2$  stimulation in adult animals resulted in a greater uterotrophic response in the neonatally DES exposed group than in the neonatally  $E_2$  exposed group. Hypertrophic and hyperplastic columnar cells were observed in the endometrium of neonatally DES exposed uteri. Moreover, the amount of lactoferrin was hyperinduced only in the neonatally DES exposed uteri. This suggests that lactoferrin induction is a specific endpoint of endocrine disruption in the hamster uterus (Hendry et al., 2002). Li et al. (2003) reported that neonatal DES exposure caused persistent increase of lactoferrin, epidermal growth factor and proto-oncogenes *c-fos*, *c-jun*, and *c-myc*. Moreover, perinatal DES exposure may lead to persistent suppression of *Hoxa-10* and *Hoxa-11*, which are involved in structural abnormalities in reproductive organs. While miRNA's oncogenic and suppressor function is known, the molecular mechanisms controlling these abnormalities are not well understood.

Neonatal DES treatment also disrupted the development, structure, and function of the hamster ovary (Alwis et al., 2011; Hendry et al., 2002). The DES-treated animals were anovulatory and lacked estrous cycles (Hendry et al., 2002). However, researchers are uncertain whether these abnormalities in the adult hamster ovary are due

to a direct mechanism that involves instant DES induced changes of the perinatal development of the ovary, or an indirect mechanism which involves changes in the development and function of the hypothalamus and/or pituitary which alters the regulation of gonadotropin, or a combination of both direct and indirect mechanisms (Alwis et al., 2011). Scientists have tested these hypotheses on mice and found either a direct or indirect mechanism at work, and they further investigated these hypotheses using the hamster cheek pouch.

We did not observe any significant differences in endocrine disruptive effects on organ weight or testosterone levels before puberty in neonatally DES- or  $E_2$ -treated male hamsters and  $E_2$  treated male hamsters. Pubertal males also exhibited normal spermatogenesis in both  $E_2$ - and DES-treated hamsters. However, at 90 days of age, the DES- but not the  $E_2$ -treated animals had various and severe reproductive tract lesions. Surprisingly, neonatal DES treatment had no effect on testosterone levels in the mature hamsters. Consequently, DES acts as a specific perinatal endocrine disruptor to induce lasting developmental lesions in the male hamster. This disruption profile obviously differs from that in the female reproductive tract. Therefore, we concluded that there are different mechanisms operating in males and females.

Histological analysis of tissues/organs from neonatally DES-exposed females confirmed that uterine size was enhanced when  $E_2$  stimulation was either withdrawn or sustained. This finding was quite different from what occurred after hamsters were prenatally exposed to DES and then uteri from intact animals were examined at different ages. In this test, the uterine size first decreased but then increased. Such differences in the target tissues/organs are likely due to differences in endocrine status (pre-vs. post-pubertal and intact vs. ovariectomized vs. ovariectomized plus  $E_2$ -stimulated).

Initial evidence suggests that neonatal DES exposure also disrupts cell-to-cell and cell-to-extracellular interactions in the hamster reproductive tract. Additional analysis of the functional and biochemical basis of these changes will help us understand how estrogen controls the

normal growth and morphogenesis of the uterus and how disruption of that developmental process can induce an unregulated neoplastic state (Hendry III et al., 2002).

Optimized techniques to detect common epithelial malignancies should decrease disease and death caused by cancer. MiRNAs are small RNAs that are commonly deregulated in cancer and thus are promising markers for the diagnosis and prognosis of cancer. Stable forms of miRNAs are also found in human plasma where they are protected from Ribonuclease (RNase) degradation, an enzyme that catalyzes the degradation of RNA into smaller components. Serum levels of miR-141 can determine whether a person has prostate cancer or not. These results prove that finding tumor-derived miRNAs in plasma or serum are a viable approach to less invasively detect and monitor common epithelial malignancies. Even with such promising blood-based protocols for cancer detection, development of markers for clinical use remains a challenge; therefore, there is an urgent need to further improve these cancer detection strategies.

MiRNAs are small regulatory RNAs that control the translation of specific mRNAs into their final protein products. Thus they are involved in both physiological and pathological processes. A study by Mitchell et al. (2008) proposed that miRNAs could be used as blood-based biomarkers for the detection of cancer because miRNAs are commonly dysregulated in cancer, their expression in human cancer is tissue specific, and they are oddly stable in formalin-fixed tissues. That stability of miRNAs in formalin-fixed tissues led to the hypothesis that stable forms of miRNAs may also be present in plasma and serum. Subsequent analyses confirmed that hypothesis and demonstrated the utility of blood-based miRNA for cancer detection with a xenograft model system and serum samples from individuals with prostate cancer. These results should promote the development of miRNAs as blood-based detection markers for cancer as well as raise questions about the stability and possible function of circulating miRNAs.

This research is still in an early developmental stage. The finding that miRNAs are present in

stable forms in blood provides a foundation for continued research into their use as blood-based cancer markers. Specifically, the study found that miR-141 can distinguish prostate cancer individuals from healthy individuals therefore proving that tumor-derived miRNAs can detect cancer with great specificity and sensitivity. The continued research of this topic will lead to the discovery of other miRNAs that detect other specific cancers (Mitchell et al., 2008).

Neonatal DES exposure permanently changes gene expression pathways that are estrogen regulated, which is supported by the lack of uterine tumors in neonatally DES-treated that were ovariectomized prepubertally. Though only morphological and pathological effects of perinatal DES exposure were found facilitated by estrogen receptors (Mericskay et al., 2005; Newbold et al., 2007) not much is known about their downstream targets or how they are involved in growth of the adenocarcinomas. However, Newbold et al. (2007) revealed some early molecular events such as induction of estrogen-regulated genes that may be involved in later abnormal estrogen responses that cause neoplasia. While the complete mechanisms that elicit an abnormal uterine response after neonatal DES exposure are unclear, the data obtained from this study may help explain the initiation events of uterine hormonal carcinogenesis and help develop a molecular fingerprint that can better predict the lasting effects of DES exposure that may be passed on to future generations (Newbold et al., 2007).

Mericskay et al. (2005) studied the role of two types of patterning genes: WNT family of secreted growth factors and homeobox genes. Members of these gene families, such as *Wnt7a*, are expressed in the embryonic stage and also throughout adulthood in the female reproductive tract. Mericskay et al. (2005) found striking uterine phenotypic similarities among *Wnt7a* mutant mice, women treated with DES in utero, and experimental rodent models treated with DES in utero. The phenotypic similarities led them to investigate whether *Wnt7a* played a role in the DES response mechanism. They found that DES down-regulated *Wnt7a* expression in the developing uterus. Therefore, they proposed that

the similar phenotypes stimulated by DES and the loss of *Wnt7a* gene function resulted from DES repressing *Wnt7a* and recapitulating the mutant phenotype. Consequently, *Wnt7a* expression is involved in the critical and permanent events that occur during the perinatal stage.

Kaufman and Adam (2002) examined a group of women whose mothers received DES during pregnancy and compared pelvic examinations from both the mothers and the daughters. Their results were taken from 28 daughters, three of which had the same mother. Records showed that 16 of the mothers had structural changes of the cervix and vaginal epithelium changes that comprised adenosis. None of the daughters showed alterations commonly associated with DES exposure. Kaufman and Adam (2002) concluded that the effects of DES exposure on the uterus are not transferred to third generation offspring. This study was initiated because of previous reports that raised concerns regarding the risk of DES-related clear cell adenocarcinoma. The risk of adenocarcinoma induced by DES exposure ranges between 0.14 and 1.4 per 1000. Consequently, the number of women examined in this study is too small to make any conclusions regarding the risk for adenocarcinoma. Experimental animal studies showed that adenocarcinoma developed as they aged, but in this study the women's age ranged between fifteen and twenty-eight. Therefore, it is possible that, as these women continue to age, they may develop adenocarcinoma of the endometrium. Yet, these daughters may not represent the general female population and the number of women examined may have been too small to be representative.

Early exposure to endocrine disruptors can cause birth defects, tumors, and reproductive disorders. Evidence from the clinical literature and animal studies reveals a link between treatment with the synthetic estrogen DES during pregnancy and the development of vaginal adenocarcinoma in their offspring (Alwis et al., 2011; Hendry III, Branham and Sheehan, 2002; Hendry III et al., 2002; Herbst, Ulfelder and Poskanzer, 1971; Kaufman and Adam, 2002; Li et al., 2003; Mericskay et al., 2005; Newbold et al., 2007). This clinical phenomenon became



known as the “DES syndrome” (Hendry III et al., 2002). Although important insight came from the original paradigm of events driving carcinogenesis (DNA mutations), newer mechanistic paradigms are now recognized. Researchers are now investigating the altered expression of non-coding-protein gene products such as miRNAs in various disease states including cancer in general and perinatal endocrine disruption in particular. In other words, researchers are probing both classical genetic and more recently discovered epigenetic mechanisms of carcinogenesis to generate more effective diagnostic, prognostic, and therapeutic strategies.

## Methods

In situ hybridization (ISH) is a method for visualizing and localizing nucleotides (DNA and RNA molecules) in specific tissue/cell types. This technique is often time consuming and difficult since it requires much optimization to acquire satisfactory results (Jørgensen, Baker, Møller, & Nielsen, 2010). In our initial protocol, we used biotin-labeled LNA probes. In such protocols, Proteinase-K is first used to demask miRNAs and thus allow their access to homologous probes. In our initial protocol, we used avidin that is directly conjugated with the enzyme horseradish peroxidase, which binds to biotin. After the biotin binding, diaminobenzidine (DAB) substrate peroxidase converts into a brown reaction product, which detects probe-to-miRNA binding. Following that reaction, methyl green nuclear counterstain was used to generally visualize tissue sections more easily since it provides a contrasting color to the principal stain under the microscope. In our revised protocol, we used double digoxigenin (DIG)-labeled LNA probes. The anti-DIG antibody that is directly conjugated with the enzyme alkaline phosphatase recognizes the double DIG-labeled probe. Later, 4-nitro blue tetrazolium and 5-bromo-4-chloro-3'-indolephosphate (NBT-BCIP) substrate, which gives a blue reaction product, is used to detect such binding. Fast red nuclear counterstain is then used to visualize tissue sections under the microscope. For both protocols, we used tissue

sections of day-5 (I) and 2-mo/O+E2 (P) uterine sections/slides generated at Via Christi Hospital.

### Protocol I

On day 1, slide pairs (with hamster uterine tissue) were deparaffinized in xylene and 99.9%, 96%, and 70% ethanol (EtOH) solutions at room temperature (RT) and then simmered in NaCitrate buffer (10mM Trisodium Citrate, pH6) for 30 minutes (antigen retrieval). Xylene removes the waxy coat that protects the tissue sections. NaCitrate buffer breaks the protein bonds, unmasking the antigens and epitopes in FFPE tissue sections and exposing the target regions. Slides were washed and soaked in PBS-T (Phosphate Buffered Saline-Tween: 19.2 g Dulbecco's PBS + 1mL Tween-20, QS 2 L with H<sub>2</sub>O, pH 7.5). Next, slides were incubated in peroxidase quenching solution (3% H<sub>2</sub>O<sub>2</sub> in MeOH) for 30 minutes at 37°C and then washed with PBS-T (Phosphate Buffered Saline-Tween). PBS-T is a wash buffer solution used to maintain a constant pH in many different applications. Immediately, before use, 1.5 µL of Proteinase-K (20mg/mL frozen in aliquots at -20°C) was added to 1 mL of Proteinase-K buffer. Slides were incubated with 200µL of Proteinase-K reagent for 1 hour at 37°C in a sealed humidior. Slides were washed with PBS-T and dehydrated in EtOH solutions. Slides were air dried for 15 minutes, placed into a slide container with Dryrite, and stored at -80°C for 48 hours.

On day 2, slides were brought to RT. The probe was then heated in a water bath for 4 minutes at 90°C. Once slides were at RT, Avidin/Biotin blocking was performed. Slides were dipped in PBS-T before adding Avidin to rewet the slides and to prevent air bubble formation. First, Avidin was added to slide pairs for 15 minutes at RT and then rinsed in PBS-T. Biotin was then added to slide pairs for 15 minutes at RT and then washed with PBS-T. Positive U6 (U6+) probe, previously prepared in lab experiment CMW1-8 at 2X concentration, was used. The probe was added to each slide pair and then placed in a sealed hybridization chamber for 48 hours at 55°C.

On day 3, slide pairs were placed in a coplin

jar with 5xSSC (saline-sodium citrate) at RT. Slides were washed in 5x, 1x, and 0.2xSSC buffers at 55°C and then washed in 0.2xSSC at RT. The ABC (Avidin-Biotin complex) reagent [4ul A (Avidin) + 200ul PBS-T was vortexed, received 4ul B (Biotin), again vortexed] was allowed to complex for 30 minutes and was then added to the slides and incubated for 20 minutes at 37°C in a humidior. Slides were washed first in PBS-T and then in deionized water. Slides were placed in a coplin jar with DAB (diaminobenzidine) solution and incubated for 5 minutes 20 seconds. Slides were dipped in methyl green counterstain for 6 seconds and then thoroughly rinsed with tap water to remove excess counterstain. Slides were allowed to dry overnight and then cover slipped. The results were analyzed by light microscopy.

