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Item Type	Dissertation
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FACTORS LINKED TO FUTURE NEUROPSYCHOLOGY REFERRAL PRACTICES
AMONG MEDICAL RESIDENTS

A Dissertation by

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Master of Arts, Wichita State University, 2018

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Submitted to the Department of Psychology
and the faculty of the Graduate School of
Wichita State University
in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy

July 2022

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FACTORS LINKED TO FUTURE NEUROPSYCHOLOGY REFERRAL PRACTICES
AMONG MEDICAL RESIDENTS

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ABSTRACT

Neuropsychologists receive most of their patient referrals from neurologists, psychiatrists, and primary care physicians (Sweet et al., 2015). It is consequently important to understand how to facilitate these providers' continued engagement with neuropsychology. Prior research has demonstrated that physicians are generally satisfied with neuropsychological evaluations; however, more information is needed about factors that contribute to their decision to refer. The current study, based on the Integrated Behavioral Model and informed by prior research in the neuropsychology, psychiatry, and mental health fields, explored factors linked to future neuropsychology referral practices among medical residents.

Results demonstrate the importance of educating medical residents about neuropsychology in order to promote future referrals. Exposure to neuropsychology during residency had the strongest impact on referral intentions. The most influential types of exposure were multiple lectures, seminars, or other didactic teaching or clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized. In terms of specific topics for education, results suggest that it is important to make residents aware of local neuropsychologists and help them understand the nature of neuropsychological services. Additional useful targets include the benefits of neuropsychological services, the variety of questions neuropsychologists are able to answer, and perceived barriers to making referrals. Finally, this study shows that psychiatry and neurology residents are generally better educated about neuropsychology than internal medicine and family medicine residents. Given that primary care residents constitute a larger potential referral base, particular attention should be given to improving the education of residents in primary care specialties.

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CHAPTER I

INTRODUCTION

Context of the Current Study

The field of neuropsychology has grown rapidly in recent years (American Academy of Clinical Neuropsychology Board of Directors, 2007). Despite its growth, it remains a relatively small specialty area of psychology, consisting of 9% of licensed psychologists (Lin et al., 2017). The American Academy of Clinical Neuropsychology (2007) provides an outline of this subfield in its guidelines for neuropsychological practice. Neuropsychology is defined as an applied science concerned with the impact of brain functioning on cognition, emotion, and behavior. In other words, it is the study of brain-behavior relationships. Neuropsychological evaluations assess brain function and dysfunction in order to understand patterns of cognitive strengths and weaknesses, identify factors contributing to deficits or patterns of performance, and provide prognoses and treatment recommendations. These evaluations typically consist of records reviews, interviews of patients and individuals who know them well, standardized testing, behavioral observations, and providing feedback on the results to patients and/or other relevant parties, such as family members. Interpretation of results is based on knowledge of how conditions that affect the brain manifest in terms of cognition, emotion, and behavior.

Schoenberg and Scott (2011) describe several unique contributions neuropsychologists can make to patient care. First, they can provide information about dysfunction that is essential for making a diagnosis. They can also provide valuable information to health care providers for research and/or patient management. Even when a patient's specific diagnosis is already known, a neuropsychological evaluation can quantify the impact of the problem through assessing the severity and type of cognitive deficits and how the patient's level of functioning impacts their

ability to follow medical recommendations and/or carry out instrumental activities of daily living. Additionally, neuropsychologists can provide prognostic information about a treatment based on what is known about the association between a patient's current neuropsychological status and medical and surgical outcomes.

Neuropsychological evaluations may be requested for a variety of reasons (Lezak et al., 2012). They may be requested in forensic cases, for purposes such as assessing if a person has capacity to stand trial, if brain dysfunction contributed to a crime, or if an event resulted in central nervous system damage (and, if so, the level of impairment the individual is likely to experience as a result). Neuropsychological assessments have also been utilized in theoretical and applied research to understand how brain structure, activity, and pathology translate into cognitive, emotional, and behavioral outcomes. A common purpose of a neuropsychological evaluation is diagnostic clarification—for example, localizing the site of brain damage, discriminating between different neurological conditions, or differentiating between neurological and psychiatric symptoms. Neuropsychological evaluations also provide valuable information about cognitive, emotional, and behavioral status that can be useful for planning patient care, identifying treatment needs, and evaluating treatment efficacy.

Purpose of the Current Study

Neuropsychologists receive most of their patient referrals from neurologists, psychiatrists, and primary care physicians, including family medicine and internal medicine specialists (Sweet et al., 2015). Because providers from these medical specialties make the majority of referrals, it is important to understand how to facilitate their continued engagement with the field of neuropsychology. The current study seeks to illuminate factors that contribute to neuropsychology-related attitudes and practices among medical residents from the specialties of

neurology, psychiatry, family medicine, and internal medicine. By focusing on the next generation of medical providers, this study aims to identify how neuropsychologists can positively impact the referral sources of the future.

Predicting Behavior: Knowledge, Attitudes, and Behavioral Intention

As doctors in training, medical residents are not yet engaged in fully independent practice. Their use of neuropsychological services during independent practice consequently cannot be directly assessed. Instead, the closest approximation of their future referral behavior is behavioral intention, i.e., the intention of making referrals. Several theories have been developed that explore predictors of behavioral intention.

The Theory of Reasoned Action. According to the Theory of Reasoned Action (Fishbein & Ajzen, 2010), behavioral intention is the most important determinant of a behavior. In other words, the strongest predictor of whether or not a person will perform a behavior is whether or not they intend to do so. However, behavioral intention is influenced by other factors, namely attitude toward the behavior and subjective norm surrounding the behavior. Attitude toward the behavior—an individual's favorable or unfavorable opinion about performing the behavior—is informed by beliefs about the outcomes of performing the behavior, weighted by evaluations of those outcomes. A person who believes that beneficial, valued outcomes will result from performing a behavior will have a favorable attitude toward that behavior. In contrast, a person who believes that negative, undesirable outcomes will result from performing a behavior will have an unfavorable attitude toward that behavior. Having a favorable attitude toward a behavior increases the likelihood that a person will intend to perform that behavior, while having an unfavorable attitude toward a behavior decreases the likelihood that a person will intend to perform it.

Subjective norms, on the other hand, are indicative of the social pressure a person feels to perform or not perform a behavior. Subjective norms are influenced by normative beliefs—whether important others are likely to approve or disapprove of the behavior—weighted by level of motivation to comply with those others’ desires. A person who believes that important others think a certain behavior should be performed, and who is motivated to meet those important others’ expectations, will have a positive subjective norm toward that behavior. In contrast, a person who believes that important others think the behavior should not be performed will have a negative subjective norm. A positive subjective norm increases the likelihood that a person will intend to perform a behavior, while a negative subjective norm decreases that likelihood. In the event that a person is not particularly motivated to meet others’ expectations, that person would have a neutral subjective norm, which would not impact behavioral intention.

In summary, under the Theory of Reasoned Action (Figure 1), a person will intend to engage in a behavior if they have a favorable attitude toward the behavior (driven by thinking there will be valued positive outcomes) and believe important others will approve of the behavior (while being motivated to fulfil those others’ wishes).

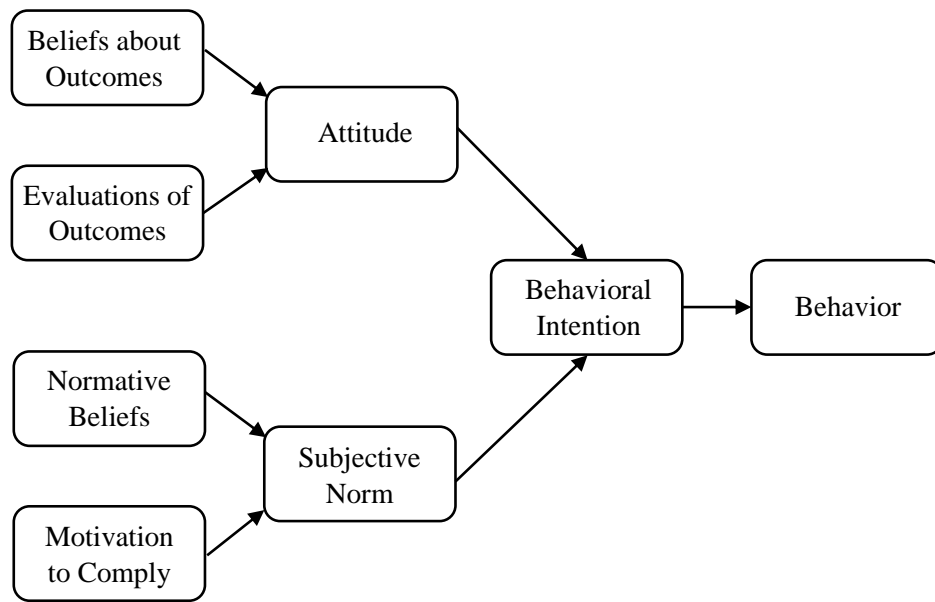


Figure 1. The Theory of Reasoned Action.

The Theory of Planned Behavior. The Theory of Planned Behavior extends the Theory of Reasoned Action by including perceived control as an additional construct that influences both behavioral intention and behavioral performance. Azjen (2012) observed that, in certain situations, a person may not have complete volitional control over their behavior. His addition to the Theory of Reasoned Action consequently attempts to account for factors outside of an individual's control that could impact behavioral intention and behavioral performance. Perceived control, or how much power a person thinks they have over their ability to perform a behavior, is determined by control beliefs regarding the presence or absence of barriers and facilitators to performing the behavior, weighted by the perceived impact of each factor on behavioral performance. The more capable a person thinks they are of performing a behavior, the more likely they are to intend to perform it. In contrast, a person who believes they are incapable of performing a behavior is unlikely to intend to perform it. To the extent that perceived control reflects actual control, perceived control also predicts behavioral performance. Under the Theory

of Planned Behavior (Figure 2), a person’s intention of engaging in a behavior is determined by attitude toward the behavior, subjective norms, and perceived control. If volitional control over the behavior is high, behavioral intention is considered sufficient to predict behavior.

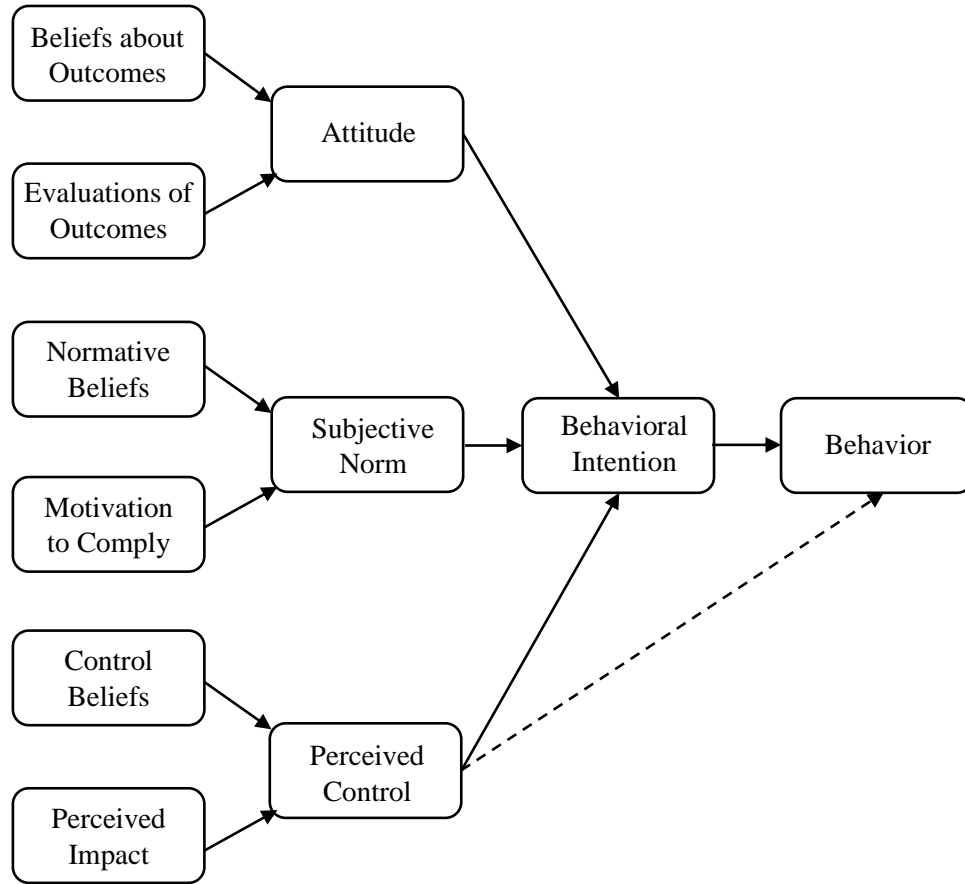


Figure 2. The Theory of Planned Behavior.

Empirical Support for the Theory of Reasoned Action and the Theory of Planned Behavior. The Theory of Reasoned Action and the Theory of Planned Behavior have been used to successfully predict and explain a wide range of behaviors, including breast self-examination, sexual decision-making/teen pregnancy, nutrition choices, physical activity, and adoption of preventive innovations (Dewi & Zein, 2017; Dippel et al., 2017; McDermott et al., 2015; McEachan et al., 2011; Hirschey et al., 2020; Overstreet et al., 2013; Riebl et al., 2015). Further,

these theories have been used to develop effective behavior change interventions (Steinmetz et al., 2016). A meta-analysis conducted by Webb and Sheeran (2006) found that, indeed, changing behavioral intentions results in changes in actual behavior.