A few modifications were made to this protocol. For instance, slides were allowed to soak in the DAB solution for 10 minutes, they were counterstained for 3 seconds, and a new stock of U6+ probe was prepared and used.

### Protocol 2

On day 1, slide pairs (with hamster uterine tissue) were deparaffinized in xylene and EtOH solutions at RT, followed by Proteinase K application. Only 0.75µL of Proteinase-K (20mg/mL frozen in aliquots at -20°C) was added to 1mL Proteinase-K buffer and each slide pair was incubated with the Proteinase-K reagent for only 10 minutes at 37°C. After the air-drying step, the hybridization mix was added to each slide pair and allowed to hybridize overnight at 55°C.

On day 2, the slides were washed in SSC buffers. Slides were transferred to a coplin jar with PBS, placed in a humidifying chamber, and incubated with blocking solution for 15 minutes at RT. After the blocking solution was removed, the anti-DIG reagent (sheep anti-DIG-AP) at 1:800 dilution in blocking solution containing 2% sheep serum was applied to the slides, they were incubated for 1 hour at RT, and then were washed with PBS-T. Next, freshly prepared AP (Alkaline Phosphatase) substrate [NBT-BCIP (4-nitro-blue tetrazolium and 5-bromo-4-chloro-3'-indolyphosphate) tablet dissolved in 10mL H<sub>2</sub>O + 20µL Levamisol

stock] was applied to the sections and the slides were incubated for 2 hours at 30°C. Aluminum foil was used to protect it from light during development. Next, the slides were incubated in KTBT (900mL RNase-free H<sub>2</sub>O + 7.9g Tris-HCl(50mM) + 8.7g NaCl (150mM) + 0.75g KCl (10mM), QS to 1000mL and autoclaved) buffer to stop the reaction and then washed with water. Approximately 200µL of Nuclear Fast Red counter stain was applied to each slide pair for 1 minute. Slides were carefully rinsed for 10 minutes then dehydrated in EtOH solutions. Slides were mounted with permount and the results were later analyzed by light microscopy. The probes we used were U6+, scrambled (negative control), miR-21, miR-29b, and miR-133a.

## Results

My project involved the development and optimization of a procedure to assess the expression of specific miRNA molecules at the cellular level in uterine tissue sections from control and neonatally DES-exposed hamsters. Afterward, I compared the results to those found at the whole organ extract level. Altered miRNA expression is now linked to both the initiation and promotion stages of carcinogenesis. Research also links neonatal DES exposure and altered expression of specific miRNAs with uterine cancer.

My initial ISH protocol did not generate definite positive or negative results because we did not clearly localize miRNA-to-probe binding where we expected it to occur with either the positive or negative control probes. We did observe hints of signal in some tissue compartments but no significantly clear signal was detected with the DAB substrate solution. Those results prompted us to significantly revise the ISH protocol.

Working with the subsequently revised protocol, we still did not acquire specific signals with any of the miRNA probes even though the positive control probe did yield strong and appropriately localized (nuclear) signals. Therefore, while the general hybridization and detection methodology does function, it does not yet allow us to detect low levels of specific miRNA expression in the uterine tissue/cell sections.

Consequently, further development and optimization of our basic ISH protocol is still needed.

## Discussion

The involvement of miRNAs in normal physiology and disease processes, including cancer, is an emerging but clearly very important topic. For example, analysis of miRNA expression can assist diagnosis and prognosis of specific cancers because they can function either as tumor suppressors or oncogenes and thereby affect cell survival, development, and proliferation (Calin & Croce, 2006). For instance, Mitchell et al. (2008) reported that levels of miR-141 expression differentiated prostate cancer patients from healthy people. Therefore, scientists are confident that continued analysis will uncover more miRNAs that can help detect and treat other cancers (Mitchell et al., 2008).

In several other studies, we found that perinatal DES exposure disrupts normal development and function of the female reproductive system, thus leading to neoplasia (Hendry et al., 2002; Mericskay et al., 2005). The objective was to determine the mechanism responsible for this type of endocrine disruption (Hendry, Branham, & Sheehan, 2002; Hendry et al., 2002; Newbold et al., 2007). More specifically, they wanted to understand what molecular factors are involved in the two-stage phenomenon of neonatal DES-induced cancer in the hamster uterus.

This research complements previous research that profiled differential miRNA expression in the neonatally DES-exposed uterus at the whole

organ level. A major objective was development of an ISH protocol able to determine whether such differences in expression occurred primarily in the epithelial or stromal compartment of the uterus. Such questions regarding the dynamics of signaling between the epithelium and stroma are crucial to understanding the mechanisms of carcinogenesis. Furthermore, we expected to detect miRNAs in the cytoplasm where they target the translation and stability of messenger RNAs. At this point, we made some progress, but the analytical protocol requires further development. We probably need to modify the concentration of each probe we test and take more precautions to reduce target miRNA degradation possibly due to incomplete inactivation of RNases (Ribonuclease) during the initial tissue fixation and/or subsequent histological processing steps. Since this technique is very sensitive, it is vital to conduct the *in situ* hybridization steps in a timely manner, which may reduce unintended drying of the tissue slides or exposure to RNases. Furthermore, the importance of applying reagents properly is evident because when all tissue sections are covered, the probe-to-target binding is enhanced. In addition, it is critical that the correct amount of reagent is used and that slides are handled properly to reduce loss of normal tissue morphology. By taking these extra precautions, we could achieve better detection and measurement of specific miRNAs in our tissue samples. Future research may find whether or not miRNAs are involved in tumor development. If this involvement is confirmed, the next step would be to determine how the detection of miRNAs can assist the diagnosis and treatment of a particular cancer.

### References

- Alwis, J. N., et al. (2011). Neonatal diethylstilbestrol exposure disrupts female reproductive tract structure/function via both direct and indirect mechanisms in the hamster. *Reproductive Toxicology*, 32(4), 472-483.
- Calin, G. A., & Croce, C. M. (2006). MicroRNA signatures in human cancers. *Nature Reviews*, 6, 857-866.
- Hendry, W. J., Branham, W. S., & Sheehan, D. M. (2002). Diethylstilbestrol versus estradiol as neonatal disruptors of the hamster (*mesocricetus auratus*) cervix. *Biology of Reproduction*, 70(5), 1306-1316.
- Hendry, W. J., et al. (2002). Developing a laboratory animal model for perinatal endocrine disruption: the hamster chronicles. *Society for Experimental Biology and Medicine*, 709-723.
- Herbst, A. L., Ulfelder, H., & Poskanzer, D. C. (1971). Adenocarcinoma of the vagina association of maternal stilbestrol therapy with tumor appearance in young women. *The New England Journal of Medicine*, 16(284), 878-881.
- Jørgensen S, Baker A, Møller S, Nielsen BS. (2010). Robust one-day in situ hybridization protocol for detection of microRNA in paraffin samples using LNA probes. *Method*, 52, 373-381.
- Kaufman, R., Adam, E. (2002). Findings in female offspring of women exposed in utero to diethylstilbestrol. *The American College of Obstetricians and Gynecologists*, 99(2), 197-200.
- Li, S., et al. (2003). Neonatal diethylstilbestrol exposure induces persistent elevation of c-fos expression and hypomethylation in Its exon-4 in mouse uterus. *Molecular Carcinogenesis*, 38, 78-84.
- Mericskay, M., Carta, L., & Sassoon, D. (2005). Diethylstilbestrol exposure in utero: a paradigm for mechanisms leading to adult disease. *Clinical and Molecular Teratology* 73, 133-135.
- Mitchell, P.S. (2008). Circulating microRNAs as stable blood-based markers for cancer detection. *PNAS*, 105(30), 10513-10518.
- Newbold, R. R., et al. (2007). Developmental exposure to diethylstilbestrol alters uterine gene expression that may be associated with uterine neoplasia later in life. *Molecular Carcinogenesis*, 46, 783-796.
- Stefano, V., et al. (2006). A microRNA expression signature of human solid tumors defines cancer gene targets. *PNAS*, 103(7), 2257-2261.



# RESEARCH SUMMA

---







# EXAMINATION OF HOW HEALTH PROFESSIONALS OF COLOR EXPERIENCE AND NEGOTIATE RACE WITHIN THEIR WORKPLACES

Courtney Berry, McNair Scholar

Darron Smith Ph.D., PA-C  
Wichita State University

## Introduction

Recent research on African American physicians indicates that racial identity plays a significant role in their work environment. Discrimination is one way that race becomes an issue; however, a small amount of literature exist that documents the experiences of African American health professionals or other minority health professionals. In today's world, racism and the attitudes that support race-based mistreatment remain a reality that affects the lives of African Americans and other minorities of color throughout the United States. No matter the social setting, discrimination and mistreatment remain a significant barrier to social justice and equality (Doane, 2006).

Though the Civil Rights Movement did much to end discriminatory practices within the federal government, other more subtle forms of discrimination remain clear and still in effect. Additional efforts to end discrimination at the federal level such as affirmative action are often met with resistance because they challenge white dominance in the United States. Previous research examined how the workplace can be a place where racism is commonly experienced, even in the medical field. In this literature review, I examined the experiences of minority healthcare professionals of color within their respective work environments. I investigated this question: How do primary care health professionals of color experience and negotiate race within their workplace? This research may lead to a better understanding of the racial experiences of minority primary care health professionals. Furthermore, I predict



this research will help institutions retain and recruit more minority individuals as the nation works towards Healthy People 2020, a national initiative to eliminate health care disparities. African Americans comprise 13% of the population but only represent 4.4% of physicians and surgeons in the medical workforce (Rao & Flores, 2007). Consistently low numbers of African Americans are enrolling in medical school. Similarly, professional schools that train allied health care practitioners (physician assistants and nurse practitioners) are experiencing issues with the recruitment of students of color. With low numbers of African Americans represented in professional training school and medicine in general, it may be difficult to increase the numbers of minorities in medical settings to offset the race-based mistreatment many report encountering; this will not be an easy task. Research indicates that medical schools, as well as PA and NP schools, need to be diversified by increasing the numbers of applicants of color. The hope is that the increase in applicants will improve the representation of providers with different racial and ethnic backgrounds in the medical workforce.

### Physician Assistants

Although more research is needed concerning the experiences of black physicians in the workplace, even less is known about the workplace experiences of African American Physician Assistants and how they address race-related issues in their work environments. According to the 2010 census report completed by the American Academy of Physician Assistants, there are 83,466 individuals eligible to practice as PAs. Whites are the dominant group with 54,866. Minorities in this field are significantly underrepresented: 618 Native Americans; 3,536 African Americans; 3,962 Latino/Hispanic Origins; 4,000 Asians; 374 other and 16,111 unknown. The American Academy of Physician Assistants 2010 census report accounted for members and non-members alike.

### Physician Assistant Focus Group

The career field of Physician Assistant was created at Duke University in 1967 based on the

needs of the federal government to expand the training sites of primary care providers, including the field of physician assistant education (Kazik, 2010; Smith & Sabino, 2012). However, even in this relatively new field, reporting mistreatment in the work place is as difficult a task as it is for their physician counterparts. In a recent unpublished study funded by the Physician Assistant Education Association on workplace discrimination among African American PAs, a small focus group was selected which consisted of four African American physician assistants, including three females and one male, who are currently PA professors at colleges or universities in North America. In most cases, the PA is the only African American faculty member or one of a few African American faculty at their institutions that train physician assistants. The four participants were asked a variety of questions concerning what they encounter daily in their work environments. Specific questions targeted their treatment by colleagues, their work efforts, their interactions with students, their interactions with patients, and their experiences with discrimination. All of the PAs in this focus group were able to relate to these specific issues and discuss the difficult situations they have experienced in their profession.

## Conclusion

Racial discrimination is something that will never completely disappear, especially given modest legal efforts to address the problems. Although blatant forms of discrimination are usually absent from society, the literature I examined has provided cogent examples of how and why discrimination is still present in America, especially in the medical profession. This unfortunate scenario plays out when physicians and physician assistants in these studies discussed consistently being questioned about decisions they made when treating patients. These PAs also talked about feeling like they were “under more scrutiny than their colleagues” (Nunez-Smith, et al., 2009). When discussing the topic of minority physicians, physician assistants and health professionals, workplace discrimination remains

prevalent because of lack of workplace communication about racial discrimination. Therefore, minority health professionals will continue to feel uncomfortable, unnoticed, and stressed within their work environment since not enough minorities choose to discuss the discrimination they experience.

The research suggests that a change needs to occur to create a better workplace environment for physicians and PAs. This change must begin with recruitment for medical schools for diversifying the physician and medical profession workforce. The consistently low numbers of African Americans enrolling in medical schools will continue the trend of an undiversified workplace. With the misperceptions of financial obligations, time commitment, stress, discrimination, lack of family/peer support, and few same-race mentors in medical school and the medical workforce, recruitment of minorities will remain low; there are not enough minority health professionals to help reverse the misperceptions. A way to resolve this problem begins with mentorship and enrichment programs within high schools and middle schools

to encourage African American and minority students to explore their options when it comes to the medical profession.

Another crucial reason to diversify the health care field is that the vast majority of current healthcare workers represent a population very different from the patient population they are currently serving and will be serving in years to come (Smith, & Sabino, 2012). Research literature also “[suggests] that primary care health professionals often treat minority patients [differently] from white patients, [which] can lead to patient distrust and poor health outcomes” (Smith, & Sabino, 2012, p. 3). Patients who experience discrimination from providers can develop negative beliefs about health care, which can ultimately affect future healthcare decisions (Bird & Bogart, 2001). As the nation moves toward the goals of Healthy People 2020, a “10-year national objective for improving the health of all Americans,” diversifying the health care field and ending workplace discrimination is more than necessary to provide proper treatment to an aging and diverse population (Healthy People 2020, 2012).

## References

- Bird, S., & Bogart, L. (2001). Perceived race-based and socioeconomic status based discrimination in interaction with health care providers. *Ethnicity & Disease*, 555-563.
- Bright, C. M., Stone, V. E., & Duefield, C. A. (1998). Perceived barriers and biases in the medical education experience by gender and race. *Journal of National Medical Association*, 681-688.
- Doane, A. (2006). What is racism? Racial discourse and racial politics. *Critical Sociology*, 256-274.
- Kazik, Jackie. (2010, Nov. 6). Career outlook for physician assistants. Retrieved from <http://physician-assistant-ed.com/2010/11/career-outlook-for-physician-assistants/>.
- Link, B. G., & Phelan, J. C. (2006). Stigma and its public health implications, 528-529.
- Nunez-Smith, M., Curry, L. A., Berg, D., Krumholz, H. M., & Bradely, E. H. (2008). Healthcare workplace conversations on race and the perspectives of physicians of african descent. *Journal General Internal Medicine*, 1471-1475.
- Nunez-Smith, M., Curry, L. A., Bigby, J., Berg, D., Krumholz, H. M., & Bradley, E. H. (2007). Impact of race on the professional lives of physicians of african descent. *Annals of Internal Medicine*, 45-51.
- Nunez-Smith, M., Pilgrim, N., Wynia, M., Dsai, M. M., Jones, B. A., Bight, C., et al. (2009). Race/ethnicity and workplace discrimination: Results of a national survey of physicians. *Journal Of General Internal Medicine*, 1198-1204.
- Price, E. G., Gozu, A., Kern, D. E., Powe, N. R., Wand, G. S., Golden, S., et al. (2004). The role of cultural diversity climate in recruitment, promotion and retention of faculty in academic medicine, 565-571.

Rao, V., & Flores, G. (2007). Why aren't there more African -American physicians? A qualitative study and exploratory inquiry of African American students' perspectives on careers in medicine. *Journal Of National Medical Association*, 986-993.  
(2012, March 29). Retrieved July 3, 2012, from Healthy People 2020: <http://www.healthypeople.gov/2020/about/default.aspx>.



# HOW DO I TEXT THEE: EFFECTS OF FREQUENT TEXTING ON RELATIONSHIPS

---

**Sarah O. Cummings, McNair Scholar**  
Richard N. Armstrong, Ph.D., Communication  
Wichita State University

## Introduction

**W**ith the continued rise in the use of social media, some researchers are beginning to question its impact on inter-personal relationships and whether the impact is positive, negative or a combination. In a world where communication is vital, sending text messages has become a popular, seemingly vital, form of communication. Interpersonal relationships involving family, friends, and significant others incorporate text messaging for a variety of reasons. Some studies have focused on text messaging within popular relationship dyads, such as mother-daughter, parent-child, boyfriend-girlfriend, and husband-wife (Seltzer, et al., 2012; Pettigrew, 2012). Other studies report that text messaging within those interpersonal relationships has both positive and negative effects.

While research on all types of relationships is important, our on-going study will focus mainly on the interpersonal relationships of boyfriend-girlfriend and husband-wife relationships of students who attend Wichita State University. We will look at studies with broad themes of text messaging effects on family and friends, then narrow down to studies with positive and negative outcomes of text messaging within romantic relationships. Our research questions include the following: Does the increase of texting decrease face-to-face communication? Does the increase of texting lead to more comprehension, misunderstanding, or a combination of both? Does text messaging create immediacy, but not intimacy, for relationships?

Is compatibility in romantic relationships a factor in how text messaging is used by each partner? Theories suggest relationships centered on text messaging can lead to more misunderstandings, which could lead to unfulfilling relationships. Furthermore, the effects of limited face-to-face communication can lead to unsatisfactory relationships as well. We suspect that text messaging may affect relationships more negatively than positively compared to relationships in which the majority of communication takes place face-to-face.

## Discussion

In an interview from a newscast, Orbuch (2010) presented several interesting points as to how men and women use text messaging. Orbuch suggests that text messaging has different purposes for men and women, which could be one factor for miscommunication. This factor would be an area to consider for future analysis because it could reveal more specific gender-based data since current studies seem to reinforce stereotypes.

The Seltzer et al. (2012) study looked at the mental aspect of how technology can interfere with our body chemistry. Since the study examined mothers and daughters, we are interested in how the analysis would have turned out if an older age group of participants of both genders had been used. Another aspect to consider in relation to this study would be this: What would the physiological data reveal if romantic partners were studied?

The three major themes Pettigrew (2009) discovered in his study adequately addressed not only the participants but describe the nature of the relationships. Specific themes in this study provide a clearer understanding of the data on communication because the themes correlate the participants within specific relationships. In the Baym et al. (2007) study, they incorporate "acquaintances" into their research, which broadened their results compared to other studies. Their view differed somewhat from Orbuch (2010) because the Baym et al. (2007) study found that men and women use text messaging for mostly the same purposes. However, the Baym et al. (2007) data seemed to correlate with the Seltzer et al. study that indicated family relation-

ships that included text messaging as a form of communication were satisfying.

Angster, Frank, and Lester (2010) incorporated time as one of their variables to identify whether a relationship will be fulfilling or not based on the amount of time text messaging is used. Since Angster, Frank, and Lester's study has a large gap in gender representation, this could skew the results since some of the other studies have found that men and women use text messaging for different reasons. Though we see the value of this variable, we hope to have a more even number of each gender within our study.

The Davila et al. (2012) study focused on negative emotions and symptoms within their study group analysis, which brought a new aspect to this research. The questionnaire and surveys used to test their participants were more than six years old, which may or may not have affected their findings. Other categories added to the definition of interpersonal relationships that other studies did not include or specify were "roommates" and "collegial coworkers."

The Skierkowski and Wood (2012) study included not only the outcome of how participants communicated via text messaging but what the outcome would be if text messaging was taken out of the equation. According to this study, applying a withdrawal period of text messaging may improve dissatisfying relationships. The Coyne et al. (2011) RELATE model took a closer look at compatibility in relationships, which we believe could be a determining factor in the ways couples communicate using social media. The idea of allowing partners to see each other's thoughts on the survey questions could be very helpful. The Halford et al. (2004) study's use of the Couple CARE Program's three parts seemed useful because the couples were required to put in more work than other studies. Like the RELATE Program, the Couple CARE Program focused on the participants themselves, not just how they viewed their partners.

In the future, we hope to incorporate different aspects of previous research, like the RELATE Program and Couple CARE Program, as well as add new dynamics to what already exists. When using self-report data, we hope to decrease the limitations of this kind of data collection by using

a longitudinal study. We may find interesting correlations as we seek to discover how college-age participants' responses might differ simply depending upon their age and whether texting is a significant part of their lives.

## Conclusion

Out of the studies we examined, more positive outcomes than negative outcomes of text

messaging were discovered within interpersonal relationships. We suspected that text messaging may negatively affect relationships, but according to previous research, what we suspected was not quite accurate. While some studies revealed negative outcomes, many were positive. Since previous studies yielded various results, further research may help provide a better understanding of the effects of text messaging, both positive and negative, within romantic relationships.

## References

- Angster, A., Frank, M., & Lester, D. (2010). An exploratory study of students' use of cell phones, texting, and social networking sites. *Psychological Reports, 107*(2), 402-404. doi: 10.2466/17.PRO.107.5.402-404
- Baym, N. K., Zhang, Y. B., Kunkel, A., Ledbetter, A., & Lin, M.-C. (2007). Relational quality and media use in interpersonal relationships. *New Media & Society, 9*(5), 735-752. doi:10.1177/1461444807080339
- Busby, D. M., Holman, T. B., & Taniguchi, N. (2001). RELATE: Relationship evaluation of the individual, family, cultural, and couple contexts. *Family Relations, 50*(4), 308-316. Retrieved from: <http://www.jstor.org.proxy.wichita.edu/stable/pdfplus/585789.pdf?acceptTC=true>
- Coyne, S. M., Stockdale, L., Busby, D., Iverson, B., & Grant, D. M. (2011). "I luv u :)!": A descriptive study of the media use of individuals in romantic relationships. *Family Relations Interdisciplinary Journal of Applied Family Studies, 60*(2), 150-162. doi: 10.1111/j.1741-3729.2010.00639.x
- Davila, J., Hershenberg, R., Feinstein, B. A., Gorman, K., Bhatia, V., & Starr, L. R. (2012). Frequency and quality of social networking among young adults: Associations with depressive symptoms, rumination, and corumination. *Psychology of Popular Media Culture, 1*(2), 72-86. doi: 10.1037/a0027512
- Halford, W. K., Moore, E., Wilson, K. L., Farrugia, C., & Dyer, C. (2004). Benefits of flexible delivery relationship education: An evaluation of the couple CARE program. *Family Relations, 53*(5), 469-476. Retrieved from: <http://dn3kg6nn2s.search.serialssolutions.com/?>
- Orbuch, T. L. (2010). Video: Love Doctor - Texting and Relationships. WJBK FOX 2 Detroit, MI: clip syndicate. Retrieved from: [http://go.galegroup.com/ps/i.do?id=GALE%7CA235091931&v=2.1&u=ksstate\\_wichita&it=r&p=AONE&sw=w](http://go.galegroup.com/ps/i.do?id=GALE%7CA235091931&v=2.1&u=ksstate_wichita&it=r&p=AONE&sw=w)
- Pettigrew, J. (2009). Text messaging and connectedness within close interpersonal relationships. *Marriage & Family Review, 45*(6-8 Families and Communication), 697-716. doi: 10.1080/01494920903224269
- Seltzer, L. J., Prosofski, A. R., Ziegler, T. E., & Pollak, S. D. (2012). Instant messages vs. speech: hormones and why we still need to hear each other. *Evolution and Human Behavior, 33*(1), 42-45. doi: 10.1016/j.evolhumbehav.2011.05.004
- Skierkowski, D., & Wood, R. M. (2012). To text or not to text? The importance of text messaging among college-aged youth. *Computers in Human Behavior, 28*(2), 744-756. doi: 10.1016/j.chb.2011.11.023





# A QUALITATIVE STUDY OF THE EFFECTS OF PEER LABELING ON JUVENILE DEVELOPMENT

**Kristina Yvette Durham, McNair Scholar**

Michael L. Birzer, Ph.D., Criminal Justice  
Wichita State University

## Summary of Research

Labeling theory proposes the idea that labeling a person as *deviant* leads to engagement in unacceptable behavior. Such labeling by parents and authority figures, such as teachers and law enforcement, has long served as a prominent factor in the behavior of juveniles. This proposed research looks to explore and provide a broader view of an overlooked aspect that can also influence juvenile behavior: peer labeling. In order to investigate the influence of peer labeling on juvenile delinquency, as well as the development of the juvenile self-identity, we propose that interviews be conducted with a small group of counselors and staff involved with the local Boys & Girls Club of America. The purpose of this study is to examine if a relationship exists between peer labeling and engagement in juvenile acts, as well as to examine the impact of peer labeling on self-concept and identity.

Labeling theory serves as the basis for understanding the evolution of maturity within adolescents. Labeling can often result in the exclusion of a person from social groups, and his adoption of a deviant status based on their failure to comply with social norms. Many studies have examined the influence of parental and teacher approval on juvenile delinquency. These studies focus on interactions between juveniles and common authority figures. The influence of peer approval has been included in several studies, but it has received little attention due to its small statistical significance in past quantitative research. Considering the amount of time adolescents spend with peers in their



approximate age groups, it is plausible to suggest that peers would have a strong influence on the development of social rules and self-perception, which would also influence the likelihood of deviance.

In relation to juveniles, proponents of the labeling theory surmise “that perceived negative societal reactions lead to the development of negative self-conceptions and greater delinquent involvement” (Adams, et al., 2003, p. 171). Labels can be formal or informal. Formal labeling involves social control agencies, such as courts and police, while informal labeling occurs more frequently among social and peer groups. Formal labeling is suggested to increase an individual’s degree of deviance because of the possibility of legal consequences. In contrast, informal labels can be based on appearances, associations, and behaviors. These informal factors are qualified through social norms that are established based on behavioral rules.

Studies have found that the more negative labels juveniles are given, the more likely they are to engage in deviant behavior. Social groups’ general reactions factor into the development and acquisition of deviant status. For most juveniles, choosing to participate in delinquent activity includes these crucial steps: a label must be applied, understood, and eventually accepted. Self-labeling perpetuates the transition to deviance (Hayes, 2012, p. 297). Once the label is accepted, the one labeled begins to display characteristics of the label. As a result, labeled adolescents will quickly become attached to social groups similar to themselves, as these groups provide acceptance that these individuals seem to no longer receive from society (Bernburg, Krohn, & Rivera, 2006, p. 70).