The Integrated Behavioral Model. More recently, the Theory of Reasoned Action and the Theory of Planned Behavior have been further expanded to create the Integrated Behavioral Model, which includes constructs from other behavioral theories (Montaño & Kasprzyk, 2015). Like its predecessors, the Integrated Behavioral Model considers behavioral intention to be the most important predictor of behavior. However, the Integrated Behavioral Model reconceptualizes the constructs that determine behavioral intention.

Under this new model, attitude toward a behavior, or how favorable or unfavorable a person perceives performing a behavior to be, is separated into experiential attitudes and instrumental attitudes, based on descriptions of attitudes as composed of both affective and cognitive elements (Conner et al., 2013; French et al., 2005). Experiential attitudes are emotional responses to the idea of performing a behavior, while instrumental attitudes are based on beliefs about the outcomes of performing a behavior (as in the Theory of Reasoned Action and the Theory of Planned Behavior). Perceived norms, defined as the social pressure a person feels to perform or not perform a behavior, now includes both injunctive norms, which are beliefs about what others think one should or should not do (as in the previous theories), and descriptive norms, which are perceptions of what others in one's network are doing. In adding the construct of descriptive norms, the goal is to capture the strong social identity possessed by certain cultures, which has been identified as indicative of normative influence (Bagozzi & Lee, 2002). Last, personal agency, characterized by Bandura (2006) as bringing one's influence to bear on environmental events and one's own functioning, is included because it has been described as a

major factor in influencing behavioral intention (Institute of Medicine, 2002). Under the Integrated Behavioral Model, personal agency consists of perceived control (as in the Theory of Planned Behavior) and self-efficacy, defined as a person's degree of confidence in their ability to perform a behavior (from Social Cognitive Theory; Bandura, 2004).

In addition to behavioral intention, the Integrated Behavioral Model also proposes four other components that directly impact behavior. First, a person needs to have enough knowledge and skill to be able to perform the intended behavior. Second, they need to be under few or no environmental constraints that would make performing the behavior difficult or impossible. Third, the intended behavior needs to be salient; it needs to be sufficiently important to the person and an active part of their thought process at the time. Last, experience performing the behavior may make the behavior habitual, at which point behavioral intention becomes less important in determining future performance of the behavior.

In summary, under the Integrated Behavioral Model (Figure 3), a person is likely to perform a behavior if they have the behavioral intention of doing so (determined by attitude toward the behavior, perceived norms, and personal agency), they have the knowledge and skills to perform the behavior, the behavior is salient, and there are not environmental constraints standing in their way. In some cases, the behavior may be a well-formed habit, which also increases the likelihood of performing the behavior.

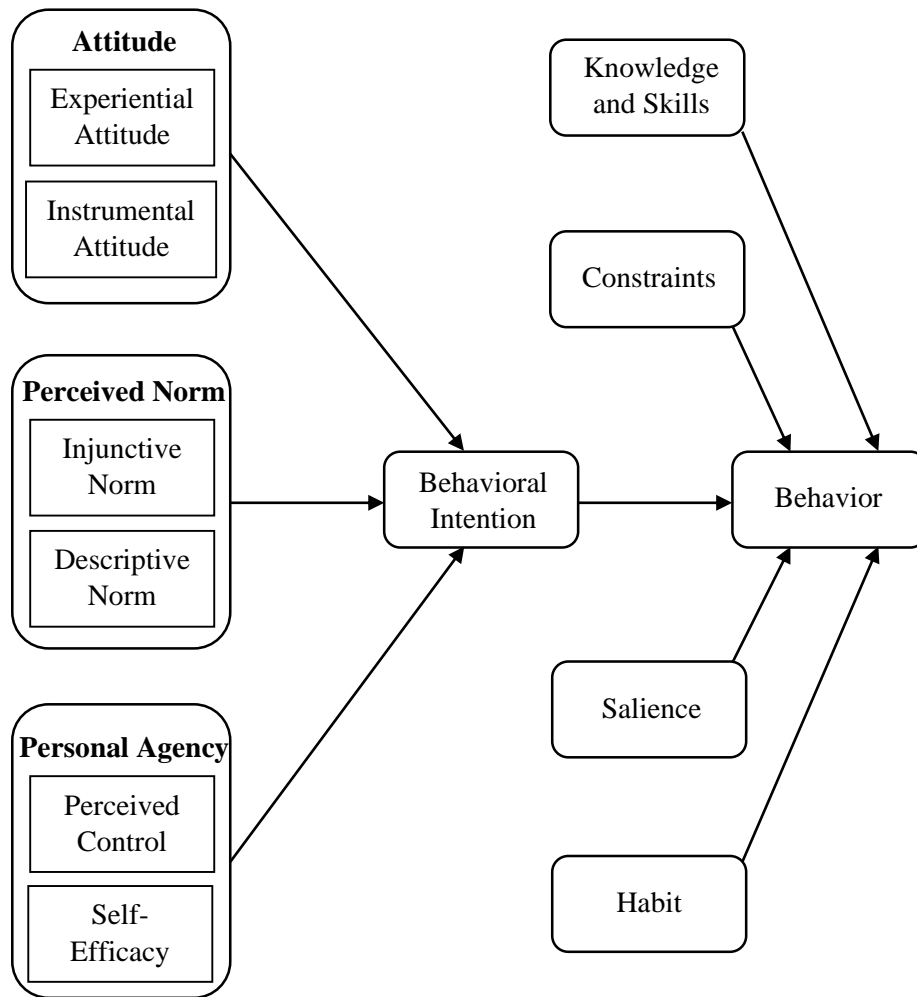


Figure 3. The Integrated Behavioral Model.

Empirical support for the Integrated Behavioral Model stems from its ability to explain and predict behaviors as diverse as physical activity, voting in political elections, and advance care planning (Branscum & Bhochhibhoya, 2016; Holbert et al., 2020; McAfee et al., 2017). Further, the model’s cross-cultural applicability has been demonstrated by its utility in understanding oral health care in Taiwan and male circumcision in Zimbabwe (Ho et al., 2019; Kasprzyk et al., 2018; Montaña et al., 2014, 2018), as well as improving health behaviors in stroke patients in China (Geng et al., 2019).

Importantly, Montaña and Kasprzyk (2015) note that the relative importance of the constructs varies for different behaviors and for different individuals carrying them out. Consequently, in order to design an effective behavior change intervention, it is important to first identify the degree to which behavioral intention is influenced by each of the possible factors. The most effective way of doing this is through discussions with members of the population of concern.

Connections Between the Current Study and the Integrated Behavioral Model. In line with recommendations from Montaña and Kasprzyk (2015), the goal of the current study is to survey predictors of medical residents' behavioral intention to utilize neuropsychological services, in order to understand how to promote behavior change in the form of increased future referrals. The Integrated Behavioral Model suggests several possible influencing factors that warrant exploration: perceived norms, attitudes, personal agency, environmental constraints, knowledge and skills, salience, and habits.

Regarding normative beliefs, it is possible that medical residents would be less likely to refer if making referrals for neuropsychological services has not been the norm during their training. Alternatively, when medical residents become independent practitioners, they may place little to no weight on what others in their practice do, so norms may have little to no impact on their behavioral intention. For this reason, injunctive and descriptive norms are less expected to be significant determinants of behavioral intention than the other constructs.

In contrast, attitudes surrounding neuropsychological services would certainly be expected to play a role. If medical residents do not perceive neuropsychology as a service that can benefit their patients (a negative instrumental belief) or if they have negative overall impressions of neuropsychology (a more experiential attitude), they would not be expected to

refer. If, however, residents have positive attitudes toward neuropsychology, it seems logical that they would be more likely to intend to make referrals during independent practice.

In terms of personal agency, if medical residents are unaware of neuropsychological services in their area, perceived control and self-efficacy regarding making referrals may be low. Lack of awareness of local services would also constitute a significant environmental constraint to making referrals. Additionally, if medical residents do not understand the nature of neuropsychological services, they may not feel efficacious when it comes to making referrals, and they may lack the knowledge to be able to refer when it would be useful to do so.

Importantly, education and training regarding neuropsychological services might positively impact attitudes, awareness, and understanding, which might in turn influence the behavioral intention of making referrals. Further, exposure to neuropsychology could be expected to increase the knowledge and skills needed to make referrals, as well as the salience of making referrals. Practice with making referrals could also make the referral process habitual. If exposure to neuropsychology does indeed influence medical residents' behavioral intention of making referrals as expected, it would also be important to understand which types of training, at what times, are most strongly linked to positive probable referral practices.

In summary, the Integrated Behavioral Model, which expands on the Theory of Reasoned Action and Theory of Planned Behavior, suggests several possible factors that seem likely to influence medical residents' behavioral intention of making referrals. These factors include exposure to neuropsychology and awareness, understanding, and attitudes surrounding neuropsychological services. The current study seeks to assess the relationships between these factors and probable referral practices, with the goal of understanding how neuropsychologists

can target educational programs to promote future referrals. The next section demonstrates how similar research has been usefully conducted in psychiatry and the mental health field.

Research in Other Psychological Domains

Attitudes and Exposure: Research from Psychiatry. As researchers attempt to address historically low rates of medical students interested in careers in psychiatry (e.g., Budd et al., 2011), a wealth of research has accumulated on the relationship between exposure to psychiatry and medical students' attitudes toward the discipline. The majority of studies utilize the 30-item Attitudes Toward Psychiatry scale (ATP-30; Burra et al., 1982), which assesses medical students' attitudes toward a variety of topics pertaining to psychiatric practice. In the original study conducted by Burra and colleagues (1982), exposure to psychiatry resulted in positive changes in medical students' attitudes toward psychiatry. Similar results have been continuously demonstrated since then. A variety of lengths and types of exposure have been shown to positively impact attitudes toward psychiatry, including a one-day visit to a forensic psychiatric unit (Mortlock et al., 2017); a non-clinical, 3-day summer school geared specifically toward counteracting negative opinions and attitudes about psychiatry (Beattie et al., 2018); combined academic coursework and practice rotations (Bulbena et al., 2005); 4-week clinical rotations (Adebowale et al., 2012; Holm-Petersen et al., 2007); an 8-week clerkship (Lyons & Janca, 2015); and a 1-year psychiatry placement (Budd et al., 2011). Findings have been consistent across countries, including the United Kingdom (Beattie et al., 2018; Budd et al., 2011; Mortlock et al., 2017), Australia (Lyons & Janca, 2015), Denmark (Holm-Petersen et al., 2007), Spain (Bulbena et al., 2005), and Nigeria (Adebowale et al., 2012).

Most similarly to the current study, Kuhnigk and colleagues (2007) surveyed German medical students about their attitudes toward psychiatry and psychotherapy and explored the role

of point in training (semester in the program), evaluations of coursework, and previous exposure to psychiatry or psychotherapy (including both practical training and personal or family experience). No differences were found by point in training, but students who had previous exposure to psychiatry or psychotherapy endorsed significantly more positive attitudes toward those fields. In contrast with other research, students' attitudes did not change after they participated in a psychiatry course and practical training. However, satisfaction with the course was significantly correlated with increases in positive attitudes ($r=0.22$).

The authors hypothesize that their distinctive findings may have been due to the included students having participated in relatively few practically oriented courses. The instruction they received was primarily theoretical, and the students made little contact with psychiatric patients until relatively late in their training. The students in Kuhnigk et al. study therefore had less hands-on experience with psychiatry than students in the studies that found psychiatry coursework and training to positively influence attitudes toward psychiatry. Indeed, McParland et al. (2003) found that improvements in medical students' attitudes toward psychiatry following a clinical rotation were predicted by experiences such as having direct involvement in patient care and seeing patients respond positively to treatment. Results from Budd et al. (2011) similarly indicate that it is key for medical students to have the opportunity to engage in experiential and active learning through practice, rather than just observing.

Research in psychiatry provides strong evidence for the positive impact of education and training on medical students' attitudes, across a variety of lengths and types of exposure. As Mortlock et al. (2017) demonstrate, even a single experience can make a difference. Based on these findings, exposure to neuropsychology would be expected to significantly benefit medical residents' attitudes toward the field. However, some types of exposure may be more effective in

influencing attitudes than others. Research in psychiatry suggests that hands-on, practical types of exposure may more effectively influence attitudes than theoretical, purely academic types of exposure. The current study aims to determine if these findings apply to neuropsychology.

Referrals from Medical Providers: Lessons from the Mental Health Field. Physicians often encounter mental health problems among their patients, and they must decide whether to treat their patients' difficulties themselves or refer their patients out for specialty mental health care (e.g., Connors et al., 2017). One prominent area of research in the mental health field has centered on factors that influence physicians' decisions to refer. Several facilitators to referrals have been identified. As outlined by Kainz (2002), physicians are more likely to refer patients for specialty mental health care if they have close working relationships with local mental health providers, understand the approach these mental health providers will use with their patients, and believe that mental health services will be effective in addressing patients' concerns (regarding the last point, also see Alvidrez & Areán, 2002). Kainz further notes that it is important for mental health providers to have good reputations, be clinically competent, be responsive to physicians' concerns, and provide feedback in a timely fashion. Additional facilitating factors include mental health services being readily available and easy to access, as well as previous personal or vicarious experiences with mental health services (Kravitz et al., 2006). Last, physicians are more likely to refer for comorbid or complex conditions than for simple conditions they believe they can easily treat in their own office (Connors et al., 2017).