This research looks to explore the following question: How does peer pressure influence juvenile behavior? Along with this question, other secondary questions will be raised: What makes peer pressure such an influential factor compared to other social interactions, and why? How does peer labeling influence adolescents’ views of themselves and others? How do juveniles determine and establish social norms within peer groups?

To explore the issue of peer labeling and its relation to juvenile delinquency, interviews will be conducted. Qualitative methods seem to be the best approach in providing a clearer view on the effects of peer labeling and providing possible answers to the proposed questions. A small set of interview questions have been developed based on the main research question. In this study, four to six interviews will be conducted with staff members at the local Boys & Girls Club. Information on issues relating to deviant behavior will be gathered based on the staff’s perceptions of the adolescents they interact with on a regular basis. After each interview, the researcher will transcribe the tape and complete an interview memo. The transcriptions and memos will become the raw data for analysis; common, recurring themes and patterns will be identified within the interviews and analyzed further.

An important objective of this proposed research is to provide in-depth descriptions of peer labeling and its influence on adolescents’ decisions. By providing a study that focuses solely on peer-to-peer interaction, a more concise view will be given on the influence of peer pressure and its significance to the choices students make. The findings may suggest that the relationship between peers and deviant behavior is just as important as the influence of parents and teachers. This influence may be due to the amount of time spent with peers in comparison to time spent with authority figures.

Some limitations to this study include lack of in-depth research with actual juveniles because interviewing juveniles would provide more realistic data. However, due to age and level of self-awareness, it may be difficult to conduct interviews and gather accurate data. Furthermore, interviewing youth counselors will likely provide more precise results. In future research, these questions should be considered: Does the power of peer influence decrease as juveniles mature? Does formal labeling increase the likelihood of adolescents to accept peer labeling and give in to peer pressure?

## References

- Adams, M., Gray-Ray, P., Ray, M., Robertson, C. (2003). Labeling and delinquency. *Adolescence*, 38(149), 171-186.
- Brownfield, D., Thompson, K. (2005). Self-concept and delinquency: The effects of reflected appraisals by parent and peers. *Western Criminology Review*, 6(1), 22-29.
- Bernburg, J., Krohn, M., Rivera, C. (2006). Official labeling, criminal embeddedness, and subsequent delinquency: A longitudinal test of labeling theory. 43(1), 67-88.
- Bryant, M., Higgins, V. (2010). Self-confessed troublemakers: An interactionist view of deviance during organizational change. *Human Relations*, 63(2), 249-277.
- Cechaviciute, I., Kenny, D. (2007). The relationship between neutralizations and perceived delinquent labeling on criminal history in young offenders serving community orders. *Criminal Justice and Behavior*, 34(6), 816-829.
- Creswell, J.W. (2012). *Qualitative Inquiry and Research Design*. Thousand Oaks: Sage.
- Hayes, T. (2010). Labeling and the adoption of a deviant Status. *Deviant Behavior*, 31(3), 274-302.
- Matza, D., Sykes, G. (1957). Techniques of neutralization: A theory of delinquency. *American Sociological Review*, 22(6), 640-670.
- Moustakas, C. (1994). *Phenomenological Research Methods*. Thousand Oaks: Sage.
- Nye, F.I., Short, J.F. (1957). Scaling delinquent behavior. *American Sociological Review*, 22, 326-331.
- Tapia, M. (2011). U.S. juvenile arrests: Gang membership, social class, and labeling effects. *Youth and Society*, 43(4), 1407-1432.
- Thompson, C., Young, R. (2011). Gender, attributions of responsibility, and negotiation of deviant labels in small groups. *Deviant Behavior*, 32(7), 626-652.





# EFFECTS OF PATIENTS' PREOPERATIONAL EXPECTATIONS FOLLOWING SHOULDER SURGERY

**Ehijator Ighalo, McNair Scholar**

Robert Manske, Ph.D., Physical Therapy  
Wichita State University

## Summary of Research

Shoulder surgery is one of the more common types of orthopedic procedures done to alleviate pain and dysfunction. Patients' preoperative expectations of shoulder surgery may affect postoperative outcomes. The purpose of this study is to identify the relationship between preoperative expectations and the patients' self-reported postoperative outcomes. All operations used to collect data for this study were performed by a single surgeon. Each patient who participated completed pre-surgery questionnaires: the Musculoskeletal Outcomes Data Evaluation and Management (MODEM), the Simple Shoulder Test (SST), and the American Shoulder and Elbow Surgeons (ASES) assessment. These questionnaires are used to evaluate individuals' self-reported results. The SST will help determine the capability the patients have for certain tasks. The ASES is what the patients use to rate the pain and disability in their shoulder (McClure P, Michener L; 2003). Our hypothesis is that patients' preoperative expectations will predict their outcomes after shoulder surgery.

## Methods

Our study included 29 patients who needed any type of shoulder operation and were treated by Surgeon Daniel Prohaska between November 2011 and July 2012. The average age of the patients (and

standard deviation) at the time of surgery was  $51.035 \pm 23.6$  years (range, 18 to 72 years old). The study included 17 males and 12 females. All of the operations were done in Wichita, KS. The operations in this study consisted of rotator cuff repairs, bone fragments or cartilage removal, arthroscopic biceps tenodesis, manipulation under anesthesia, total shoulder arthroplasty, debridement, and distal clavicle excision. The patients in this study may or may not have had a previous shoulder operation before this shoulder operation study.

### Postoperative Management and Rehabilitation

The study was approved by the International Review Board (IRB). Each participant signed a consent form and, at any point within the study, they could choose to withdraw from participation. All the prospective data in the study was obtained through the standard routine care of the patients and was part of their medical records.

Before each operation, the patients were evaluated. These evaluations included giving a detailed medical history, being physically examined, answering questionnaires, and taking a series of assessments. Before the operation, participants were given the Musculoskeletal Outcomes Data Evaluation and Management System (MODEMS) questionnaire. The MODEMS questionnaire consists of six questions, each regarding patients' expectations for the operation and expectations for the results of their treatment. The total MODEMS scores for the six questions were added up and score ranged from 5-25. A score of 5 corresponds to the highest level of expectation (Definitely Yes), whereas a score of 25 corresponds to the lowest level of expectation (Definitely Not). Answers that were marked 6 (Not Applicable) were not scored or included in the sum. No attempts were made to influence patients' expectations beside the standard procedures of explaining the operation.

Before the operations, patients took a series of assessments: the Simple Shoulder Test (SST), and Visual Analog Scale (VAS), and the American Shoulder and Elbow Surgeons Assessment Form (ASES). These self-report assessments will

be taken four times in the year following surgery: after six weeks, after three months, after six months, and after a year.

## Discussion

### Limitations

Because of limited time, we could not finish collecting and analyzing the assessments from the ASES and SST. Without the completion of the assessments, correlations could not be drawn to support or deny our hypothesis. Furthermore, we did not anticipate the rescheduling and cancellation of patients' operations. The amount of data collected was from Wichita residents, which is a small, limited sample of those who receive shoulder surgery. Additional resources are needed to gain more accurate results. In the future, results from studies like this one could help hospitals improve standard procedures with patients prior to and after an operation. In turn, those improvements may lead to more optimistic outlooks from patients as they enter the recovery stage.

## Conclusion

In my current study, we are finishing the process of collecting and analyzing the data from the ASES and SST assessments. The MODEMS surveys have been collected, and the average score of our patients is 7.392, a relatively low number, showing that the patients are optimistic and expect a satisfactory recovery. According to the results of the MODEMS, we found that many of our participants have high expectations for the operation overall.

Expectations regarding patients' satisfaction after surgical operations are significant because studies have shown that expectations independently influence the recovery rate and pain tolerance of patients. Still, more research needs to be analyzed for a better understanding of attitudes about recovery. A common foundation should be established regarding patients' expectation scores. Once that structure is established, it will indicate the level of expectation that seems reasonable prior to the operation.

Another important objective of this kind of research would be to find a way to increase patients' preoperational expectations so that they will recover more satisfactorily. Patients who attended patient education (PE) classes before their operation have exhibited higher optimistic

expectations than those who do not attend PE classes. Therefore, a study involving patients with low expectations who participate in PE classes would be beneficial for gathering data to compare with their previous scores and to compare with those who did not take the PE classes.

## References

1. McClure P, Michener L. Measure of adult shoulder function. *Arthritis and Rheumatism*. Wiley. 2003;49.
2. Williams, L. The benefits of a positive attitude on an injury. *LiveStrong*. 2010  
Available at: <http://www.livestrong.com/article/160862-the-benefits-of-a-positive-attitude-on-an-injury/#ixzzIywhoSu33>. Accessed on April 5, 2012.
3. Collingwood, J. The relationship between mental and physical health. *Psych Central*. 2010. Available at: <http://psychcentral.com/lib/2010/the-relationship-between-mental-and-physical-health/>. Accessed on January 29, 2012.
4. Cole DC, Mondloch MV, SH Johnson. Listening to injured workers: how recovery expectations predict outcome – a prospective study. NCBI. 2002. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC99453/>.
5. Martin R. Effects of stress on the heart. *Heart Healthy Living*. Available at: [http://www.hearthealthy-online.com/heart-disease-overview/stress-management/stress-effect-on-heart\\_I.html](http://www.hearthealthy-online.com/heart-disease-overview/stress-management/stress-effect-on-heart_I.html). Accessed June 26, 2012.
6. Nauert R. (2006). Pre-surgery anxiety slows recovery in children. *Psych Central*. 2006. Available at: <http://psychcentral.com/news/2006/08/22/pre-surgery-anxiety-slows-recovery-in-children/204.html>. Accessed on June 23, 2012.
7. Kim ES, Park N, and Peterson C. Dispositional optimism protects older adults from stroke. *American Stroke Association*. 2011. Available at: [http://www.ordinedeimedici.com/documenti/StudioIctus\\_Stroke\\_2011\\_Kim\\_AHA.pdf](http://www.ordinedeimedici.com/documenti/StudioIctus_Stroke_2011_Kim_AHA.pdf). Accessed on June 5, 2012.
8. Segerstrom SC, Optimism and Immunity: Do positive thoughts always lead to positive effects? *Brain Behav Immun*. 2005;19(3):195-200.
9. Scheier MF, Matthew KA, Owens JF, Magovern GJ, Lefebvre CR, Abbott AR. Dispositional optimism and recovery from coronary artery bypass surgery: The beneficial effects on physical and psychological well-being. *APA PsycNet*. 1989;57(6):1024-1040.
10. Carnes, D. What is sports psychology? *LiveStrong*. 2010. Available at: <http://www.livestrong.com/article/130522-sports-psychology/>. Accessed on March 23, 2012.
11. Heil, J. *Psychology of Sport Injury*. Human Kinetic Pub. 1993.
12. Henn FR, Robert TZ, Kang L, and Green A. Patients' preoperative expectations predict the outcome of rotator cuff repair. *JBS*. 2011;93.
13. Spearman's rank-order correlation. *Laerd Statistic*. Available at: <https://statistics.laerd.com/statistical-guides/spearman-rank-order-correlation-statistical-guide.php>. Accessed on June 24, 2012.
14. Janis IL. Psychological stress. *Journal of Social Issues*. 2010; 10:12-25. New York: Wiley. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-4560.1954.tb01995.x/abstract>. Accessed on June 12, 2012.
15. Johnson M, Carpenter L. Relationship between pre-operative anxiety and post-operative state. NCBI. 1980. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/7384335>. Accessed on June 17, 2012.
16. Dawson J, Fitzpatrick R, Murray D, Carr A. Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg Br*. 1998;80(1):63-9.

17. Groot KI, Boeke S, and Passchier J. Preoperative expectations of pain and recovery in relation to postoperative disappointment in patients undergoing lumbar surgery. *JSTOR*. 1999;37:149-156. Available at: <http://www.jstor.org/stable/3767220>. Accessed on May 23, 2012.
18. Mannion AF, Kampfen S, Munzinger U, and Ines Kramers-de Quervain. The role of patient expectations in predicting outcome after total knee arthroplasty. *Arthritis Research & Therapy*. 2009; 11(5). Available at: <http://arthritis-research.com/content/pdf/ar2811.pdf>. Accessed October 19, 2012.
19. Scott CE, Bugler KE. Patient expectations of arthroplasty of the hip and knee. *JBJS*. 2011. Available at: <http://www.bjj.boneandjoint.org.uk/content/94-B/7/974.abstract>. Accessed March 23, 2012.
20. Papanastassiou I, Anderson R, Barber N, Conover C, Castellvi AE. Effects of Preoperative Education on Spinal Surgery Patients. *SASjournal*. 2011; 5:120-4. Available at <http://www.elevating-healthcare.org/sites/default/files/field/Papanastassiou.pdf>. Accessed on March 23, 2012.
21. Thomas KM, Sethares KA. An investigation of the effects of preoperative interdisciplinary patient education on understanding postoperative expectations following a total joint arthroplasty. *Orthop Nurs*. 2006; 27:374-81. <http://arthritis-research.com/content/pdf/ar2811.pdf>



# ONLY TIME WILL TELL: A STUDY OF DELIBERATE PRACTICE METHODS AND STRATEGIES USED BY MUSICIANS

**Christina Johnson, McNair Scholar**

Steve Oare, Ph.D., School of Music  
Wichita State University

## Summary of Research

**T**he purpose of this research was to highlight the cognitive differences between undergraduate, graduate, and professional musicians as well as the differences between collegiate and professional musicians' practice sessions. My extended literature review examined the essential cognitive processes of the instrumentalists. The research revealed several distinct components of deliberate practice as well as themes regarding this type of expert practice. The complexity of practice and its subsequent strategies and techniques warrants further investigation.

The instrumentalists in my study were asked to provide verbal reports during and immediately after viewing their videotaped practice sessions. The data for this study included interviews, verbal reports, and videotape analysis. The results of this study showed that the collegiate-level musicians did not display the same level of deliberate practice that was displayed by the professional musician. According to this study and others, practice skills, like other instrumental skills, must be learned (Hallam 2001, Oare 2007).

To develop proper practice skills, students need to develop the deliberate practice techniques demonstrated by the professional. For instance, the musician can exhibit and provide self-awareness of his self-regulation processes within his practice session. Self-regulation processes include, but are not limited to, the following: goal-setting, metacognitive skills, practice strategies, self-awareness,



self-efficacy, and creativity. Being able to deliberately practice while maintaining effective time management skills contributes to effective pacing strategies, like the amount of time a musician uses face-time (having the instrument to the face) to non-face-time practice. Finally, the musician must develop an understanding of a variety of practice strategies that can be implemented at his or her disposal. Musicians need an abundance of resources available to them such as peers, teachers, books (musical or non-musical), mirrors, tuners, metronomes, recordings of professional musicians besides those of their specific instrument to increase their depth of knowledge.

In conclusion, with the incorporation of deliberate practice strategies used by professional

musicians, college-aged musicians will likely become more proficient in playing their chosen instrument. We hope to provide collegiate musicians with an understanding of how they can use their practice time more effectively as they progress toward advanced musicianship. Additionally, more research on the cognitive processes of musicians needs to be conducted. By comparing the collegiate and the professional musicians, we can provide data to assist children and novice musicians in the process of becoming professionals. With future research and an examination of the musicians' background and level of expertise, we may be able to determine why and how the musicians chose these processes, which will benefit teachers, researchers, and above all, the musicians themselves.

## References

- Barry, N., & Hallam, S. (2002). Practice. In Parncutt & McPherson, *The Science and Psychology of Music Performance* (pp. 151-165). New York: Oxford University Press.
- Bergee, M. (1993). A Comparison of faculty, peer, and self-evaluation of applied brass jury performances. *Journal of Research in Music Education*, 19-27.
- Bergee, M. (1997). Relationships among faculty, peer, and self-evaluations of applied performances. *Journal of Research in Music Education*, 601-612.
- Bergee, M. (2003). Faculty interjudge reliability of music performance evaluation. *Journal of Research in Music Education*, 137-150.
- Caine, R., Caine, G., McClintic C., & Klimek, K. (2005). *12 brain/mind learning principles in action*. Thousand Oaks, CA: Corwin Press.
- Chaffin, R., & Imreh, G. (2001). A comparison of practice and self-report as sources of information about the goals of expert practice. *Psychology of Music*, 40-68.
- Ericsson, K. T.-R. (1993). The role of deliberate practice in expert performance. *Psychological Review*, 363-406.
- Ericsson, K., & Simon, H. (1993). *Protocol analysis: Verbal reports as data*. Cambridge: Massachusetts Institute of Technology.
- Hallam, S. (2001). The Development of metacognition in musicians: Implications for education. *British Journal of Music Education*.
- Hewitt, M. (2001). The Effects of modeling, self-evaluation, and self-listening on junior high instrumentalists' music performance and practice attitude. *Journal of Research in Music Education*, 307-322.
- Miksza, P. (2005). *The effect of mental practice on the performance achievement of high School trombonists*. Ohio Music Education Association.
- Nielsen, S. (2004). Strategies and self-efficacy beliefs in instrumental and vocal individual practice: A study of students in higher music education. *Psychology of Music*, 418-431.
- Oare, S. (2007). *Goals and self-Assessment in the middle school learner: A study of music practice habits*.
- Rohwer, D. (2006). Practice behaviors of eighth grade instrumental musicians. *Journal of Research in Music Education*, 353-355.

## Deliberate Practice Methods and Strategies Used by Musicians

---

- Zimmerman, B. (1986). Development of self-regulated learning: Which are the key subprocesses? *Contemporary Educational Psychology*, 305-427.
- Zimmerman, B. (2000). Self-Efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 82-91.
- Zimmerman, B. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Association*, 166-183.





# PHANTOM LIMB PAIN OF LOWER EXTREMITY AMPUTEES: A CASE STUDY AND PERIPHERAL MECHANISMS

**Tammy Lowe, McNair Scholar**

Kenneth Pitetti, Ph.D., Physical Therapy  
Wichita State University

## Introduction

In the United States, there are approximately 1.7 million people living with limb loss (Ziegler-Graham, Mackenzie, Ephraim, Trivison, Brookmeyer, 2008), and it is estimated that one out of every 200 people in the U.S. has had an amputation (Adams, Hendershot, Marano, 1999). The four main causes of amputation each year are complications of the vascular system (e.g., diabetes), cancer, trauma, and congenital anomalies. Amputations due to complications of the vascular system, especially from diabetes, accounted for 82% of limb loss and increased at a rate of 27% from 1988 to 1996 (Dillingham, Pezzin, Mackenzie, 2002).

With the increasing trend in the incidences of dysvascular amputations, there is a growing interest in treating the secondary conditions associated with limb loss. The most predominant secondary condition is amputation-related pain. The three most reported amputee-related types of pain were phantom limb pain, residual limb pain, and back pain. Of these three, phantom pain is the most prevalent and has been reported as high as 80-85% in persons with limb loss (Ephraim et al., 2005; Guimmarra, Gibson, Georgiou-Karistianis, & Bradshaw, 2007; Smith, Ehde, Legro, Reiber, del Aguila, & Boone, 1999).

## Background: Pain Pathways

The action potential of the dorsal root ganglion is initiated at the pain receptor. Once initiated in

the nociceptors, the action potential bypasses the cell body in the dorsal root ganglion (DRG) and continues to propagate into the synaptic terminal in the dorsal horn of the spinal cord. From the dorsal horn the pain fibers enter the spinal cord and synapse onto specific neurons within the dorsal horn of the spinal cord, such as projecting neurons. Projecting neurons leave the dorsal horn, cross over to the opposite side of the spinal cord via the anterior white commissure, and ascend up the spinal cord rostrally towards the brain in a special sensory tract known as the spinothalamic tract. The spinothalamic tracts ascend through the spinal cord and brain stem to eventually synapse with several thalamic nuclei, including the ventral posterolateral nucleus (VPL). Fibers from the VPL convey painful and thermal sensations to the primary somatosensory cortex. The primary somatosensory cortex is organized into body parts called a homunculus. Specific areas of the upper extremities (wrist, hand, fingers, and thumb) and lower extremities (foot and toes) are primarily involved in phantom limb pain (PLP).

### Peripheral Mechanisms

Following amputation of a limb, there is an active, although abortive, attempt by the peripheral nerves at regeneration (Wallerian degeneration), which results in the formation of bulbous swellings (neuromas) at the cut ends of the nerve where sprouting fibers form. Neuromas are composed of abnormal sprouting axons and have a significant degree of sympathetic innervation. In humans, elevated sympathetic discharge, as well as increased levels of circulating epinephrine can trigger or exacerbate ectopic neuronal activity from the neuromas (Devor, 2006). Furthermore, results by Katz (1992) suggest a relationship between PLP and sympathetic-efferent outflow of cutaneous vasoconstrictor fibers in the stump and stump neuroma; that is, cooling of the stump causes a reflexive increase in sympathetic-efferent vasoconstriction to the stump and therefore the release of norepinephrine onto the sprouts of the primary afferents located in the stump neuroma, resulting in PLP.

Disorganized ends (i.e., sprouting sites) within the neuroma develop hyperexcitability and

often show spontaneous impulse activity (ectopic discharge). Increased excitability of the injured nerves in the neuroma is postulated to be due to increased densities of abnormal or dysfunctional sodium channels (Devor, 2006; England et al., 1996; Lai, Hunter, Porreca, 2003). Given that the cell bodies of peripheral nerves reside in the dorsal root ganglion (DRG), and given that there is a “switch” in sodium channels, the source of this switch must originate in the DRG where the nucleus of these cell bodies reside. Supporting this theory, work by Waxman (1999) demonstrated that a down-regulation of the “normal” Na<sub>v</sub> and SNS/PN3 sodium channel genes and an up-regulation of the previously silent “dysfunctional” alpha-III sodium channel genes occurred following amputation of the sciatic nerve of laboratory animals. Alpha-III channels, unlike Na<sub>v</sub> and SNS/PN3 channels, have a lower receptor potential threshold and can open spontaneously, resulting in spontaneous firing. Thus the membrane of the injured C-fiber and A-delta DRG neurons, and their processes, are retuned and, therefore, exhibit changes in their properties which can poise it to fire inappropriately.

Another anatomical change that occurs following amputation and that is thought to play a role in the peripheral component of PLP is the formation of ephapses between C-fibers. Ephapses are sites where action potentials on one axon can depolarize the neighboring axon to threshold and elicit impulses in that axon (cross talk). That is, the possibility exists that ephapse formation could occur between C-fibers of differing origin—one originating from the stump and one that originated from the amputated limb (Mense & Simmons, 2001).

### Case Participant

The participant (65 years) lost his right leg (below the knee amputation) while on combat operations during the Vietnam War. Though 42 years have passed since the event, he still suffers PLP, which he describes as shooting, stabbing pain from the toes, top of the foot, instep and ankle from his missing limb, at a frequency of 1-2 times per week, usually in a spontaneous manner, (dysfunctional sodium channels). In addition, he

experiences an increase in PLP when exposed to the cold, such as attending late fall early winter high school football games and late winter early spring baseball games, e.g., sympathetic origin. Episodes of stump breakdowns have occurred frequently and are always accompanied with increased PLP, e.g., potential ephapses relationship.

## Conclusion

The awareness, sensations, and pain felt by amputees have indeed earned the mysterious title “phantom” as the exact mechanisms causing such experiences remain elusive. Here we’ve discussed only one component of the neurological pathway that may be involved in these phenomena. Besides peripheral mechanisms, central mechanisms have also been implicated, including those suggesting alterations in the transmission of action potentials within the spinal cord and brain. The Gate

Control Theory of Pain was introduced in 1965 by Ronald Melzack and Patrick Wall—this theory highlights regulatory mechanisms within the dorsal horn of the spinal cord, mechanisms that may go awry following amputation and deserve further investigation in relation to phantom limb pain. The Neuromatrix Theory of Pain, again proposed by Melzack, suggests that changes in neural mapping patterns, in areas such as the somatosensory cortex, can lead to a reorganization of the homunculus following amputation and allow for the activation of neural patterns producing pain without somatic input (Melzack, 2005; Flor et al., 2006; Giummarra et al., 2007). Some have proposed that this remapping is a protective evolutionary trait that in some amputees, those who experience phantom pain, has gone awry (Giumarra et al., 2007). But if phantom pain is such an abnormality, why is the estimated percentage of sufferers (80–85%) so high?

## References

- Adams, P. F., Hendershot, G. E., & Marano, M. A. (1999). *Current estimates from the National Health Interview Survey, 1996*. National Center for Health Statistics. Vital Health Statistics, Series 10 (200).
- Birbaumer, N., Lutzenberger, W., Montoya, P., Larbig, W., Unertl, K., Topfner, S., Grodd, W., Taub, E., & Flor, H. (1997). Effects of regional anesthesia on phantom limb pain are mirrored in changes in cortical reorganization. *The Journal of Neuroscience, 17*, 5503–5508.
- Bittar, R. G., Otero, S., Carter, H. & Aziz, T. Z. (2005). Deep brain stimulation for phantom limb pain. *Journal of Clinical Neuroscience, 12*(4), 399–404.
- Chabal, C., Jacobson, L., Russell, L., & Burchiel, K. J. (1989). Pain responses to perineuronal injection of normal saline, gallamine, and lidocaine in humans. *Pain, 36*, 321–325.
- Chabal, C., Jacobson, L., Russell, L., & Burchiel, K. J. (1992). Pain responses to perineuronal injection of normal saline, epinephrine, and lidocaine in humans. *Pain, 49*, 9–12.
- Davis, K. D., Treede, R. K., Raja, S. N., Meyer, R. A., & Campbell, J. N. (1991). Topical application of clonidine relieves hyperalgesia in patients with sympathetically maintained pain. *Pain, 47*, 309–317.
- Devor, M., Janig, W., & Michaelis, M. (1994). Modulation of activity in dorsal root ganglion neurons by sympathetic activation in nerve-injured rats. *Journal of Neurophysiology, 1994*, 71, 38–47.
- Devor, M. (2006). *Responses of nerves to injury in relation to neuropathic pain*. In: Wall, P. D., Melzaek, R., eds. *Textbook of Pain*, 5<sup>th</sup> ed. Edinburgh: Churchill-Livingston, p. 905–927.
- Dillingham, T., Pezzin, L., & MacKenzie E. (2002). Limb amputation and limb deficiency: Epidemiology and recent trends in the United States. *Southern Medical Journal, 95*, 875–883.
- England, J. D., Happel, L.T., Kline, D. G., Gamboni, F., Thouron, C. L., Liu, A. P., & Levinson, S. R. (1996). Sodium channel accumulation in humans with painful neuromas. *Neurology, 47*, 272–276.
- Ephraim, P. L., Wegener, S. T., MacKenzie, E. J., Dillingham, T. R., & Pezzin, L.E. (2005). Phantom pain, residual limb pain, and back pain in amputees: Results of a national survey. *Archive Physical Medicine Rehabilitation, 86*, 1910–1919.