Several barriers to physician referrals consist of the opposites of the facilitating factors. Lack of local mental health resources presents a barrier to making referrals, as do difficulties or delays in securing appointments (Connors et al., 2017; Heneghan et al., 2008; Kainz, 2002; Walders et al., 2003). Communication issues are another barrier (Kainz, 2002), which can be

caused by lack of familiarity with local mental health providers (Connors et al., 2017).

Physicians' willingness to refer is also reduced when they are unaware of guidelines for mental health treatment (Alvidrez & Areán, 2002) or when they do not understand the scope of available services or their utility (Connors et al., 2017; Kainz, 2002). Additional problems can result when physicians are unclear about the distinction between various types of mental health professionals, such as psychologists, marriage and family therapists, clinical social workers, and psychiatrists, which makes it challenging to know to whom a referral should be sent (Kainz, 2002). A final barrier consists of insurance-related difficulties (Connors et al., 2017; Kainz, 2002; Walders et al., 2003).

Research in the mental health field demonstrates that several factors are important in facilitating physician referrals. These results seem likely to apply to the field of neuropsychology as well. First, local services must be readily available, and those services must be able to satisfy both patients' and physicians' goals. It is also valuable to build strong working relationships with physicians and to make the referral process as easy as possible. Additionally, research in the mental health field suggests that educating physicians about neuropsychological services may be key in facilitating future referrals. Physicians may benefit from education regarding the availability of local neuropsychological services, the unique services neuropsychologists offer, their benefits, when utilizing neuropsychological services is most useful, and how to make referrals. Last, Alvidrez and Areán (2002) point out that specific education geared toward addressing barriers to making referrals is needed.

In light of the findings from research in the mental health field, the current study seeks to explore relationships between probable referral practices and medical residents' education, awareness, understanding, and attitudes surrounding neuropsychological services. This study will

also assess benefits and barriers medical residents perceive regarding utilizing neuropsychological services. By understanding the impact of these factors on referral practices, neuropsychologists will be better equipped to provide specific education that targets both facilitating factors and barriers to making referrals.

Previous Research in Neuropsychology

Within the field of neuropsychology, physician-focused research has centered on physicians' use of and satisfaction with neuropsychological services. Tremont and colleagues (2002) surveyed physicians who referred patients to an outpatient, hospital-based neuropsychology practice. Physician specialties included neurology, psychiatry, internal medicine, and neurosurgery. The most commonly reported reasons for referral were to gain diagnostic clarity and establish baseline cognitive functioning. Physicians expressed high levels of satisfaction with the neuropsychological evaluations their patients received; 97.7% reported that the evaluations were mostly or very useful. An overwhelming majority of physicians (97.7%) stated that their referral questions were satisfactorily answered and that they agreed with the provided diagnoses (97.7%) and recommendations (97.1%). Most physicians (94.3%) also indicated that they would refer similar patients again. Results did not differ by patient diagnosis or physician specialty.

In a follow-up study conducted by the same practice group, Bishop and colleagues (2003) investigated the use of inpatient neuropsychological evaluations by physicians in an acute inpatient hospital setting. Physician specialties spanned a wide range, including neurology, neurosurgery, geriatric medicine, internal medicine, cardiology, endocrinology, oncology, and infectious disease. In order of frequency, physicians most often referred patients for neuropsychological evaluations to examine cognitive status, inform discharge or treatment

planning, assess competency or other legal-related concerns, and increase diagnostic clarity. Bishop et al. evaluated the utility of neuropsychological evaluations indirectly by exploring how often information from these evaluations was incorporated into patients' discharge summaries. They found that 78% of discharge summaries contained information about the neuropsychological evaluation, 48% referenced specific aspects of the results, and 68% referenced specific recommendations. Further, placement decisions were consistent with neuropsychologists' recommendations 80% of the time. Again, findings did not differ by physician specialty. Specific results and recommendations were actually mentioned more often for neuropsychological evaluations than for other types of services, suggesting that neuropsychological evaluations are as much a part of patient treatment, and are at least as important to physicians, as other types of consultative services.

As Temple and colleagues (2006) note, the Tremont et al. (2002) and Bishop et al. (2003) studies were conducted by the same practice group, which could limit the generalizability of their results. Temple et al. consequently conducted the first national survey of physicians about their use of and satisfaction with neuropsychological evaluations. Physician specialties included primary care, geriatrics, psychiatry, neurology, and neurological surgery. The majority of surveyed physicians (89%) indicated that they had referred patients for neuropsychological evaluations. When the results were broken down by specialty, percentages ranged from 70% (primary care physicians) to 99% (neurologists). In order of frequency, physicians most often referred patients to neuropsychologists to clarify diagnoses, establish baseline cognitive functioning, obtain treatment recommendations, assess competency or other legal concerns, and acquire a second opinion. Physicians were generally satisfied with neuropsychological services. Most respondents indicated that their referral questions were answered to their satisfaction

(89.8%), that they agreed with the diagnoses (94.4%) and recommendations (89.7%), that the evaluations and reports were useful (87.8%), and that they would utilize neuropsychological services in the future (86.9%). No differences were found by physician specialty.

Temple et al. (2006) also asked physicians to rate the importance of various factors in deciding to refer to a particular neuropsychologist and to identify barriers to making referrals. The factors most frequently rated as important in deciding to refer to a particular neuropsychologist were having found that specific neuropsychologist helpful in the past, recommendations from colleagues, the neuropsychologist having board certification, and institutional affiliation. The most influential barriers to making referrals were reported to be geographic proximity, simply not seeing the need, and lack of familiarity with the field of neuropsychology. Primary care physicians cited lack of familiarity with neuropsychology as a barrier more often than other specialties, suggesting that educational efforts geared toward primary care physicians may increase the number of referrals they provide (Temple et al., 2006).

In summary, previous research in the field of neuropsychology demonstrates that neuropsychological evaluations are useful for physicians in both inpatient and outpatient settings. Findings indicate that physicians are generally satisfied with the information they receive, tend to agree with neuropsychologists' diagnoses and recommendations, and integrate specific information from neuropsychological evaluations into treatment planning. The research also suggests that most physicians plan to utilize neuropsychological services in the future.

While prior physician-focused research has provided valuable insights into physicians' use of and attitudes toward neuropsychological services, the existing research has significant limitations that the current study seeks to address. Both Tremont et al. (2002) and Temple et al. (2006) surveyed physicians about specific experiences they have had with neuropsychologists.

Tremont and colleagues asked physicians about their satisfaction regarding specific patients, while Temple et al. asked what influenced the decision to refer to a specific neuropsychologist. Consequently, minimal information has been collected about physicians' overall opinions of neuropsychological evaluations or what factors might contribute to physicians making referrals to neuropsychologists in general. Additionally, Tremont and colleagues (2002) only surveyed physicians who had previously made referrals for neuropsychological services. They did not collect information about physicians as a whole. Further, while Temple et al. (2006) conducted the only national survey on this topic, their survey had a very low response rate (10.8%).

The current study seeks to address the limitations of the existing research by exploring medical residents' behavioral intention and attitudes toward neuropsychology in general, regardless of their level of exposure to neuropsychology. Bishop et al. (2003) also suggest that future research should investigate which aspects of neuropsychological services have the greatest impact on physicians' satisfaction with and utilization of those services. This study aims to achieve a similar goal by assessing factors that influence medical residents' behavioral intention to refer.

The Current Study

The current study, based on the Integrated Behavioral Model and informed by prior research in the fields of neuropsychology, psychiatry, and mental health, seeks to illuminate the relationships between medical residents' behavioral intention to refer and their education, awareness, understanding, and attitudes surrounding neuropsychological services. This study will also qualitatively assess perceived benefits to patients and barriers to ordering neuropsychological services. Ultimately, this study hopes to inform how neuropsychologists can target educational programs with the goal of promoting future referrals.

Research Questions and Hypotheses

1. How do the following factors relate to intended referral practices: awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients?
 - a. Given that all of these factors would be expected to influence behavioral intention under the Integrated Behavioral Model, and since findings from research in the mental health field corroborate this hypothesis, all of these factors are expected to statistically significantly correlate with intended referral practices.
2. Which types of exposure to neuropsychology, at what times, most strongly influence the intention to make referrals for neuropsychological services?
 - a. Based on research in the field of psychiatry, it is hypothesized that types of exposure that provide direct, hands-on experience will more positively impact medical residents' intention to refer than theoretical, academic types of exposure.
3. What do medical residents perceive as 1) benefits to patients of neuropsychological services and 2) barriers to ordering those services?

CHAPTER II

METHOD

Participants

Study participants consisted of residents in accredited neurology, psychiatry, family medicine, and internal medicine residency training programs across the United States who responded to a request to complete an online survey about resident education and attitudes surrounding neuropsychological practice. Residents outside of these specialties, outside of the United States, or who were not participating in an accredited residency program were excluded. Sample selection utilized a nonprobability design and snowball sampling technique. First, survey invitations were emailed to coordinators of accredited residency training programs in the selected specialties. Program coordinators were identified using national lists of residencies provided by the Accreditation Council for Graduate Medical Education (ACGME; see <https://apps.acgme.org/ads/Public/Reports/Report/1>). The survey invitations included requests for program coordinators to forward the emails to residents in their programs. Based on a prior survey conducted using a similar format (Bowman et al., 2018), a power analysis conducted in IBM SPSS SamplePower indicated that a minimum of 328 resident responses would be required in order to achieve 90% power.

Survey invitations were sent to 1,420 program coordinators. A total of 427 neurology, psychiatry, family medicine, and internal medicine residents completed the survey. See Table 1 for participant demographics.

TABLE 1
PARTICIPANT DEMOGRAPHICS

Characteristic	<i>n</i>	%
Specialty		
Family Medicine	141	33.02
Internal Medicine	129	30.21
Psychiatry	97	22.72
Neurology	51	11.94
Combined Specialty	8	1.87
Internal Medicine/Psychiatry	4	0.94
Internal Medicine/Pediatrics	3	0.70
Family Medicine/Psychiatry	1	0.23
Not Reported	1	0.23
Residency Year		
1	150	35.13
2	133	31.15
3	102	23.89
4	38	8.90
5	1	0.23
6	3	0.70
Degree		
MD	306	71.66
DO	118	27.63
Other	3	0.70
Region		
Midwest	156	36.53
Northeast	115	26.93
Southeast	93	21.78
West	36	8.43
Southwest	25	5.85
Not Reported	2	0.47

Due to the small number of residents from combined specialties ($n = 8$) or whose specialty was not reported ($n = 1$), these participants were excluded from analyses of the data according to specialty. However, they were included in analyses that utilized the entire sample.

Survey Procedure

Survey invitations were emailed to included residency training program coordinators via REDCap, a secure web application utilized for building and managing online surveys and databases. The initial survey email provided introductory information about the study, including the names of the researchers, the purpose of the study, expected time to complete the survey, and contact information in the event of questions regarding the survey or the rights of research participants. The email also contained a link to the survey. Program coordinators were asked to forward the email to residents in their programs. Two reminder emails were also sent to program coordinators; the first was sent 10 days after data collection began, while the second was sent 7 days later. In addition to the introductory content of the initial email, the reminder emails indicated that no exposure to or knowledge of neuropsychology was necessary to complete the survey. Again, program coordinators were asked to forward the emails, which contained survey links, to their residents. The survey closed after approximately 4 weeks.

Residents accessed and completed the survey online via an html link contained within the emails. The opening screen of the survey consisted of the consent statement. The consent statement reiterated introductory information about the survey and noted that participation was optional, the residents would remain anonymous, they could stop taking the survey at any time, and there were not expected to be any personal risks or benefits to participation. Residents were subsequently asked if they agreed or did not agree to participate. If they agreed to participate, the survey followed. Residents were not required to answer all of the questions. Study data were collected and managed utilizing secure REDCap electronic data capture tools hosted at the University of Kansas School of Medicine. IRB approval was obtained from the University of Kansas Medical Center Human Subjects Committee.

Measures

The survey contained 15 questions (see Appendix A). It was estimated that the survey would take approximately 3 to 5 minutes to complete. The majority of the items utilized multiple-choice or multiple-answer formats. If residents selected “Other” in response to any item, an additional field appeared in which they were prompted to explain their answer. In terms of demographic information, residents were instructed to indicate their degree, residency year, residency specialty, and region of the United States. No identifying information was collected.

Residents were then asked about sources of exposure to neuropsychology, including lectures/seminars/other didactic teaching, clinical rotations, reading medical literature, writing orders/consultations for neuropsychological evaluations, or no exposure, at 3 time points: 1) prior to medical school, 2) during medical school, and 3) during residency. The next items utilized Likert scales (strongly disagree, disagree, agree, or strongly agree) to assess: a) residents’ awareness of local neuropsychological services, b) their understanding of the nature of neuropsychological services, c) whether they think neuropsychological services could benefit their patients, and d) whether they are likely to utilize neuropsychological services when they practice independently.