- Flor, H., Nikolajsen, L., & Jensen, T. S. (2006). Phantom limb pain: a case of maladaptive CNS plasticity? *Nature*, 7, 873-881.
- Giummarra, M. J., Gibson, S. J., Georgiou-Karistianis, N., & Bradshaw, J. L. (2007). Central mechanisms in phantom limb perception: The past, present and future. *Brain Research Reviews*, 54, 219-232.
- Jenson, T. S., Krebs, B., Neilsen, J., & Rasmussen, P. (1985). Immediate and long-term phantom limb pain in amputees: incidence, clinical characteristics and relationship to pre-amputation pain. *Pain*, 21, 267-268.
- Katz, J. (1992). Psychophysical correlates of phantom limb experience. *Journal of Neurology, Neurosurgery, and Psychiatry*, 55, 811-821.
- Kooijman, C. M., Dijkstra, P. U., Geertzen, J. H. B., Elzinga, A., & Schans, C. P. (2000). Phantom pain and phantom sensations in upper limb amputees: An epidemiological study. *Pain*, 87, 33-41.
- Lai, J., Hunter, J. C., & Porreca, F. (2003). The role of voltage-gated sodium channels in neuropathic pain. *Current Opinions in Neurobiology*, 13, 291-297.
- Marshall, H. M., Jensen, M. P., Ehde, D. M., & Campbell, K. M. (2002). Pain site and impairment in individuals with amputation pain. *Archives of Physical Medicine and Rehabilitation*, 83, 1116-1119.
- Mense, S. & Simons, D. G. (2001). *Muscle pain: Understanding its nature, diagnosis, and treatment*. Lippincott, Williams, & Wilkins, Philadelphia, PA, (p. 65).
- Millstein, S., Bain, D., & Hunter, B. A. (1985). A review of employment patterns of industrial amputees—factors influencing rehabilitation. *Prosthetics and Orthotics International*, 9, 69-78.
- Mitchell, S.W. (1871). Phantom limb. *Lippincott's Magazine of Popular Literature and Science*, 8, 563-569.
- Nikolajsen, L., Hansen, C. L., Nielsen, J., Keller, J., Arendt-Nielson, L., & Jenson, T. S. (1996). The effect of ketamine on phantom pain: a central neuropathic disorder maintained by peripheral input. *Pain*, 67, 69-77.
- Nikolajsen, L., & T. S. Jensen (2001). Phantom pain. *British Journal of Anesthesia*, 87, 107-116.
- Nystrom, B. and Hagbarth, R. (1981). Microelectrode recordings from transected nerves in amputees with phantom limb pain. *Neuroscience Letters*, 27, 211-216.
- Raja, N., Treede, R. D., Davis, K. D., & Campbell, J. N. (1991). Systemic alpha-adrenergic blockage with phentolamine: A diagnostic test for sympathetically maintained pain. *Anesthesiology*, 74, 691-698.
- Rudy, T., Lieber, S., Boston, J., Gourley, L., & Baysal, E. (2003). Psychosocial predictors of physical performance in disabled individuals with chronic pain. *Clinical Journal of Pain*, 19, 18-30.
- Schoppen, T., Boonstra, A., Groothoff, J W., van Sonderen, E., Goeken, L. N., & Eisma, W. H. (2001). Factors related to successful job reintegration of people with a lower limb amputation. *Archives of Physical Medicine and Rehabilitation*, 82, 1425-1431.
- Scholz, J. & Woolf, C. (2006). *Neuropathic Pain: A Neurodegenerative Disease*. In: Proceedings of the 11<sup>th</sup> World Congress on Pain (eds. H. Flor, E. Kalso, and J. Dostrovsky), pp. 373-384. IASP Press.
- Sherman, R. A., Sherman, C. J., & Parker, L. (1984). Chronic phantom and stump pain among American veterans: results of a survey. *Pain*, 18, 83-95.
- Sherman, R. A. and Bruno, G. M. (1987). Concurrent variation of burning phantom limb and stump pain with near surface blood flow in the stump. *Orthopedics*, 10, 1395-1402.
- Smith, D. G., Ehde, D. M., Legro, M. W., Reiber, G. E., del Aguila, M., & Boone, D. A. (1999). Phantom limb, residual limb, and back pain after lower extremity amputations. *Clinical Orthopaedics and Related Research*, 361, 29-38.
- Torebjork, E., Wahren, L., Walin, G., & Koltzenburg, M. (1995). Noradrenaline-evoked pain in neuralgia. *Pain*, 63, 11-20.
- Wartan, S. W., Hamann, W., Wedley, J. R., & McColl, I. (1997). Phantom pain and sensation among British veteran amputees. *British Journal of Anaesthesiology*, 78, 652-659.

## Phantom Limb Pain of Lower Extremity Amputees

---

- Waxman, S. G. (1999). The molecular pathophysiology of pain: abnormal expression of sodium channel genes and its contributions to hyperexcitability of primary sensory neurons. *Pain, 82*, S133-S140.
- Whyte, A. S. & Carroll, L. J. (2002). A preliminary examination of the relationship between employment, pain and disability in an amputee population. *Disability and Rehabilitation, 24*, 462-470.
- Ziegler-Graham K., MacKenzie, E. J., Ephraim, P. L., Trivison, T. G., & Brookmeyer, R. (2008). Estimating the prevalence of limb loss in the United States: 2005 to 2050. *Archives of Physical Medicine and Rehabilitation, 89*, 422-429.







# THE ONGOING INVESTIGATION OF THE CENTRAL FAN QUESTION THROUGH NUMERICAL COMPUTATIONS

**Francis L. Nguyen, McNair Scholar**

Thomas DeLillo, Ph.D., Mathematics  
Wichita State University

## Summary of Research

**T**his ongoing research explores whether or not the principal investigators can provide enough data for conjectures into the existence of central fans. With the use of MATLAB for numerical computations, we developed tools to analyze different capillary surfaces at reentrant corners to determine where a central fan does and does not exist. In conjunction with our last investigation into graphing minimal surfaces, we were still required to develop code to solve a Riemann–Hilbert problem on the unit disk of the complex plane. However, before solving this problem, it was necessary to translate our exponential map of the capillary boundary onto the unit disk. In our previous research, we demonstrated code ported from Fortran [1] into MATLAB to compute a conformal map from a circular arc polygon onto the unit disk. The circular arc polygon represents the exponential map of the capillary boundary and the boundary conditions of the capillary surface. While performing rigorous testing, the investigators discovered the limitations and boundaries of the conformal mapping method discussed in our previous research.

To resolve the central fan question and promote better understanding of these technologies, we need reliable computational tools for modeling capillary surfaces. Such tools provide a method to investigate a wide variety of surfaces in pursuit of answering the central fan question. These tools would provide engineers with the ability to simulate designs free of the expense of prototype construction and extraterrestrial experimentation.

The task of constructing capillary surfaces is broken into three modules suggested by Mitchell [2] and based on a mathematical framework specified by Athanassenas and Lancaster [3]. We implement each module in MATLAB. Each module numerically completes one of the three tasks outlined in the methodology:

1. a conformal map  $\Psi: E \rightarrow \mathbb{D}$  implementing Henrici [4], DeLillo [5], Driscoll and Trefethen [6], Fornberg [7] and numerical experiments.
2. a solution  $f_0: \mathbb{D} \rightarrow \mathbb{D}$  to the Riemann-Hilbert problem according to Monakhov ([2], [3], [8]), and
3. a construction of the minimal surface using the Enneper-Weierstrass representation ([2], [3]).

Our principal investigation includes improving the conformal mapping module and encoding the Monakhov solution to the Riemann-Hilbert problem as suggested by Athanassenas and Lancaster [3], and Mitchell [2]. To improve the conformal mapping module, the investigators abandoned previous work, replacing the very computationally intensive implementation based on Marshall [9] with a much quicker and, overall, more accurate implementation crafted by the

investigators. The new methods combine simpler maps from Henrici [4], DeLillo [5], Driscoll and Trefethen [6], and Fornberg [7].

The investigators developed a conformal mapping module that is more accurate and facilitates implementation of the Riemann-Hilbert module. We continue to update both the conformal mapping classes and the Riemann-Hilbert module. At the moment, we have  $10^{-4}$  to  $10^{-5}$  accuracy, which is not as accurate as hoped for. Hence, the more time we invest into this research, the more we plan on increasing the accuracy. Polishing the modules will provide a variety of implementation of capillary profiles. Lastly, we plan on making the object classes easier to use in other areas of minimal surfaces. The surface construction module is well-tested and robust. We compute minimal surfaces from their Enneper-Weierstrass representations based on holomorphic functions,  $(f, g)$ , determined by their boundary conditions. Here  $f$  is determined by solving a suitable Riemann-Hilbert problem defined by the geometry of the boundary. Computing the surfaces allows one to consider the flow of fluids in zero gravity and other areas where surface tension plays an important role, such as those encountered with spacecraft.

## References

1. D.E. Marshall and S. Rohde, *Lens chains and the geodesic algorithm for conformal mapping*, preprint.
2. C.P. Mitchell, *An investigation of capillary surfaces at non-convex corners*, Master's Thesis (532), Wichita State University, 2009.
3. M. Athanassenas and K. E. Lancaster, *CMC capillary surfaces at reentrant corners*, Pacific J. Math. Vol. 234, No. 2 (2008), 201-228.
4. P. Henrici, *Applied and Computational Complex Analysis*, Volume 3, Wiley-Interscience, New York, NY, 1993.
5. T.K. Delillo, *Numerical Conformal Mapping with Fourier Series Methods*, Unpublished Note.
6. T.A. Driscoll and L.N. Trefethen, *Schwarz-Christoffel Mapping*, 1<sup>st</sup> ed., Cambridge University Press, 2002, <http://www.math.udel.edu/driscoll/research/conformal.html>
7. B. Fornberg, *A numerical method for conformal mappings*, SIAM J. Sci. Statis. Comput., 1 (1980), pp. 386-400.
8. V.N. Monakhov, *Boundary-Value Problems with Free Boundaries for Elliptic Systems of Equations*, Translations of Mathematical Monographs, AMS, Providence, 1980.
9. D.E. Marshall and S. Rohde, *Convergence of a Variant of the Zipper Algorithm for Conformal Mapping*, SIAM J. on Numerical Analysis, 45 (2007), 2577-2609.



# THE ONES LEFT BEHIND: DELINQUENCY IN CHILDREN WITH INCARCERATED PARENTS

**Michelle Ofuokwu, McNair Scholar**

Ryan Alexander, Ph.D., Criminal Justice  
Wichita State University

## Introduction

The adult prison population throughout the United States has grown rapidly in recent years. According to the Bureau of Justice Statistics, about two-thirds of incarcerated women and more than one-half of incarcerated men are parents of children under the age of 18 (Hagan, 1996). Virtually half of all parents in prison are African Americans. Of the other half, 29% are White, and 19% are Hispanic (Travis & Waul, 2003). The highest rates of delinquent behavior are found among males that are between 15 and 17 years old (World Youth Report, 2003). This study examines the impact of parental incarceration on male and female juvenile delinquents. Furthermore, this study investigates this question: Are males or females more likely to become juvenile delinquents when a parent has a history of incarceration? The hypothesis is that females will be more affected by parental incarceration than males, and more likely to become delinquent.

### Parents in Prison

The incarceration of a parent adds stress within the family structure. For example, children tend to act out in frustration because their parents return home with no preparation to reintegrate into society or their own families. These types of situations can cause several challenges for the offenders in terms of staying out of prison (Carpenter, Graham, & Harris, 2010). Furthermore, the men and

women who are incarcerated often suffer from low self-esteem, which impacts their availability to parent and the quality of their parenting (Harris, Graham, & Carpenter, 2010).

### **Prison Experience and Juveniles**

Sometimes prisons are located hundreds of miles away from families. Such distances can make preservation of those connections extremely difficult, if not impossible, to maintain due to lack of transportation, funding for transportation, or the time required for travel. Mothers tend to be at least 160 miles away from families due to the shortage of female institutions, which makes maintaining ties with their children difficult (Travis & Waul, 2003). Policy makers fear that these children are at a higher risk for becoming delinquents, which may translate into later adult incarceration. Children of incarcerated parents often live in poverty. These circumstances can lead to trouble with authorities because the burden of a poor financial situation can cause offenders to commit more crimes.

### **General Strain Theory (GST)**

This project used General Strain Theory as a theoretical structure. I briefly examined how this theory relates to the development of juvenile delinquency. Specifically, the focus concerned strain and loss of control that a parent can encounter due to incarceration. GST has been used to explain differences in crime and delinquency by examining the effect of strains on individuals and groups. This theory encompasses several strains or stressors that increase the likelihood or occurrence of criminal activity. These strains are divided into three different scenarios: the adolescent is not attached to parents, school or other institutions; parents fail to observe their children's needs; and the adolescent has not adopted conventional beliefs (Agnew, 1992).