Next, residents were asked about their overall impressions of neuropsychology on a Likert scale (very negative, negative, positive, very positive, or N/A). They were then instructed to select activities for which they would consider ordering neuropsychological services, including establishing baseline cognitive functioning, establishing or confirming a neurocognitive diagnosis, determining capacity/competency for making decisions, and/or providing treatment recommendations.

Last, in two questions with an open-ended response format, residents were asked to list perceived barriers to ordering neuropsychological services and perceived ways in which neuropsychological services could be beneficial to patients.

Review of Participant Responses

Prior to analyzing the data, participant responses were reviewed for consistency. If residents indicated that they had received no exposure to neuropsychology during a certain time point in their training, their responses were examined to ensure that they had not selected both “no exposure” and one or more types of exposure for that time point. If they had selected both, their “no exposure” response was deleted. This decision was made in light of two factors. First, these residents appeared to be valid responders overall; they endorsed having exposure to neuropsychology at multiple time points, and they only selected “no exposure” along with one or more types of exposure at one of these time points. Second, when they selected both “no exposure” and one or more types of exposure, they generally selected the type(s) of exposure that they were statistically most likely to have received, based on the overall sample. Given these considerations, it was believed that the inconsistencies in these residents’ responses were due to how they interpreted the term “exposure.” It is possible that the residents felt that while they had technically been exposed to neuropsychology in some way, the exposure they received was not substantial, leaving them with a sense that they had not truly been exposed to neuropsychology at that time point (e.g., “Sure, I did some reading, but I had no *real* exposure to neuropsychology”). In support of this hypothesis, this group of residents generally endorsed lower levels of understanding of neuropsychology than the overall sample and frequently cited lack of experience with and knowledge about neuropsychology as barriers to making referrals. Both of these tendencies would be consistent with residents feeling as if they had not truly been exposed

to neuropsychology. Given that these residents did endorse having some exposure to neuropsychology, however slight, it was believed that they were more appropriately grouped with other participants who were exposed to neuropsychology rather than with individuals who genuinely had no exposure at all to neuropsychology. Consequently, their “no exposure” response for that time point was deleted, and the types of exposure that they selected were retained.

Similarly, if residents selected receiving exposure to neuropsychology both through “a single lecture, seminar or other didactic teaching” and “multiple lectures, seminars or other didactic teaching” at a given time point, their “single lecture” response for that time point was deleted. Their “multiple lecture” response was retained because it more accurately characterized their experiences during that time.

Residents’ “Other” responses were also reviewed. As previously noted, if residents selected “Other” for sources of exposure to neuropsychology or activities for which they would consider ordering neuropsychological services, a field appeared in which they were prompted to explain their answer. If their response fit into one of the provided categories, and if that category had not already been selected, their response was added to that category and removed from the “Other” category. For example, for types of exposure, one resident selected “Other” and typed in, “Shadowing with faculty neuropsychologists.” Since one of the provided types of exposure is “a clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred,” this resident’s response was recategorized accordingly.

Quantitative Data Analysis

Most of the Likert scales were collapsed into two categories for analysis due to clustering of participant responses. For example, the majority of residents selected either “agree” or

“disagree” regarding awareness of local neuropsychological services and understanding of neuropsychological services. Since relatively few responses were endorsed on the extremes (“strongly agree” or “strongly disagree”), responses on these questions were collapsed into two categories: agree/strongly agree and disagree/strongly disagree. When asked about referral intentions and perceiving neuropsychology as a service that can benefit patients, most residents selected “agree” or “strongly agree.” In order to maximize the number of participants in the “disagree” group while maintaining ease of interpretation of results, responses were again collapsed into two categories as described above. Overall impressions of neuropsychology were highly positively skewed, with only 4 residents (0.94%) reporting negative impressions and no residents reporting very negative impressions. Due to its restricted range, this item was not included in any analyses. Specific analyses conducted for the quantitative research questions were as follows:

1. How do the following factors relate to probable referral practices: awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients?
 - a. Spearman rank order coefficients were calculated to assess the strengths of the relationships between these variables.
 - b. Binary logistic regression was also used. The resulting odds ratios were reviewed to determine the impact of these factors on intention to refer.
2. Which types of exposure to neuropsychology, at what times, most strongly influence the intention to make referrals for neuropsychological services?
 - a. Binary logistic regression was utilized. Odds ratios were examined to assess how type and timing of exposure affect medical residents’ intention to refer.

Qualitative Data Analysis

In order to understand perceived benefits to patients and barriers to ordering neuropsychological services, three independent researchers coded the responses to the open-ended survey questions line by line. A qualitative approach recommended by Creswell and Poth (2018) was used to establish and assess interrater reliability. First, each coder independently reviewed the same 20 participants' responses and developed a list of preliminary codes. The coders then met as a group to examine the codes, their definitions, and the participant responses that fell under each code. Based on this group discussion, an initial codebook was created that contained agreed-upon codes and their definitions. This shared codebook was subsequently applied to 30 new participant responses. Again, each coder analyzed the data independently. The coders then met as a group to compare their coding and assess intercoder agreement. Agreement was defined as all of the coders assigning the same code to given piece of data. Per Creswell and Poth, as informed by Miles et al. (2014), the coders sought to achieve 85% to 90% agreement. During the first interrater reliability check, 75% agreement was achieved. The coders reviewed areas of disagreement, and the codes and their definitions were refined as needed. New codes were also added to address participant responses that were not adequately captured by the existing codes.

Next, using the revised codebook, the coders independently analyzed 30 additional participant responses, achieving 81% agreement. The codebook was again refined as needed according to group discussions and was independently applied to 30 more responses. This time, 88% agreement was achieved. Since the threshold of at least 85% agreement had been met, it was determined that adequate interrater reliability had been established. The remainder of the open-ended responses were subsequently split evenly among the 3 coders. While each coder was

responsible for a unique subset of the data, another group meeting was held after coding was complete to achieve consensus on unclear, confusing, or complicated responses. Throughout the coding process, previously analyzed responses were recoded when necessary, according to changes in the codebook (e.g., newly added codes that better captured those responses or revisions to the code names or definitions).

After all of the responses were coded, the coders met to discuss potential themes regarding benefits and barriers. The discussion centered on identifying codes that appeared to group together under overarching thematic categories. Following the meeting, names were assigned to the thematic categories and a list was compiled of which codes fell under each theme, based on the previous discussion. The other coders provided feedback on the theme names and the codes assigned to the themes, and consensus was achieved on how the responses were categorized. During this process, the codebook continued to be refined, as thinking about overarching categories sparked new considerations about codes, their names, and their definitions. For example, it became apparent that one code was being used to encapsulate three distinct, although similar, concepts. This code was subsequently split into three different codes that better captured the differences in residents' responses. Changes to the codebook were reviewed and approved by all coders, and responses were recoded accordingly.

After the codes and themes were determined, sample responses were selected that were deemed representative of each code. All coders reviewed the sample responses and agreed that they were appropriate choices. Last, frequencies of each code were calculated in order to identify the most commonly reported benefits and barriers.

CHAPTER III

RESULTS

Exposure to Neuropsychology

Prior to medical school, the proportion of residents exposed to neuropsychology was relatively low, with most residents receiving no exposure at all (60.42%; Table 2). The most common types of exposure during this timeframe were lectures, seminars, or other didactic teaching (14.52% multiple didactics; 11.24% single didactic) or reading medical literature (11.24%).

TABLE 2

TYPES OF EXPOSURE TO NEUROPSYCHOLOGY PRIOR TO MEDICAL SCHOOL

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
A single lecture, seminar or other didactic teaching	11.24% (<i>n</i> = 48)	14.18% (<i>n</i> = 20)	11.63% (<i>n</i> = 15)	8.25% (<i>n</i> = 8)	7.84% (<i>n</i> = 4)
Multiple lectures, seminars or other didactic teaching	14.52% (<i>n</i> = 62)	15.60% (<i>n</i> = 22)	15.50% (<i>n</i> = 20)	13.40% (<i>n</i> = 13)	13.73% (<i>n</i> = 7)
A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized	3.75% (<i>n</i> = 16)	3.55% (<i>n</i> = 5)	3.88% (<i>n</i> = 5)	4.12% (<i>n</i> = 4)	3.92% (<i>n</i> = 2)

TABLE 2 (continued)

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred	1.41% (<i>n</i> = 6)	1.42% (<i>n</i> = 2)	0.78% (<i>n</i> = 1)	2.06% (<i>n</i> = 2)	1.96% (<i>n</i> = 1)
Reading of medical literature	11.24% (<i>n</i> = 48)	10.64% (<i>n</i> = 15)	11.63% (<i>n</i> = 15)	10.31% (<i>n</i> = 10)	15.69% (<i>n</i> = 8)
I had no exposure to neuropsychology	60.42% (<i>n</i> = 258)	55.32% (<i>n</i> = 78)	58.14% (<i>n</i> = 75)	69.07% (<i>n</i> = 67)	60.78% (<i>n</i> = 31)
Other	5.15% (<i>n</i> = 22)	4.26% (<i>n</i> = 6)	3.88% (<i>n</i> = 5)	5.15% (<i>n</i> = 5)	9.80% (<i>n</i> = 5)

Note: “Other” included research, friend or family contact with the field, working with neurodevelopmental disabilities, athletic training and concussions, participating in neuropsychological testing, and training as a neuropsychologist.

In contrast, the majority of residents across specialties received exposure to neuropsychology during medical school; only 19.67% reported having no exposure during this stage of their training (Table 3). Didactics and reading continued to be frequently endorsed, albeit at higher percentages than prior to medical school (32.79% multiple didactics; 29.27% single didactic; 23.42% reading medical literature). Clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized were also relatively common (24.59%).

TABLE 3

TYPES OF EXPOSURE TO NEUROPSYCHOLOGY DURING MEDICAL SCHOOL

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
A single lecture, seminar or other didactic teaching	29.27% (<i>n</i> = 125)	27.66% (<i>n</i> = 39)	31.01% (<i>n</i> = 40)	32.99% (<i>n</i> = 32)	19.61% (<i>n</i> = 10)
Multiple lectures, seminars or other didactic teaching	32.79% (<i>n</i> = 140)	39.01% (<i>n</i> = 55)	30.23% (<i>n</i> = 39)	23.71% (<i>n</i> = 23)	43.14% (<i>n</i> = 22)
A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized	24.59% (<i>n</i> = 105)	22.70% (<i>n</i> = 32)	17.83% (<i>n</i> = 23)	36.08% (<i>n</i> = 35)	27.45% (<i>n</i> = 14)
A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred	9.13% (<i>n</i> = 39)	12.77% (<i>n</i> = 18)	6.98% (<i>n</i> = 9)	9.28% (<i>n</i> = 9)	5.88% (<i>n</i> = 3)
Reading of medical literature	23.42% (<i>n</i> = 100)	21.99% (<i>n</i> = 31)	22.48% (<i>n</i> = 29)	23.71% (<i>n</i> = 23)	27.45% (<i>n</i> = 14)
I had no exposure to neuropsychology	19.67% (<i>n</i> = 84)	17.02% (<i>n</i> = 24)	20.16% (<i>n</i> = 26)	21.65% (<i>n</i> = 21)	17.65% (<i>n</i> = 9)
Other	1.64% (<i>n</i> = 7)	2.13% (<i>n</i> = 3)	0% (<i>n</i> = 0)	2.06%, (<i>n</i> = 2)	3.92% (<i>n</i> = 2)

Note: "Other" included friend or family contact with the field and performing neuropsychological testing.

During residency, most participants continued to receive exposure to neuropsychology (Table 4). Less than a quarter of respondents (23.19%) lacked exposure during this timeframe. The most common types of exposure were clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized (32.32%), multiple didactics (31.85%), writing orders/consultations for neuropsychological evaluations (30.91%), and reading medical literature (28.57%). Notably, more psychiatry residents reported receiving each type of exposure than residents from other specialties, except for a single didactic. Neurology residents possessed the next highest percentages.

TABLE 4

TYPES OF EXPOSURE TO NEUROPSYCHOLOGY DURING RESIDENCY

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
A single lecture, seminar or other didactic teaching	13.82% (<i>n</i> = 59)	18.44% (<i>n</i> = 26)	10.85% (<i>n</i> = 14)	12.37% (<i>n</i> = 12)	11.76% (<i>n</i> = 6)
Multiple lectures, seminars or other didactic teaching	31.85% (<i>n</i> = 136)	27.66% (<i>n</i> = 39)	9.30% (<i>n</i> = 12)	58.76% (<i>n</i> = 57)	47.06% (<i>n</i> = 24)
A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized	32.32% (<i>n</i> = 138)	23.40% (<i>n</i> = 33)	17.83% (<i>n</i> = 23)	56.70% (<i>n</i> = 55)	41.18% (<i>n</i> = 21)
A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred	10.54% (<i>n</i> = 45)	7.09% (<i>n</i> = 10)	3.88% (<i>n</i> = 5)	22.68% (<i>n</i> = 22)	15.69% (<i>n</i> = 8)

TABLE 4 (continued)

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Writing orders/ consultations for neuropsychological evaluations	30.91% (<i>n</i> = 132)	22.70% (<i>n</i> = 32)	19.38% (<i>n</i> = 25)	55.67% (<i>n</i> = 54)	35.29% (<i>n</i> = 18)
Reading of medical literature	28.57% (<i>n</i> = 122)	20.57% (<i>n</i> = 29)	20.93% (<i>n</i> = 27)	48.45% (<i>n</i> = 47)	31.37% (<i>n</i> = 16)
I had no exposure to neuropsychology	23.19% (<i>n</i> = 99)	26.95% (<i>n</i> = 38)	41.09% (<i>n</i> = 53)	3.09% (<i>n</i> = 3)	9.80% (<i>n</i> = 5)
Other	0.70 (<i>n</i> = 3)	0% (<i>n</i> = 0)	0.78% (<i>n</i> = 1)	1.03% (<i>n</i> = 1)	1.96% (<i>n</i> = 1)

Note: “Other” included research and neurology rotations.