### **Social Control Theory**

Another theory that works with GST is the Social Control Theory. This theory covers bonding between adolescents and their parents. Hirschi (1969) outlined four types of bonding that create strong community ties and promote confor-

mity. These types are attachment, commitment, involvement, and belief. The four elements of bonding are separate but interconnected. Attachment refers to the emotional bond between juveniles and others. According to Hirschi, attachments or lack of attachments to primary agents of socialization (i.e., parents, teachers, peers, and school) can be used to predict delinquency. Children who have strong emotional ties to parents are more likely to adopt their parents' value system and less likely to do anything to jeopardize the relationship. Children who do poorly in school are less likely to form an attachment to school or teachers. Less attachment means they are less likely to adopt institutional rules.

Along with attachment, the next element is commitment. Variables related to commitment include motivation, determination, accomplishment and success. Adolescents who have commitment are less likely to engage in behaviors that will ruin their chances of success. The next element is involvement. Being involved in law-abiding activities, such as organized sports, leaves little time for delinquency (Clevenger & Birkbeck, 1996). The last element is belief, which is the acceptance of the moral legitimacy of the social value system. The less rule-bound people feel, the more likely they are to break rules, such as acting out in school, which can lead to more serious forms of delinquency.

### **Defining Juvenile Delinquent/Offender**

The Kansas Juvenile Justice Code and Revised Kansas Juvenile Justice Code defines a *juvenile delinquent/offender* as "a person who commits an offense while 10 or more years of age but less than 18 years of age. The offense, which, if committed by an adult, would constitute the commission of a felony or misdemeanor, as defined by K.S.A. 21-3105 and amendments thereto, or who violates the provisions of K.S.A. 21-4204A or 41-727 or subsection (j) of K.S.A. 74-8810, and amendments thereto, but does not include: A person 14 or more years of age who commits a traffic offense, as defined in subsection(d) of K.S.A. 8-2117, and amendments" (Jennings, 2009).

When a young person matches the definition of a delinquent, their behavior is often reflected through statistics about delinquency among males and females; male delinquency usually involves physical forms of aggression, while, for females, it is related to other more subtle forms of aggression (Hagan, McCarthy, & Foster, 2002).

## Adolescent Struggles with Parental Incarceration

The social stigma of parental incarceration impacts children by suggesting their households are unstable (Travis & Waul, 2003). Social stigma can pressure children into accepting negative labels associated with having a parent incarcerated. As a result, this stigma can become a self-fulfilling prophecy towards delinquency (Becker, 1967). Children tend to turn to delinquency to release the tension they experience in their daily lives or the stress of the stigma (Agnew, 1992). Furthermore, juveniles may commit illegal activities to meet their needs. They often will attack or flee. Sometimes they may use drugs and alcohol to cope with many of the negative aspects in their lives.

## Community and Faith-based Programs

This particular population of juveniles needs extra assistance in maintaining long-term and short-term goals. Many state and local governments, as well as nonprofit providers, have programs designed to reinforce healthy parent-child relationships and develop successful outcomes for both children and parents. Many communities, nonprofit organizations, churches and faith-based organizations offer a variety of social services to assist people in prison as well as their children. The absence of an incarcerated mother or father has a significant impact on delinquency, so these groups also provide mentoring services that help children build relationships with their incarcerated parents (Garland, Kane, & Nickel, 2009).

The Big Brothers Big Sisters program Children of Promise has a mentoring program that is designed to impact children with an incarcerated parent. The workers pair each child with a caring committed mentor who can teach them life skills

they may have missed by having a parent incarcerated. In Kansas, many children who are a part of the Children of Promise program show more confidence, have a sense of future goals, and want to sidestep delinquency, and avoid substance abuse issues. Along with Children of Promise, the Amachi program is a nationwide partnership of secular and faith-based organizations working together to provide mentoring to the children of incarcerated parents. The program matches children of incarcerated parents with caring and responsible adults who will act as mentors (Garland et al. 2009).

## Methods

### File Review

Court Services files from the 18<sup>th</sup> Judicial District in Sedgwick County Kansas were reviewed for this study. The files in the database are juvenile records consisting of medical history, substance abuse issues, parental history, and the nature of their crime. These files are confidential and can only be reviewed by Court Services personnel. However, a confidentiality agreement between the researcher and Court Services was secured.

Seventy-five files were randomly selected from the files of juvenile offenders under Court Services Probation. Offenders' files that were selected for this study provided a wide variety of offenses, like misdemeanor theft, as well as felony cases, such as possession of narcotics. The 18<sup>th</sup> Judicial District Court Services covers all of Sedgwick County, in Kansas. This location was chosen out of convenience for the researcher. However, Sedgwick County is one of the most populated counties in Kansas and represents a heterogeneous population.

## Results

Various scholars have explained the correlation between delinquent behavior in children with incarcerated parents by looking at race, educational level, gender, parent's incarceration, and criminal history. The purpose of this research is to answer the following question: Are males more likely than females to become juve-

nile delinquents when a parent has a history of incarceration? The findings of this study revealed that, in response to the research question, African American males are more often delinquent than females and other minorities. The average age of subjects in the sample range was 13–18 years old, for a mean of 16 years old. Females had a 38.7% property crime rate, while males had a 61.3% rate. Most female subjects had a 70.7% person crime rate, while males only had a 29.3% rate. For status offenses, females were at 89.3% and males were only at 10.7% rate. This study is based on the idea that juveniles commit crimes because the absence of a parent impacts their development. However, the degree of the impact of absent parents due to incarceration may vary between male and female juveniles.

## Discussion

This research focused on the result of incarcerated parents' absence, and its poten-

tial impact on juvenile delinquency. The study revealed that a parent with a criminal history is a significant factor in juvenile delinquency. My research question considered the effects of parental incarceration on each gender; however, my research revealed that it does not matter if a juvenile has a parent in prison at the time of the juvenile's delinquency. Rather, if a parent has any kind of criminal history, i.e., any amount of jail time, the parent was still absent from his child's life, which drastically increases the likelihood for delinquency in the child. Furthermore, the absence of parental involvement does increase the possibility of future juvenile delinquency in their children. Other studies have established the validity of these ideas. The results of this research do not support my specific question; however, the research is significant. Most importantly, this kind of study can help identify children who may be at risk for future delinquency because their parent is or was incarcerated.

## References

- Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology*, 30. Retrieved from <http://courses.missouristate.edu/KarlKunkel/SOC540/agnew.pdf>
- Agnew, R., & Brody, L. (1997). General and crime: A general strain theory perspective. *Journal of Research in Crime and Delinquency*. Retrieved from <http://jrc.sagepub.com/content/34/3/275>
- Becker, E. (1967). *Beyond Alienation*. New York: George Braziller.
- Clevenger, M., & Birbeck, C. (1996). The causes of delinquency. Institute for Social Research University of New Mexico, 2. Retrieved from [http://nmsc.unm.edu/index.php/download\\_file/-/view/143](http://nmsc.unm.edu/index.php/download_file/-/view/143).
- Jennings, J. R. (2009). Kansas juvenile justice code and revised kansas juvenile justice code. Kansas Legislature. Retrieved from [http://www.jja.ks.gov/code\\_book.html](http://www.jja.ks.gov/code_book.html).
- Hagan, J., McCarthy, B., & Foster, H. (2002). A gendered theory of delinquency and despair in the life course. *Act Sociological*, 45. Retrieved from <http://www.jstor.org/stable/4194907>
- Hagan, J. (1996). *The next generation: Children of prisoners*. University of North Carolina. Retrieved from [http://www.doc.state.ok.us/offenders/ocjrc/96/The%20Next%20 Generation.pdf](http://www.doc.state.ok.us/offenders/ocjrc/96/The%20Next%20Generation.pdf)
- Harris, R. Y., Graham, A. J., & Carpenter, J. G. (2010). *Children of incarcerated parents: Theoretical, developmental, and clinical issues*. New York, NY: Springer Publishing Company.
- Nickel, J., Garland, C., & Kane, L. (2009). *Children of incarcerated parents: An action plan for federal policymakers*. New York, New York: Council of State Governments Justice Center.
- Travis, J., & Waul, M. (2003). *Prisoners once removed: The impact of incarceration and reentry on children, families, and communities*. Washington, DC: The Urban Institute.
- Wade, C. & Travis, C. (2006). *Psychology*, Eighth Ed. Upper Saddle River, NJ: Pearson Education, Inc.
- World Youth Report. (2003). Juvenile delinquency, 189–211. Retrieved from <http://www.un.org/esa/socdev/nyin/documents/worldyouthreport.pdf>



# PARENT-CHILD RELATIONSHIPS AND THE INTENSITY OF ADOLESCENTS' ROMANTIC RELATIONSHIPS

**Kia Porter, McNair Scholar**

Jennifer Pearson, Ph.D., Sociology  
Wichita State University

## Introduction

Adolescent romantic relationships are important because they contribute to the adolescent's identity and psychosocial development. Research indicates that parent-child relationships can predict the adolescent's attachment style in their romantic relationships. Research on parental influence on adolescent romantic relationships reveals the impact of parent-child relationships on the development of young adults and their behavior in future romantic relationships.

In the current study, we explored if parent-child relationships are associated with intensity in the adolescent romantic relationships. We considered two dimensions of parent-child relationships: attachment to parents and parents' involvement in shared activities. We examined how these dimensions of parent-child relationships are associated with three aspects of adolescents' romantic relationships: emotional intimacy, relational exclusivity, and sexual behavior. We also investigated if parent-child relationships have a stronger impact on girls compared to boys.



## Methods

### Data Source and Sample

The data comes from the National Longitudinal Study of Adolescent Health (Add Health) which is a nationally representative study of adolescents between grades 7 through 12 in the 1994 and 1995 school year. Adolescents who were currently in romantic relationships at the time of the Add Health study and lived with at least one residential parent or parental figure were included in the current study. The data specifically was derived from the first wave of data that included at-home interviews and a questionnaire for the participant's parents.

### Measures

Parental attachment was first split into two categories: quality of relationship with mother or father. Quality of relationship with the mother or father was measured by the responses to the following questions and statements: "How close do you feel to your mother/father? How much do you think she/he cares about you? Your mother/father is warm and loving toward you. Overall, you are satisfied with the relationship with your mother/father. You are satisfied with the way your mother/father and you communicate with each other." These statements were individually put on a scale of 1-5 where 1 represented the lowest level of parental attachment and 5 represented the highest levels of parental attachment.

Parental involvement in shared activities was measured by the following activities: "shopped with mother/father; gone to a movie with mother/father; sports with mother/father; school project with mother/father; attending religious services with mother/father." This variable of parental involvement was put on an index of 0 to 5, where 0 represented have not done any activities with a parent in the past month, and 5 represented having done all five activities with a parent within the past month at the time of the study.

Emotional intimacy was measured using the following statements: "My partner gave me a present; I gave my partner a present; my partner told me that she/he loved me; we thought of

ourselves as a couple; I told other people that we were a couple; we have talked about contraception or sexually transmitted diseases." The participants who reported having done all six events were coded as 1, and for those who reported having done less than those six events were coded as 0. Relational exclusivity was measured by this statement: "I have spent less time with my friends so I can spend more time with my partner." Those who reported having relational exclusivity were coded as 1, and those reported not having it were coded as 0. Sexual behavior was measured by this statement: "We had sexual intercourse." Those who reported having sex with their partner were coded as 1, and those who answered no were coded as 0.

### Procedure

First, we found the averages for the descriptive statistics over all the measures. Next, we used bivariate analysis to examine associations between parent-child relationship variables and intensity of adolescent romantic relationships. We then explored these associations by using multivariate logistic regression to predict emotional intimacy, sexual behavior, and exclusivity with parental attachment and involvement, controlling for family structure, race/ethnicity, age, and socioeconomic status (as measured by parents' education level). To examine whether parent-child relationships have a stronger impact on girls compared to boys, we ran all analyses separately by gender.

## Results

Girls who reported high emotional intimacy in their romantic relationship had significantly lower levels of parental attachment. Girls and boys who reported high emotional intimacy had significantly lower levels of parental involvement. After controlling for family structure and background variables, the association between parent-child relationships and emotional intimacy disappeared. Girls who reported relational exclusivity had significantly lower levels of parental attachment. This association remained significant after controlling for family structure and background variables. Boys and girls who had sex with their romantic partner reported significantly lower lev-

els of parental attachment and involvement. For girls, the associations remained significant. For boys, after controlling for background variables and family structure, the associations between the parent-child relationship variables and sexual behavior were no longer significant.

## Discussion

The strongest findings from our study focused on the associations between sexual behavior and parent-child relationships. Results suggest that strong parent-child relationships tend to discour-

age sexual behavior within romantic relationships, especially for daughters. Perhaps as the adolescent spends more time with parents, the parents' values have more of an impact on the children, especially when it comes to adolescent sexual behavior. Future researchers could replicate this study for more current data. Since we used the first wave of data, this study was a cross-sectional study. A longitudinal study would better test causality between parent-child relationships and intensity in adolescent romantic relationships. Lastly, future researchers could create their own study to include more in-depth measures that are tailored to their interests.