A chi-square test for independence revealed a statistically significant, medium-sized association between specialty and exposure to neuropsychology during residency, χ^2 (3, *n* = 418) = 50.63, $p < .001$, Cramer’s *V* = .35. Pairwise comparisons with a Bonferroni correction showed that more psychiatry and neurology residents received exposure during residency (96.91% and 90.20%, respectively) than internal medicine residents (58.91%; $p < .001$). Psychiatry residents also more often received exposure during residency than family medicine residents (96.91% compared to 73.05%; $p < .001$). No other statistically significant differences between specialties were found.

Awareness of Local Neuropsychological Services

The data for the overall sample regarding awareness of local neuropsychological services was nearly evenly split; 50.59% of residents agreed or strongly agreed that they were aware of

neuropsychological services available in their communities, while 49.41% disagreed or strongly disagreed (Table 5).

TABLE 5
AWARENESS OF LOCAL NEUROPSYCHOLOGICAL SERVICES

	Overall (<i>n</i> = 425)	Family Medicine (<i>n</i> = 140)	Internal Medicine (<i>n</i> = 128)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Original Categories					
Strongly Disagree	14.12% (<i>n</i> = 60)	17.86% (<i>n</i> = 25)	21.88% (<i>n</i> = 28)	4.12% (<i>n</i> = 4)	5.88% (<i>n</i> = 3)
Disagree	35.29% (<i>n</i> = 150)	35.71% (<i>n</i> = 50)	43.75% (<i>n</i> = 56)	28.87% (<i>n</i> = 28)	25.49% (<i>n</i> = 13)
Agree	41.88% (<i>n</i> = 178)	39.29% (<i>n</i> = 55)	32.03% (<i>n</i> = 41)	51.55% (<i>n</i> = 50)	50.98% (<i>n</i> = 26)
Strongly Agree	8.71% (<i>n</i> = 37)	7.14% (<i>n</i> = 10)	2.34% (<i>n</i> = 3)	15.46% (<i>n</i> = 15)	17.65% (<i>n</i> = 9)
Collapsed					
Disagree	49.41% (<i>n</i> = 210)	53.57% (<i>n</i> = 75)	65.63% (<i>n</i> = 84)	32.99% (<i>n</i> = 32)	31.37% (<i>n</i> = 16)
Agree	50.59% (<i>n</i> = 215)	46.43% (<i>n</i> = 65)	34.38% (<i>n</i> = 44)	67.01% (<i>n</i> = 65)	68.63% (<i>n</i> = 35)

A chi-square test for independence showed a statistically significant, small to medium association between specialty and awareness of local neuropsychological services, χ^2 (3, *n* = 416) = 31.51, *p* < .001, Cramer's *V* = .28. In follow-up pairwise comparisons using a Bonferroni correction, psychiatry and neurology residents were significantly more likely to endorse awareness of local neuropsychological services (67.01% and 68.63%, respectively) than internal

medicine residents (34.38%; $p < .001$). Psychiatry residents were also more likely to endorse awareness of local neuropsychological services than family medicine residents (67.01% compared to 46.43%; $p = .003$). There were no other statistically significant differences by specialty.

Understanding of Neuropsychological Services

When asked if they understood the nature of the services provided by a neuropsychologist, a majority of residents (54.85%) agreed or strongly agreed (Table 6).

TABLE 6

UNDERSTANDING THE NATURE OF NEUROPSYCHOLOGICAL SERVICES

	Overall (<i>n</i> = 423)	Family Medicine (<i>n</i> = 139)	Internal Medicine (<i>n</i> = 128)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 50)
Original Categories					
Strongly Disagree	9.69% (<i>n</i> = 41)	12.23% (<i>n</i> = 17)	17.19% (<i>n</i> = 22)	1.03% (<i>n</i> = 1)	2.00% (<i>n</i> = 1)
Disagree	35.46% (<i>n</i> = 150)	39.57% (<i>n</i> = 55)	44.53% (<i>n</i> = 57)	22.68% (<i>n</i> = 22)	26.00% (<i>n</i> = 13)
Agree	46.10% (<i>n</i> = 195)	40.29% (<i>n</i> = 56)	36.72% (<i>n</i> = 47)	58.76% (<i>n</i> = 57)	60.00% (<i>n</i> = 30)
Strongly Agree	8.75% (<i>n</i> = 37)	7.91% (<i>n</i> = 11)	1.56% (<i>n</i> = 2)	17.53% (<i>n</i> = 17)	12.00% (<i>n</i> = 6)
Collapsed					
Disagree	45.15% (<i>n</i> = 191)	51.80% (<i>n</i> = 72)	61.72% (<i>n</i> = 79)	23.71% (<i>n</i> = 23)	28.00% (<i>n</i> = 14)
Agree	54.85% (<i>n</i> = 232)	48.20% (<i>n</i> = 67)	38.28% (<i>n</i> = 49)	76.29% (<i>n</i> = 74)	72.00% (<i>n</i> = 36)

A chi square test for independence revealed a statistically significant, medium-sized association between specialty and understanding, $\chi^2(3, n = 414) = 40.56, p < .001$, Cramer's $V = .31$. Pairwise comparisons with a Bonferroni correction showed that more psychiatry and neurology residents endorsed understanding the nature of neuropsychological services (76.29% and 72.00%, respectively) than family medicine or internal medicine residents (48.20% and 38.28%; $p < .001$ for all comparisons except neurology versus family medicine, where $p = .006$). No other statistically significant differences by specialty were observed.

Attitudes Toward Neuropsychology

Both perceptions of neuropsychology as a service that benefits patients (Table 7) and overall impressions of neuropsychology (Table 8) were highly skewed; the vast majority of residents across specialties offered positive responses. Specifically, 94.81% of residents indicated that neuropsychology is a service that could benefit their patients, while 83.14% reported having positive or very positive impressions of neuropsychology. Less than one percent (0.94%) of residents reported having negative impressions, and no residents endorsed having very negative impressions. However, 27.13% of internal medicine residents and 18.44% of family medicine residents selected "N/A" when asked about their impressions, in contrast to the much smaller proportions of psychiatry and neurology residents (4.12% and 1.96%, respectively) who selected this answer.

TABLE 7

PERCEIVING NEUROPSYCHOLOGY AS A SERVICE THAT CAN BENEFIT PATIENTS

	Overall (<i>n</i> = 424)	Family Medicine (<i>n</i> = 139)	Internal Medicine (<i>n</i> = 128)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Original Categories					
Strongly Disagree	2.12% (<i>n</i> = 9)	1.44% (<i>n</i> = 2)	3.91% (<i>n</i> = 5)	0% (<i>n</i> = 0)	3.92% (<i>n</i> = 2)
Disagree	3.07% (<i>n</i> = 13)	2.16% (<i>n</i> = 3)	5.47% (<i>n</i> = 7)	1.03% (<i>n</i> = 1)	1.96% (<i>n</i> = 1)
Agree	58.02% (<i>n</i> = 246)	61.15% (<i>n</i> = 85)	62.50% (<i>n</i> = 80)	53.61% (<i>n</i> = 52)	45.10% (<i>n</i> = 23)
Strongly Agree	36.79% (<i>n</i> = 156)	35.25% (<i>n</i> = 49)	28.13% (<i>n</i> = 36)	45.36% (<i>n</i> = 44)	49.02% (<i>n</i> = 25)
Collapsed					
Disagree	5.19% (<i>n</i> = 22)	3.60% (<i>n</i> = 5)	9.38% (<i>n</i> = 12)	1.03% (<i>n</i> = 1)	5.88% (<i>n</i> = 3)
Agree	94.81% (<i>n</i> = 402)	96.40% (<i>n</i> = 134)	90.63% (<i>n</i> = 116)	98.97% (<i>n</i> = 96)	94.12% (<i>n</i> = 48)

TABLE 8

OVERALL IMPRESSIONS OF NEUROPSYCHOLOGY

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Original Categories					
Very Negative	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)
Negative	0.94% (<i>n</i> = 4)	0.71% (<i>n</i> = 1)	2.33% (<i>n</i> = 3)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)
Positive	55.97% (<i>n</i> = 239)	56.03% (<i>n</i> = 79)	56.59% (<i>n</i> = 73)	57.73% (<i>n</i> = 56)	49.02% (<i>n</i> = 25)
Very Positive	27.17% (<i>n</i> = 116)	24.82% (<i>n</i> = 35)	13.95% (<i>n</i> = 18)	38.14% (<i>n</i> = 37)	49.02% (<i>n</i> = 25)
N/A	15.93% (<i>n</i> = 68)	18.44% (<i>n</i> = 26)	27.13% (<i>n</i> = 35)	4.12% (<i>n</i> = 4)	1.96% (<i>n</i> = 1)
Collapsed					
Negative	0.94% (<i>n</i> = 4)	0.71% (<i>n</i> = 1)	2.33% (<i>n</i> = 3)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)
Positive	83.14% (<i>n</i> = 355)	80.85% (<i>n</i> = 114)	70.54% (<i>n</i> = 91)	95.88% (<i>n</i> = 93)	98.04% (<i>n</i> = 50)
N/A	15.93% (<i>n</i> = 68)	18.44% (<i>n</i> = 26)	27.13% (<i>n</i> = 35)	4.12% (<i>n</i> = 4)	1.96% (<i>n</i> = 1)

Intention to Refer

Regarding the behavioral intention of making referrals, 86.05% of residents reported that they are likely to consult/order neuropsychological services when they practice independently (Table 9). A chi-square test for independence revealed a small but statistically significant

association between specialty and referral intentions, $\chi^2 (3, n = 414) = 13.56, p < .01$, Cramer's $V = .18$. Follow-up pairwise comparisons with a Bonferroni correction showed that psychiatry residents more often endorsed intending to make referrals than internal medicine residents (95.88% compared to 78.91%; $p = .001$). No other statistically significant differences between specialties were found.

TABLE 9
INTENTION TO REFER TO NEUROPSYCHOLOGISTS
DURING INDEPENDENT PRACTICE

	Overall (<i>n</i> = 423)	Family Medicine (<i>n</i> = 139)	Internal Medicine (<i>n</i> = 128)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 50)
Original Categories					
Strongly Disagree	1.89% (<i>n</i> = 8)	0.72% (<i>n</i> = 1)	4.69% (<i>n</i> = 6)	0% (<i>n</i> = 0)	2.00% (<i>n</i> = 1)
Disagree	12.06% (<i>n</i> = 51)	13.67% (<i>n</i> = 19)	16.41% (<i>n</i> = 21)	4.12% (<i>n</i> = 4)	10.00% (<i>n</i> = 5)
Agree	58.39% (<i>n</i> = 247)	63.31% (<i>n</i> = 88)	60.94% (<i>n</i> = 78)	56.70% (<i>n</i> = 55)	44.00% (<i>n</i> = 22)
Strongly Agree	27.66% (<i>n</i> = 117)	22.30% (<i>n</i> = 31)	17.97% (<i>n</i> = 23)	39.18% (<i>n</i> = 38)	44.00% (<i>n</i> = 22)
Collapsed					
Disagree	13.95% (<i>n</i> = 59)	14.39% (<i>n</i> = 20)	21.09% (<i>n</i> = 27)	4.12% (<i>n</i> = 4)	12.00% (<i>n</i> = 6)
Agree	86.05% (<i>n</i> = 364)	85.61% (<i>n</i> = 119)	78.91% (<i>n</i> = 101)	95.88% (<i>n</i> = 93)	88.00% (<i>n</i> = 44)

Reasons for Ordering Neuropsychological Services

A majority of residents indicated that they would consider ordering neuropsychological services to establish or confirm a neurocognitive diagnosis (84.07%), differentiate neurocognitive disorders from psychiatric disorders (74.71%), establish baseline cognitive functioning (57.61%), or provide treatment recommendations (56.67%; Table 10). The least commonly endorsed activity was serving as an expert witness (15.93%).