## References

- Cavanagh, S. E., Crissey, S. R., & Raley, R. K. (2008). Family structure and adolescent romance. *Journal of Marriage and Family*, 70, 698-714.
- Connolly, J., Craig, W., Goldberg, A., & Pepler, D. (2004). Mixed gender groups, dating, and romantic relationships in early adolescence. *Journal of Research on Adolescence*, 14, 185-207.
- Cui, M., Fincham, F. D., & Pasley, B. K. (2008). Young adult romantic relationships: The role of parents' marital problems and relationship efficacy. *Personality and Social Psychology Bulletin*, 34, 1226-1235.
- Furman, W. (2002). The emerging field of adolescent romantic relationships. *Current Directions in Psychological Science*, 11, 177-180.
- Harris, K.M., C.T. Halpern, E. Whitsel, J. Hussey, J. Tabor, P. Entzel, and J.R. Udry. 2009. *The National Longitudinal Study of Adolescent Health: Research Design*. Retrieved from <http://www.cpc.unc.edu/projects/addhealth/design>.
- Heifetz, M., Connolly, J., Pepler, D., & Craig, W. (2010). Family divorce and romantic relationships in early adolescence. *Journal of Divorce and Remarriage*, 51, 366-378.
- Kinsfogel, K. M. & Grych, J. H. (2004). Interparental conflict and adolescent dating relationships: Integrating cognitive, emotional and peer influences. *Journal of Family Psychology*, 18, 505-515.
- Longmore, M. A., Manning, W. D., & Giordano, P. C. (2001). Preadolescent parenting strategies and teens' dating and sexual initiation: A longitudinal analysis. *Journal of Marriage and Family*, 63, 322-335.
- Mahl, David (2001). The influence of parental divorce on the romantic relationship beliefs of young adults. *Journal of Divorce and Remarriage*, 34, 89-118.
- Nosko, A., Tieu, T., Lawford, H., & Pratt, M. (2011). How do I love thee? Let me count the ways: parenting during adolescence, attachment styles, and romantic narratives in emerging adulthood. *Developmental Psychology*, 47, 645-657.
- Rodrigues, L. N., & Kitzmann, K. M. (2007). Coping as a mediator between interparental conflict and adolescents' romantic attachment. *Journal of Social and Personal Relationship*, 24, 423-439.
- Roisman, G., Booth-LaForce, C., Cauffman, E., & Spieker, S. (2009). The development significance of adolescent romantic relationships: Parent and peer predictors of engagement and quality at age 15. *Journal of Youth and Adolescence*, 38, 1294-1305.
- Pearson, Jennifer; Muller, Chandra & Frisco, Michelle L. (2006). Parental involvement, family structure, and adolescent sexual decision making. *Sociological Perspectives*, 49, 67-90.
- Steinberg, S. J., Davila, J., & Fincham, F. (2006). Adolescent marital expectations and romantic experiences: associations with perceptions about parental conflict and adolescent attachment security. *Journal of Youth and Adolescence*, 35, 333-348.





# FROM DROPPED OUT TO CHECKED IN: A SNAPSHOT OF ALTERNATIVE EDUCATION

**Monica Williams, McNair Scholar**

Jeri Carroll, Ph.D., Curriculum and Instruction  
Wichita State University

## Summary of Research

**M**any high schools today employ a conventional model of schooling for students in grades 9-12. This model includes traditional, lecture-style classes that follow a typical schedule of two semesters (four nine-week terms), midterms, and finals. Many students are able to conform to this model. For those who do not, research shows that alternative education can meet their needs.

The purpose of this study was to determine the structure and effects of an alternative high school in a small, but growing, school district in the Midwest. After a review of the literature, researchers completed a case study of this high school in order to review its history, necessity, student population, structure, and effects. This research encompassed both qualitative data (i.e., student surveys and principals/superintendent interviews) and quantitative data as the researchers sought to determine why these students were in alternative schools as well examine the outcomes of the students' participation in this school. The results of this research may help pinpoint the continued need for these types of environments in districts and how they can be used effectively to serve nontraditional students as they find success.

## Literature Review

Although the number of dropouts is slowly decreasing, in 2008, 8.1 percent of adults ages 16-24

had yet to earn a diploma or general education development (GED) certificate and were not enrolled in school (U.S. Department of Education, 2011). Engaging and encouraging these students to continue their education is problematic. Currently, in the United States, experts are examining alternative education as a viable option to help combat this educational dilemma. This study used both a literature review and an original study in an attempt to answer the following questions: (1) What percentage of *dropouts* in the selected area elect to attend alternative high schools? (2) What is the structure of this alternative school? (3) At what point in their education did these students first experience a disconnection? (4) Why have students who chose to attend this alternative high school dropped out of mainstream high schools? (5) What do the students see as the benefits of attending this alternative school?

In 2002, the United States Department of Education (USDE) defined alternative education as “a public [or private] elementary/secondary school that addresses needs of students that typically cannot be met in a regular school, provides nontraditional education, [and] serves as an adjunct to regular school, special education or vocational education” (Faller et al., 2006, p. 12). Various strategies that are used in alternative education help engage students and assist them in succeeding where traditional schools are failing. Morrissette (2011) breaks down these strategies into five key areas: (1) school environment/ambiance, (2) sense of belonging, (3) pedagogical expertise, (4) program flexibility, and (5) self-awareness. Since these reasons seem to be why alternative education is succeeding and, along those same lines, why traditional schools are failing (at least for these students), more research needs to focus on the purpose and outcome of alternative schools. The purpose of this study was to examine the following hypotheses: (1) For students who are not successful in a normal high school environment, alternative education can be successful. (2) Alternative education allows students to feel more engaged (i.e., personalized instruction, goal setting, class size, teaching strategies, etc.) and achieve more success than in a normal high school environment.

## Methodology

### School

The focus of this investigation was an alternative school in a small suburban district in the Midwest. The school enrolls students in grades 9–12 on an application and interview basis. The school uses a nontraditional schedule with a personalized and flexible, individualized work environment. Teachers work to develop strong relationships with the students. Standard enrollment is about 60 students.

### Participants

Participants included 19 students. Of those students, 15 were male and four were female. Students ranged between 16 years old and 21 years old, and they were 10<sup>th</sup> graders to recent graduates. Seventeen students were White, one was Black/African American, and one was Other. Only one student identified himself as Hispanic. Participants also included the first principal of the alternative school and the two current associate principals. In this cohort, there was one male and two females. Lastly, participants included both the past superintendent (in office during the formation of the alternative school) and the current superintendent who were both male.

### Procedure

Informed consent was provided for all participants. Students participated in surveys that included both demographic and experience based questions. Administrators participated in interviews. Dropout statistics were also gathered online as well as information from the school website and school handbook.

### Data Analysis

Interviews were analyzed using a constant comparative technique. First, interviews were transcribed and returned to participants for approval. Researchers then separately read interviews and highlighted themes. Three themes emerged: (1) school structure, (2) curriculum/goals, and (3) nontraditional student. Surveys were analyzed using descriptive statistics. Survey

answers were compiled into graphs. Write-in responses were listed and used to answer questions and address statements.

### Results

**Question 1:** What percentage of *dropouts* in the selected area elect to attend alternative high schools?

The answer was unclear because the alternative school works as a program within the district's high schools and because not all students choose to immediately continue their education at the alternative school.

**Question 2:** What is the structure of this alternative school?

Currently, the alternative school uses a four-day school week with a late daily start time. Students are admitted each quarter based on individual applications and personal interviews. Typically, there is a waiting list. The school has eight staff members for around 60 students and is staff-intensive and student-centered. Strong teacher-student relationships are emphasized at the school. Students work through contracts (packets of work required to attain the credit) at their own pace with a teacher's help. Students can earn credit in a variety of ways. Counseling and other services are provided along with incentive programs that are used to encourage commitment. Once students meet school and district requirements, they are allowed to graduate.

**Question 3:** At what point in their education did these students first experience a disconnection?

Student responses varied; their disconnection ranged from the 2<sup>nd</sup> grade to never experiencing disconnection. However, the majority of students who have felt a disconnection first experienced that feeling as freshmen in high school. Furthermore, two-thirds of students first felt a disconnection with their environment in high school. Six students responded that they had never experienced a disconnection, and one student chose not to answer.

**Question 4:** Why have students who chose to attend this alternative high school dropped out of mainstream high schools?

In the traditional school, these students did not feel like they fit in. They felt discouraged, bullied, alone, and behind. One student responded, "I needed help and never got it." Another student said, "[I didn't] fit in with the students at the school, and [I] couldn't get [the] work done on time." Other students responded saying that "small groups, aka *cliques*," "the teachers," and "[b]eing in the 'stupid' kid classes" all made them feel disconnected. Feeling like the "trouble maker" or "coming from a small school to a large school" made other students feel lost. Lastly, another student described her experience saying, "[I] felt like most people thought they were above me and did not care to associate with me. I had good friends, on the other hand. My grades were also horrible, and I miss[ed] a lot of school." All of these reasons validated students' feelings of disconnection in their previous school.

**Question 5:** What do the students see as the benefits of attending this alternative school?

Of the 19 students in this study, 18 felt that they are more successful in an alternative school. A multiple-mark question on the survey found that the majority of students felt that they are more successful in the alternative school because of smaller class sizes, teaching strategies, and teacher involvement.

### Additional Considerations

The alternative school began as a program idea within the traditional high school but later was solidified through a Charter School Grant. The alternative school's core goals are the following: "To provide a quality academic environment that leads to the awarding of a high school diploma, [t]o provide students with those personal/social living skills that will help them be successful for life, [and to] provide vocational guidance and placement that will lead to successful career attainment." Administrators monitor success through student stories: "I mean when you have a kid that comes to you after they graduate and says, 'I might be dead by now [...] if it hadn't been for the people, but now I'm working, happy, married, have a kid, supporting myself.' [...] How can you argue that?" (Administrator 2, interview, May 2012).

The program is flexible and student-centered, allowing the goals, curriculum, and resources to change often depending on what the needs of the students. Furthermore, research validated both hypotheses; however, the difficulty is determining whether these hypotheses would indeed be true for other alternative settings.

## Conclusion

In conclusion, alternative education settings provide students who do not conform to traditional models an option to continue their

education in a way that fits their learning styles. Students have the opportunity to find success where they had failed previously. Through unique techniques and individualized instruction, students can become reengaged, eventually taking ownership of their education. By supporting these students in their effort to find success through education, potential risk factors can be eliminated. In this type of alternative environment, students can accomplish academic goals as well as deal with personal issues. Overall, alternative environments provide nontraditional students a safe harbor to learn, plan, and succeed.

## References

- Bullock, L. M. (2007). Introduction to the special issue: ensuring student success through alternative schools. *Preventing School Failure, 51*(2), 3-4.
- Dye, J. F., Schatz, I. M., Rosenberg, B. A., & Coleman, S. T. (January, 2000). Constant comparison method: A kaleidoscope of data. *The Qualitative Report, 4*(1/2), Retrieved from <http://www.nova.edu/ssss/QR/QR4-1/dye.html>.
- Faller, S. E., Gable, R. A., Poirier, J. M., Quinn, M. M., & Tonelson, S. W. (2006). An examination of school climate in effective alternative programs. *Preventing School Failure, 51*(1), 11-17.
- Flower, A., Jolivette, K., & McDaniel, S. C. (2011). A literature review of research quality and effective practices in alternative education settings. *Education & Treatment of Children, 34*, 489-510.
- Foley, R. M., & Pang, L.-S. (2006). Alternative education programs: program and student characteristics. *High School Journal, 89*(3), 10-21.
- Johannessen, L. R. (2004). Helping "struggling" students achieve success. *Journal of Adolescent & Adult Literacy, 47*(8), 638-647.
- Kansas State Department of Education. (n.d.). *Kansas state department of education report card 2010-2011*. Retrieved from [http://svapp15586.ksde.org/rcard/district.aspx?org\\_no=D0266](http://svapp15586.ksde.org/rcard/district.aspx?org_no=D0266).
- McGinty, S., Stemp, K., & Wilson, K. (2011). Re-engaging young people with education and training: What are the alternatives? *Youth Studies Australia, 30*, 32-39.
- Morrisette, P. J. (2011). Exploring student experiences within the alternative high school context. *Canadian Journal of Education, 34*(2), 169-188.
- Schussler, D. L. (2009). Beyond content: How teachers manage classrooms to facilitate intellectual engagement for disengaged students. *Part of Special Section: A Person-Centered Approach to Classroom Management, 48*(2), 114-121. doi: 10.1080/00405840902776376.
- U.S. Department of Education, National Center for Education Statistics. (2011). Status dropout rates. Retrieved from *The Condition of Education 2011 (NCES 2011-033)*, [http://nces.ed.gov/programs/coe/indicator\\_sde.asp](http://nces.ed.gov/programs/coe/indicator_sde.asp).
- Watson, S. L. (2011). Somebody's gotta fight for them: A disadvantaged and marginalized alternative school's learner-centered culture of learning. *Urban Education, 46*(6), 1496-1525. doi: 10.1177/0042085911413148.
- University of Wisconsin Oshkosh. (n.d.) *What is curriculum: A variety of definitions* [PowerPoint slides]. Retrieved from <http://www.uwosh.edu/facstaff/cramer/new-folder/CurrDefinedand%20History.ppt>.

#### Notice of Nondiscrimination

Wichita State University does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, marital status, status as a veteran or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0205; telephone (316) 978-6791.



Funding Level: \$252,043

The McNair Scholars Program is funded 100% by the U.S. Department of Education.