TABLE 10

REASONS FOR ORDERING NEUROPSYCHOLOGICAL SERVICES

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Establishing baseline cognitive functioning	57.61% (<i>n</i> = 246)	53.90% (<i>n</i> = 76)	51.16% (<i>n</i> = 66)	64.95% (<i>n</i> = 63)	68.63% (<i>n</i> = 35)
Establishing or confirming a neurocognitive diagnosis	84.07% (<i>n</i> = 359)	82.27% (<i>n</i> = 116)	78.29% (<i>n</i> = 101)	91.75% (<i>n</i> = 89)	88.24% (<i>n</i> = 45)
Differentiating neurocognitive disorders from psychiatric disorders	74.71% (<i>n</i> = 319)	76.60% (<i>n</i> = 108)	70.54% (<i>n</i> = 91)	81.44% (<i>n</i> = 79)	68.63% (<i>n</i> = 35)
Documenting functional limitations (driving, independent living, etc.)	44.03% (<i>n</i> = 188)	39.72% (<i>n</i> = 56)	36.43% (<i>n</i> = 47)	57.73% (<i>n</i> = 56)	52.94% (<i>n</i> = 27)
Providing treatment recommendations	56.67% (<i>n</i> = 242)	60.28% (<i>n</i> = 85)	61.24% (<i>n</i> = 79)	51.55% (<i>n</i> = 50)	50.98% (<i>n</i> = 26)
Determining capacity/competency for making decisions	43.33% (<i>n</i> = 185)	48.23% (<i>n</i> = 68)	48.06% (<i>n</i> = 62)	34.02% (<i>n</i> = 33)	39.22% (<i>n</i> = 20)

TABLE 10 (continued)

	Overall (<i>n</i> = 427)	Family Medicine (<i>n</i> = 141)	Internal Medicine (<i>n</i> = 129)	Psychiatry (<i>n</i> = 97)	Neurology (<i>n</i> = 51)
Serving as an expert witness	15.93% (<i>n</i> = 68)	19.15% (<i>n</i> = 27)	10.08% (<i>n</i> = 13)	23.71% (<i>n</i> = 23)	9.80% (<i>n</i> = 5)
Other	0.70% (<i>n</i> = 3)	0.71% (<i>n</i> = 1)	0% (<i>n</i> = 0)	0% (<i>n</i> = 0)	3.92% (<i>n</i> = 2)

Note: “Other” includes evaluations for social service access and evaluating/documenting disease progression.

Relationship Between Awareness, Understanding, and Perceived Benefits and Intention to Refer

In order to understand how awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients relate to probable referral practices, Spearman rank order coefficients were first calculated to assess the strengths of the relationships between these variables. For the correlational analysis, original Likert scale categories were maintained (strongly agree, agree, disagree, and strongly disagree). As Table 11 demonstrates, intention to refer was positively and significantly correlated with awareness, understanding, and perceived benefits. Relationships with awareness and understanding were of medium strength, while a large correlation was observed with perceived benefits.

TABLE 11
CORRELATIONS WITH INTENTION TO REFER

	<i>n</i>	<i>r_s</i>
Awareness of local neuropsychological services	421	.45**
Understanding the nature of neuropsychological services	419	.42**
Perceiving neuropsychology as a service that can benefit patients	421	.70**

Note: ** = Significant at $p < .001$.

Next, binary logistic regression was used to determine the impact of these factors on intention to refer. Contingency tables were created beforehand to examine expected and observed frequencies and determine the appropriateness of each variable for inclusion in the regression analysis. Due to low cell counts, perceived benefits could not be included. This was not surprising, given the small number of residents who denied perceiving neuropsychology as a service that could benefit patients.

Hierarchical binary logistic regression was then utilized to build the most parsimonious model. Awareness was entered first due to its larger correlation with referral intentions, followed by understanding. Model fit improved significantly by adding awareness as a predictor. Adding understanding as a second predictor further improved the model fit. Including an interaction term did not benefit the model. Using the model that contained only main effects, both awareness and understanding emerged as statistically significant predictors of referral intentions (see Table 12). For residents who endorsed being aware of local neuropsychological services, the odds were 4.03 times higher that they would state that they intend to refer to neuropsychologists during independent practice, compared to residents who denied awareness of local neuropsychological services. Similarly, residents who reported understanding the nature of neuropsychological services had 2.67 higher odds of stating that they intend to refer, compared to residents who denied understanding neuropsychology.

TABLE 12

IMPACT OF AWARENESS AND UNDERSTANDING ON INTENTION TO REFER

Predictor	<i>b</i>	SE _{<i>b</i>}	95% CI _{<i>b</i>}	OR	95% CI _{OR}
Awareness	1.39**	0.39	0.62-2.45	4.03	1.86-8.72
Understanding	0.98*	0.36	0.34-1.80	2.67	1.33-5.37
Constant	0.93**	0.18	0.58-1.31	2.53	

Note: $n = 417$. * = Significant at $p < .01$. ** = Significant at $p < .001$. Significance values determined after controlling for the false discovery rate using the Benjamini-Hochberg procedure.

Diagnostic statistics were inspected for violation of assumptions and signs of bias in the model. Collinearity diagnostics (tolerance and variance inflation factor, or VIF) were not indicative of multicollinearity. Measures of influence (leverage, Cook's distance, and difference in beta value, or DFBeta) did not show that any cases were exerting undue influence over model parameters. In other words, the regression model was stable across the sample; it was not biased by any influential cases. Standardized residuals, on the other hand, were suggestive of 10 potential outliers. In 7 of the cases, residents indicated that they were aware of local neuropsychological services and understood the nature of neuropsychological services but were unlikely to utilize neuropsychological services when they practice independently. In 3 cases, residents endorsed awareness, denied understanding, and denied intending to refer. These 10 cases were outliers because all other participants who selected those combinations of awareness and understanding reported that they were likely to make referrals in the future. As these cases represent realistic potential combinations of resident opinions and experiences, there was not sufficient justification to remove these participants from the model. Further, as measures of influence demonstrate, these cases did not have a large effect on the regression analysis. These participants' responses were consequently retained.

Timing of Exposure to Neuropsychology

To determine which types of exposure to neuropsychology, at what times, most strongly influence referral intentions, two binary logistic regression analyses were conducted. The first focused on timing of exposure. Contingency tables created prior to the analysis revealed that all time points could be appropriately included. Again, variables were entered hierarchically in order to build the most parsimonious model. The time points were entered from most to least recent, on the grounds that exposure to neuropsychology later during medical training would be expected to be more likely to be remembered and be more similar (and therefore more relevant) to the interactions residents would have with the field during independent practice. For these reasons, exposure during residency was expected to have the strongest impact on referral intentions, followed by exposure during medical school, then exposure prior to medical school.

Model fit improved significantly by adding exposure to neuropsychology during residency as a predictor. Exposure during medical school and prior to medical school, on the other hand, did not improve model fit, nor did interactions between the time points. When considering the model that included exposure during residency only, exposure during residency was a statistically significant predictor of referral intentions (see Table 13). Participants who were exposed to neuropsychology during residency had 4.29 times higher odds of stating that they intend to utilize neuropsychological services during independent practice than residents who did not receive exposure to neuropsychology during residency. Because the model only contained one dichotomous predictor, one can also easily make statements about predicted probabilities at different levels of the predictor. Examination of predicted probabilities showed that residents who were not exposed to neuropsychology during residency had a 69.79%

probability of stating that they intend to refer. When residents received exposure to neuropsychology during residency, the probability of intending to refer increased to 90.83%.

TABLE 13
IMPACT OF TIMING OF EXPOSURE ON INTENTION TO REFER

Predictor	<i>b</i>	SE _{<i>b</i>}	95% CI _{<i>b</i>}	OR	95% CI _{OR}
Residency	1.46**	0.29	0.84-2.02	4.29	2.41-7.62
Constant	0.84**	0.22	0.41-1.31	2.31	

Note: *n* = 423. ** = Significant at *p* < .001.

Diagnostic statistics were not concerning for multicollinearity or influential cases. Standardized residuals were suggestive of 30 possible outliers. In all of these cases, residents were exposed to neuropsychology during residency but denied intending to make referrals during independent practice. All other participants who received exposure to neuropsychology during residency endorsed intending to refer. Given that it is possible for a resident to have exposure to neuropsychology and nonetheless feel disinclined to refer to neuropsychologists in the future, there was not sufficient justification to remove these cases from the model. Moreover, these cases did not have a large effect on the regression analysis, as demonstrated by measures of influence. These residents' responses were consequently retained.

Types of Exposure During Residency

In order to understand which types of exposure during residency most strongly impact referral intentions, another binary logistic regression analysis was conducted. Again, contingency tables were examined beforehand to determine the appropriateness of each variable for inclusion in the analysis. Due to low cell counts, clinical rotations or other clinical experiences in which shadowing of a neuropsychologist occurred could not be included. Separate analyses by specialty also could not be conducted. The regression model was therefore created using data from the overall sample.

In building the model, variables were entered hierarchically on theoretical grounds. Since research in the field of psychiatry suggests that hands-on, practical types of exposure more effectively influence attitudes than theoretical, purely academic types of exposure, types of exposure were entered from most hands-on to least hands-on. Depth of exposure was also considered; for example, multiple lectures, seminars, or other didactic teaching would be expected to have a greater impact than a single lecture, seminar, or other didactic teaching. Variables were consequently entered in the following order: 1) writing orders/consultations for neuropsychological evaluations (“writing orders”), 2) clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized (“rotations with orders”), 3) multiple lectures, seminars or other didactic teaching (“multiple didactics”), 4) a single lecture, seminar or other didactic teaching (“a single didactic”), and 5) reading of medical literature (“reading”). Writing orders, rotations with orders, and multiple didactics each significantly improved model fit. In contrast, neither a single didactic nor reading improved model fit. The final regression model therefore included only writing orders, rotations with orders, and multiple didactics.

When the model was run with writing orders, rotations with orders, and multiple didactics entered simultaneously, only multiple didactics and rotations with orders emerged as statistically significant predictors of referral intentions (see Table 14). For residents who were exposed to neuropsychology during residency via multiple lectures, seminars, or other didactic teaching, the odds of stating that they intend to refer to neuropsychologists during independent practice were 3.25 times higher, compared to residents who did not have multiple didactics exposing them to neuropsychology. Similarly, residents who participated in clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized during

residency had 3.15 times higher odds of stating that they intend to refer than residents without such experience.

TABLE 14

IMPACT OF TYPE OF EXPOSURE DURING RESIDENCY ON INTENTION TO REFER

Predictor	<i>b</i>	SE _{<i>b</i>}	95% CI _{<i>b</i>}	OR	95% CI _{OR}
Multiple didactics	1.18 [†]	0.42	0.37-2.49	3.25	1.42-7.45
Rotations with orders	1.15 [†]	0.43	0.42-2.17	3.15	1.37-7.24
Writing orders	0.72	0.39	0.03-1.64	2.05	0.96-4.41
Constant	1.15**	0.18	0.82-1.54	3.14	

Note: *n* = 423. [†] = Significant at *p* = .01 after applying the Benjamini-Hochberg procedure.

** = Significant at *p* < .001.

Writing orders was not a significant predictor of referral intentions (*p* = .06). The fact that the confidence interval of the odds ratio for writing orders includes 1 further supports the non-significance of this variable, as 1 is the threshold at which the direction of the effect changes. An odds ratio greater than 1 would indicate that residents who have experience with writing orders have higher odds of endorsing intending to refer, while an odds ratio less than 1 would indicate that residents who have written orders have lower odds of intending to refer. Since the confidence interval for the odds ratio includes values both less than and greater than 1, it cannot be confidently stated whether experience with writing orders increases or decreases the odds of intending to refer.

Diagnostic statistics were not indicative of multicollinearity or influential cases. Standardized residuals were suggestive of 13 potential outliers. In each of these cases, the resident denied intending to refer, despite having received exposure to neuropsychology during residency via multiple didactics, rotations with orders, and/or writing orders. Since having exposure to neuropsychology does not guarantee that residents will want to utilize neuropsychological services in the future, these cases were considered to represent realistic

combinations of resident opinions and experiences. Additionally, measures of influence demonstrated that these cases did not have a large effect on the regression analysis. These residents' responses were consequently retained.

Differences in Exposure During Residency According to Specialty

After the regression analysis, follow-up chi-square tests for independence were conducted to explore differences by specialty in exposure to neuropsychology during residency via multiple didactics and rotations with orders. There was a statistically significant, medium-sized association between specialty and multiple lectures, seminars, or other didactic teaching, $\chi^2(3, n = 418) = 69.46, p < .001$, Cramer's $V = .41$. Pairwise comparisons with a Bonferroni correction showed that significantly more psychiatry and neurology residents (58.76% and 47.06%, respectively) received exposure to neuropsychology during residency via multiple didactics than internal medicine residents (9.30%; $p < .001$). Psychiatry residents also received exposure through multiple didactics more often than family medicine residents (58.76% compared to 27.66%; $p < .001$). Family medicine residents, in turn, were exposed to neuropsychology via multiple didactics more frequently than internal medicine residents (27.66% compared to 9.30%; $p < .001$). No other statistically significant differences between specialties were observed.

A statistically significant, medium-sized association was also found between specialty and clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized, $\chi^2(3, n = 418) = 46.16, p < .001$, Cramer's $V = .33$. After applying a Bonferroni correction, significantly more psychiatry and neurology residents (56.70% and 41.18%, respectively) participated in rotations with orders during residency than internal medicine residents (17.83%; $p < .001$ for psychiatry and $p = .002$ for neurology). Psychiatry

residents also participated in rotations with orders more often than family medicine residents (56.70% compared to 23.40%; $p < .001$). There were no other statistically significant differences between specialties.

Benefits to Patients of Neuropsychological Services

About half of residents (46.37%) offered at least one benefit of neuropsychological services. Themes regarding perceived benefits are presented in Table 15, with each theme's codes listed in the subsequent tables.

TABLE 15

THEMES FOR BENEFITS TO PATIENTS OF NEUROPSYCHOLOGICAL SERVICES

Theme	Theme Frequency ($n = 198$)
Diagnostics	55.56% ($n = 110$)
Patient Care	50.00% ($n = 99$)
Neuropsychology as a Specialty	16.16% ($n = 32$)
Nonspecific	11.11% ($n = 22$)
Unsure	5.05% ($n = 10$)
Confidence	1.52% ($n = 3$)

Diagnostics. The most common theme revolved around diagnostics (55.56% of residents who responded to the benefits question; Table 16).

TABLE 16

BENEFITS THEME: DIAGNOSTICS

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Diagnosis	Assists in establishing a diagnosis; provides diagnostic clarity	To differentiate psychological vs. neurological disorders I see them as useful for clarifying whether a patient is demented... and what is the type/etiology	43.43% (<i>n</i> = 86)
Functioning	Helpful for understanding and documenting neuropsychological strengths and weaknesses	Better understanding a patient's cognitive abilities and their deficits Recognizing areas of impairment [and] functional limitations	14.65% (<i>n</i> = 29)
Prognosis	Assists in understanding the likely outcome or course of a disease	Being able to realistically understand the potential and limitations for recovery Helping families understand prognosis/limitations of treatment	4.04% (<i>n</i> = 8)
Tracking cognition	Can compare cognitive abilities across time and monitor disease progression	Able to... track patient progress It can [be helpful to] see how unclear neurodegenerative processes progress Follow changes over time with repeated testing	4.04% (<i>n</i> = 8)

TABLE 16 (continued)

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Capacity	Helps the resident understand the patient's decision-making capabilities	They help me to understand a patient's... capacity to make decisions, which helps us provide better care because we know whether that patient can decide something for themselves or if we should be more paternal / get help with decisions from a surrogate decision maker	3.03% (<i>n</i> = 6)
Barriers	Can identify issues interfering with healthcare	This can help determine any barriers that could be playing a major role in their healthcare All medical treatments are useless if the patient is cognitively unable to participate (taking pills, going to follow up, performing tests, self-care)	2.02% (<i>n</i> = 4)
Second opinion	Gives patients and their loved ones another opinion	Provides them another opinion Provides a second expert opinion	1.01% (<i>n</i> = 2)

Gaining diagnostic clarity was the most popular benefit both within this theme and within the category of perceived benefits as a whole, cited by 43.43% of participants. Among residents who reported diagnostic clarity as a benefit, several specifically mentioned neuropsychologists' ability to distinguish between neurological and psychiatric disorders. This type of differential diagnosis appears to be particularly valued.

Residents also indicated that neuropsychological services are beneficial because they assist in identifying patients' current level of functioning (14.65%). As one resident noted,

neuropsychological services aid in “better understanding a patient’s cognitive abilities and their deficits.” Through neuropsychological assessment, physicians, patients, and their loved ones gain knowledge about patients’ strengths and weaknesses, areas of impairment, and functional limitations.

Less commonly reported benefits within the diagnostics theme included understanding prognosis (e.g., “the potential and limitations for recovery;” 4.04%). Some residents (4.04%) also cited the value of tracking cognitive change over time through serial assessment. For example, they noted that comparisons in test scores can be helpful to “see how unclear neurodegenerative processes progress.” Other residents (3.03%) endorsed determining capacity/competency for decision-making as a benefit, as this can inform whether the patient or another party would be the most appropriate individual to make decisions on topics such as the patient’s finances or medical care. Identifying barriers to participation in healthcare was another benefit (2.02%). As one resident explained, “All medical treatments are useless if the patient is cognitively unable to participate (taking pills, going to follow up, performing tests, self-care).” A final benefit under the diagnostics theme was offering patients and their loved ones a second opinion (1.01%).

Patient Care. A second thematic cluster centered on patient care (50.00%; Table 17). Approximately one third of residents (31.82%) reported that neuropsychological evaluations inform their treatment planning. In many cases, they explicitly expressed appreciation for the treatment recommendations that neuropsychologists provide. For example, one resident stated, “Their input can help guide treatment and make it easier to evaluate what services a patient will need for discharge.”

TABLE 17

BENEFITS THEME: PATIENT CARE

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Informs treatment	Guides treatment planning; provides useful recommendations	<p>Their input can help guide treatment and make it easier to evaluate what services a patient will need for discharge</p> <p>To provide... recommendations for patients who have specific neuropsychological pathology</p>	31.82% (<i>n</i> = 63)
Therapeutic benefits	Provides intangible benefits such as psychoeducation, reassurance, and acceptance	<p>Reassure or educate patient/family</p> <p>Help patients to accept their current stage [of] function[ing]</p> <p>Helping patients feel more comfortable with diagnoses and treatment</p> <p>Bringing closure to patient, family, and friends</p>	10.61% (<i>n</i> = 21)
Holistic	Part of providing full-spectrum, interdisciplinary care	<p>Neuropsychologists are potentially an important member of the treatment team in a family medicine setting. They would lend a wealth of knowledge and education that would tremendously benefit... the other members of a multidisciplinary team</p> <p>An additional team member for the broad scope of patient care</p>	7.07% (<i>n</i> = 14)

TABLE 17 (continued)

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Supports	Assists patients with accessing relevant community resources or accommodations	Point out areas where... services could be obtained for patient due to diagnosis Disability approval Services may also help [with] finding accommodating job opportunities	5.56% (<i>n</i> = 11)
Quality of life	Can improve quality of life and decrease suffering	Services may also help improve their quality of life Improve life of patients to decrease suffering and disease	3.54% (<i>n</i> = 7)

Another commonly described benefit involved the intangible therapeutic benefits that neuropsychological services offer to patients and their families (10.61%). Specifically, residents mentioned that patients and their families value receiving psychoeducation, emotional support, and reassurance; obtaining a better understanding of patients' diagnoses, strengths, and limitations; being provided with answers; and getting closure. It was additionally noted that neuropsychological services can help patients to accept and feel more comfortable with their current level of functioning, diagnosis, and treatment.

Further, 7.07% of respondents reported that neuropsychological services are a key component of holistic, full-spectrum care. As one resident noted, neuropsychologists' specialized knowledge is useful not only for patients and their families, but for the entire multidisciplinary treatment team. A few residents (5.56%) mentioned that neuropsychological services—

particularly the documentation of diagnoses and deficits—can assist patients in accessing helpful community supports, such as school or work accommodations or disability. Other residents (3.54%) expressed that neuropsychological services can improve patients’ quality of life and decrease suffering.

Neuropsychology as a Specialty. Residents also seemed to appreciate neuropsychology as a specialty area (16.16% of respondents; Table 18).

TABLE 18

BENEFITS THEME: NEUROPSYCHOLOGY AS A SPECIALTY

Code	Code Definition	Sample Responses	Code Frequency (n = 198)
Expertise	Neuropsychologists have specialized knowledge about cognition and conditions that impact cognition	Like any subspecialty, it provides expert consultation when diagnoses or treatment plans are not clear Offer[s] more specialized services for conditions that primary care has little training on treating	9.09% (n = 18)
Comprehensive	Neuropsychologists can complete more thorough evaluations than other providers	More in-depth assessment of patient needs Having more time than physicians to do exhaustive diagnostic testing	6.57% (n = 13)
Objective	Neuropsychological testing provides objective information about cognition	More accurate than clinical judgment Provides more objective data	2.02% (n = 4)

One benefit in this category involved neuropsychologists’ expertise in cognition and conditions that impact cognition (9.09%). As one resident indicated, neuropsychologists “offer more specialized services for conditions that primary care has little training on treating.” Another

noted, “Like any subspecialty, [neuropsychology] provides expert consultation when diagnoses or treatment plans are not clear.”

Residents also cited neuropsychologists’ ability to conduct in-depth, comprehensive evaluations (6.57%). One participant pointed out, neuropsychologists “[have] more time than physicians to do exhaustive diagnostic testing.” Another resident eloquently summarized both of the aforementioned benefits as follows: “Cognitive disorders require dedicated time and expertise to accurately diagnose.”

The objective nature of neuropsychological evaluations was identified as a benefit as well (2.02%). For example, one participant reported that neuropsychological testing is “more accurate than clinical judgment.”

Nonspecific. Approximately 11% of residents offered nonspecific benefits of neuropsychological services (Table 19). For example, they stated that neuropsychological services are helpful for certain patient populations and disorders, but they did not explicitly describe the ways in which those services are helpful (e.g., “they can help with neurological issues such as but not limited to dementia”).

TABLE 19

BENEFITS THEME: NONSPECIFIC

Code	Code Definition	Sample Responses	Code Frequency (n = 198)
Nonspecific	Resident’s response references benefits but does not provide specifics	They can help with neurological issues such as but not limited to dementia Dementia patients, patients with substance abuse, patients with placement issues would all benefit from neuropsych services	11.11% (n = 22)

Unsure. A small subset of residents (5.05%) expressed that they were unable to identify any benefits due to lack of knowledge about neuropsychology (Table 20). One resident responded, “[I] don’t have enough of an understanding about [neuropsychology] as to determine the benefit to patients.”

TABLE 20

BENEFITS THEME: UNSURE

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Unsure	Resident is not able to identify benefits due to lack of knowledge about neuropsychology	Unsure due to lack of understanding of the field Don't have enough of an understanding about it as to determine the benefit to patients	5.05% (<i>n</i> = 10)

Confidence. While not directly a benefit to patients, 1.52% of residents remarked that soliciting the services of a neuropsychologist increased their confidence in their own medical decision-making (Table 21). They were reassured that they had conducted a thorough workup and were providing the correct treatment, and they gained “peace of mind... by conclusively settling concerns regarding cognitive functioning.”

TABLE 21

BENEFITS THEME: CONFIDENCE

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 198)
Confidence	Increases provider confidence in diagnosis and treatment planning	The time that I referred a patient for full cognitive eval, I felt that the recommendations gave me the confidence that I was not missing anything in the workup and connecting the patient with all of the right resources to work on cognitive abilities Get ‘peace of mind’ (for... providers) by conclusively settling concerns regarding cognitive functioning	1.52% (<i>n</i> = 3)

Barriers to Making Referrals

Over half of residents (56.21%) provided at least one barrier to making referrals. Table 22 contains the themes regarding perceived barriers, with each theme’s codes presented in the subsequent tables.

TABLE 22

THEMES FOR BARRIERS TO MAKING REFERRALS

Theme	Frequency (<i>n</i> = 240)
Logistics	70.00% (<i>n</i> = 168)
Education-Related	40.42% (<i>n</i> = 97)
Patient Characteristics	7.08% (<i>n</i> = 17)

TABLE 22 (continued)

Theme	Frequency (<i>n</i> = 240)
Resident Negativity Toward Neuropsychology	5.00% (<i>n</i> = 12)

Logistics. The most popular theme revolved around logistical difficulties (70.00% of residents who responded to the barriers question; Table 23).

TABLE 23

BARRIERS THEME: LOGISTICS

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 240)
Availability	Not enough (or no) providers of neuropsychological services in the area; no access to neuropsychological services	Limited number of neuropsychologists in my area Not typically available in an inpatient setting	50.00% (<i>n</i> = 120)
Cost	Neuropsychological testing is too expensive, and/or insurance will not cover it	Cost of testing It is difficult to have insurance pay for it at times and burden falls on patient	23.33% (<i>n</i> = 56)
Wait time	Long length of time between referral and appointment	Outpatient appointments take months to get in Access to provider in a timely manner	14.58% (<i>n</i> = 35)

TABLE 23 (continued)

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 240)
Time commitment	Testing requires patients to be available for a large chunk of time	Need for patient to allocate 2-4 hours for neuropsych testing Time constraints; sometimes family does not want to take a patient outside the house for a 6 hour testing as the patient becomes disruptive	3.33% (<i>n</i> = 8)
Language	It can be challenging to find a neuro-psychologist who speaks the same language as the patient	Language barriers Currently only 1 neuropsychologist at the hospital I work in who is English-speaking only	1.25% (<i>n</i> = 3)
Timing	Ordering neuropsychological testing would not be helpful at the time	Timing of testing - acute psychiatric or medical illness that could influence results rather than being more stable Patients present at an advance stage of their memory issues and... the testing will not aid treatment due to the already advanced stage	1.25% (<i>n</i> = 3)
Travel	It is difficult for patients to travel for appointments, and/or distance from providers of neuropsychological services is a concern	Many of my patients are unable to travel outside their local town I plan to work in a rural area, and... travel will be a major hurdle for my future patients	1.25% (<i>n</i> = 3)

Most commonly, residents reported that neuropsychological services are simply not available to them (50.00%). The majority of residents describing such barriers indicated that there are too few or no neuropsychologists in their area, which presents difficulties with reliably

accessing providers. Others expressed that neuropsychologists do not conduct evaluations in the residents' work setting (e.g., in an inpatient context) or at convenient times (e.g., on weekends).

An additional barrier centered around the perceived cost of neuropsychological services (23.33%). Residents stated that insurance does not always cover neuropsychological testing and that without insurance coverage, it is simply too expensive. One participant explained, "It is difficult to have insurance pay for it at times and [the] burden falls on [the patient]."

Wait time emerged as another common barrier (14.58%). Residents expressed that it can take a long time for patients to be seen by neuropsychologists. One such resident reported, "Outpatient appointments take months to get in." Due to the long wait time between referrals and appointments, referral questions may not be answered "in a timely manner."

Less frequently reported barriers within the logistics theme included the requirement that patients be available for a substantial amount of time for testing (3.33%). As one resident explained, "Sometimes family does not want to take a patient outside the house for a 6 hour testing as the patient becomes disruptive." Other residents (1.25%) cited language mismatches between patients and providers, noting, for example, "[There is] currently only one neuropsychologist at the hospital I work in who is English-speaking only." Some residents (1.25%) also expressed feeling like neuropsychological testing would not be useful at the time. One participant wrote, "Patients present at an advance[d] stage of their memory issues and... the testing will not aid treatment due to the already advanced stage." Another barrier involved the distance patients might need to travel to access neuropsychological services (1.25%). For example, one resident stated, "Many of my patients are unable to travel outside their local town."

Education-Related. A second theme involved barriers related to limited education and training about neuropsychological services (40.42%; Table 24).

TABLE 24

BARRIERS THEME: EDUCATION-RELATED

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 240)
Knowledge	Lack of understanding about neuro- psychology, including about the nature of neuropsychological services, their benefits, and when or how to refer	Not fully understanding what a neuropsychologist does and what their scope of practice is;	34.17% (<i>n</i> = 82)
		Not knowing the extent to which they can benefit patient care	
		Not being familiar with when to consult	
Awareness	Lack of awareness of local neuro- psychologists or of being able to consult neuropsychology	Not knowing location or physicians to refer to	12.08% (<i>n</i> = 29)
		Not aware of being able to consult this service	

Residents commonly characterized lack of knowledge about the field as a hindrance to making referrals (34.17%). They indicated that they do not understand what neuropsychologists do, when neuropsychological services can be helpful, or how make a referral. One resident simply responded, “I do not know enough about it.”

Some residents (12.08%) also described a barrier related to awareness of local neuropsychological services. These residents reported not knowing who provides neuropsychological services in their area (“not knowing location or physicians to refer to”) and/or not being aware that they are able to consult neuropsychologists. Since each of these barriers could be rectified by more thorough education about neuropsychology and the presence

of neuropsychological services locally, they were grouped together under an education-related theme.

Patient Characteristics. A third thematic cluster centered on patient characteristics (7.08%; Table 25).

TABLE 25

BARRIERS THEME: PATIENT CHARACTERISTICS

Code	Code Definition	Sample Responses	Code Frequency (n = 240)
Patient willingness	Patients may not be willing to participate in testing	Willingness of patients to participate Patients often decline	2.92% (n = 7)
Patient stigma	Patients may have negative beliefs about neuropsychology or psychology in general	Patient stigma against testing Taboo in society	2.08% (n = 5)
Patient inability	Patients may not be capable of completing testing	Patient... ability to cooperate with testing Their neurocognitive deficits may preclude adequate testing	1.67% (n = 4)
Nonattendance	Patients may not attend their appointments	Patients actually going to appointments (self-driven vs. brought by caregivers) As outpatient, patients often miss appointments	1.25% (n = 3)

Residents indicated that sometimes patients are not willing to participate in the assessment process (2.92%) or hold stigma related to neuropsychology or psychology in general (e.g., “patient stigma against testing;” 2.08%). Other residents noted that patients may not be

capable of completing neuropsychological evaluations (1.67%). For example, one participant stated that “[patients’] neurocognitive deficits may preclude adequate testing.” A few residents (1.25%) reported that some patients simply do not attend their scheduled appointments (e.g., “as outpatient, patients often miss appointments”).

Resident Negativity Toward Neuropsychology. In some instances, residents’ own negativity toward neuropsychology appeared to be a barrier (5.00%; Table 26).

TABLE 26

BARRIERS THEME: RESIDENT NEGATIVITY TOWARD NEUROPSYCHOLOGY

Code	Code Definition	Sample Responses	Code Frequency (n = 240)
Unhelpful	Resident does not believe that neuropsychological evaluations are helpful	Currently, the evaluations are not very helpful	1.67% (n = 4)
		Often inconclusive results that don't help me the way I was anticipating when ordering the test	
Quality	Resident expresses negative views about the quality or competence of local neuropsychologists	Quality of local providers	0.83% (n = 2)
		Inability of neuropsychologist to determine temporary delirium states when determining capacity	
Rejection	Resident has previously been told that their referral was inappropriate	Having consult rejected When I have ordered the consult while inpatient, neuropsychiatry has often told me a reason that a neuropsych consult or test is not appropriate for my patient, so I don't consult them as much in general	0.83% (n = 2)

TABLE 26 (continued)

Code	Code Definition	Sample Responses	Code Frequency (<i>n</i> = 240)
Negative beliefs	Negative experiences or views about neuropsychology that do not fit into the other categories	Results are lengthy, often discouraged to read them Excessive use of diagnosis and psych medications	2.08% (<i>n</i> = 5)

A few participants (1.67%) indicated that neuropsychological services have not been helpful in the past. One such resident reported receiving “often inconclusive results that don’t help me the way I was anticipating when ordering the test.” Other residents (0.83%) expressed disdain for the quality of local providers. As an example, a respondent cited “inability of [the] neuropsychologist to determine temporary delirium states when determining capacity” as a barrier.

Two residents (0.83%) stated that they have become discouraged by previously being told that their referrals were not appropriate. One of them explained, “When I have ordered the consult while inpatient, neuropsychiatry has often told me a reason that a neuropsych consult or test is not appropriate, so I don’t consult them as much in general.” The other resident reported that their past consults have been “rejected,” which carries a substantial negative connotation.

CHAPTER IV

DISCUSSION

Overview of Key Findings

The primary goal of this study was to explore factors that impact medical residents' intention to refer to neuropsychologists during independent practice. One valuable finding is that awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients were all positively correlated with probable referral practices. Perceived benefits could not be included in a follow-up regression analysis due to low cell counts caused by being positively skewed. However, both awareness and understanding predicted referral intentions. Exposure to neuropsychology during residency also influenced referral intentions. The most impactful types of exposure during residency were multiple lectures, seminars, or other didactic teaching and clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized.

Additional noteworthy findings include residents' overwhelmingly positive attitudes toward neuropsychology. The vast majority of residents agreed that neuropsychology is a service that could benefit their patients, and most residents reported having positive overall impressions of the field. The results regarding referral intentions are equally promising: the majority of residents reported that they are likely to consult or order neuropsychological services during independent practice.

Several differences were observed according to specialty. Compared to residents in primary care programs, psychiatry and neurology residents endorsed greater awareness and understanding surrounding neuropsychological services. Psychiatry and neurology residents

were also more often exposed to neuropsychology during residency, and they more frequently received the most impactful types of exposure. Finally, psychiatry residents endorsed intending to refer more often than internal medicine residents.

The most commonly reported benefits to patients of neuropsychological services revolved around diagnostics, particularly gaining diagnostic clarity and identifying patients' current level of functioning. Patient care was another popular theme, with residents frequently citing the influence of neuropsychological services on treatment planning and the intangible therapeutic benefits that patients and their families receive. Residents also seemed to appreciate neuropsychology as a specialty area. They reported valuing neuropsychologists' unique expertise regarding cognition and their ability to conduct comprehensive evaluations.

Primary barriers to making referrals included logistical difficulties, such as limited availability of neuropsychological services, cost, and wait time. Residents also described problems related to limited education and training about neuropsychology. Specifically, they reported lack of knowledge about the field and lack of awareness of local neuropsychological services as obstacles to making referrals.

Awareness, Understanding, and Perceived Benefits

Awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients were all positively correlated with probable referral practices. In other words, greater awareness, understanding, and perceived benefits were associated with an increased likelihood of intending to refer. These correlational findings are consistent with expectations based on the Integrated Behavioral Model. Under the Integrated Behavioral Model, both experiential and instrumental attitudes play a key role in determining behavioral intention, so it is unsurprising

that perceiving neuropsychology as a service that can benefit patients—a positive instrumental belief about the outcome of making referrals—boasted a strong correlation with intention to refer. Correlations were also expected with awareness and understanding surrounding neuropsychological services, through their hypothesized roles as factors that influence personal agency. After all, if residents are unaware of neuropsychological services in their area, their perceived control and self-efficacy regarding making referrals would be expected to be low. Similarly, if they do not understand the nature of neuropsychological services, they would likely not feel efficacious when it comes to making referrals and identifying situations when it would be useful to do so.

The current results are also consistent with research about factors that affect physicians' decisions to refer their patients for specialty mental health care. This research shows that physicians are more likely to refer if they understand the approach that the mental health providers will use with their patients and less likely to refer if they do not understand the scope or utility of available services (Connors et al., 2017; Kainz, 2002). In other words, physicians' referral decisions are impacted by how well they understand mental health services (analogous to understanding the nature of neuropsychological services). Believing that mental health services can effectively address patients' concerns, analogous to perceived benefits, has also been identified as a key facilitating factor (Alvidrez & Areán, 2002; Kainz, 2002). The finding that lack of local mental health resources is a barrier to making referrals (Connors et al., 2017; Heneghan et al., 2008; Walders et al., 2003) highlights the importance of being aware of the services that are available (analogous to awareness of local neuropsychological providers).

Based on the Integrated Behavioral Model and research in the mental health field, awareness, understanding, and perceived benefits surrounding neuropsychological services were

all expected to demonstrate positive correlations with probable referral practices. It is worthwhile to note, however, that the correlation between referral intentions and perceived benefits ($r_s = .70$) was quite a bit larger than the correlations with awareness and understanding ($r_s = .45$ and $r_s = .42$, respectively). The reason for this finding is unclear, based on the existing research, but it seems logical. If a given service is not expected to benefit patients, there is no reason for medical providers to order that service; in fact, ordering a service that poses costs to patients (e.g., payment, time commitment) without benefits might violate physicians' commitment to do no harm. Thus, it might be the case that perceiving benefits to patients of neuropsychological services is a prerequisite for intending to refer.

Given the significant relationship between perceived benefits and referral intentions, it is unfortunate that perceived benefits could not be included in the follow-up binary logistic regression focused on predicting intention to refer. The skewed nature of the responses (94.81% of residents agreed that neuropsychology can benefit their patients) resulted in low cell counts that rendered this variable inappropriate for inclusion. However, this is a very positive finding for the field of neuropsychology. When the analysis was run with just awareness and understanding, both variables significantly predicted referral intentions. Residents who endorsed being aware of local neuropsychological services had 4.03 times higher odds of stating that they intend to refer to neuropsychologists during independent practice, compared to residents who denied awareness of local neuropsychological services. Similarly, residents who reported understanding the nature of neuropsychological services had 2.67 times higher odds of stating that they intend to refer, compared to residents who denied understanding neuropsychology.

Comparisons of odds ratios (4.03 versus 2.67) indicates that awareness served as a stronger predictor of referral intentions than understanding. Prior research does not suggest an

explanation for this finding. Nonetheless, one might speculate that since lack of awareness of local neuropsychological services would constitute a significant environmental constraint under the Integrated Behavioral Model, it might have a more substantial impact on referral behavior than lacking knowledge about what neuropsychologists do. After all, a provider could theoretically make a referral without a strong understanding of neuropsychology; however, it is impossible to complete the referral process without knowing where to send the referral. For similar reasons, awareness would be expected to more strongly impact perceived control and self-efficacy regarding making referrals. If awareness exerts more influence on personal agency than understanding, it would be anticipated to have a larger effect on behavioral intention.

Type and Timing of Exposure to Neuropsychology

Regarding timing of exposure to neuropsychology, only exposure during residency significantly predicted referral intentions. Participants who were exposed to neuropsychology during residency had 4.29 times higher odds of stating that they intend to utilize neuropsychological services during independent practice than residents who did not receive exposure to neuropsychology during residency. Exposure during residency also increased the probability of intending to refer by 21.04% (from 69.79% to 90.83%). The finding that exposure to neuropsychology positively affects referral intentions is consistent with research in the mental health field, which suggests that past experiences with services and positive prior contact with providers facilitate physician referrals (Kainz, 2002; Kravitz et al., 2006). It is also consistent with research in psychiatry, which provides strong evidence for the positive impact of education and training on medical students' attitudes.

Among the types of exposure participants received during residency, the only significant predictors of referral intentions were multiple lectures, seminars, or other didactic teaching and

clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized. Residents who were exposed to neuropsychology during residency via multiple lectures, seminars, or other didactic teaching had 3.25 times higher odds of stating that they intend to refer to neuropsychologists during independent practice, compared to residents who did not have multiple didactics exposing them to neuropsychology. Similarly, residents who participated in clinical rotations or other clinical experiences during residency in which neuropsychological services were ordered or utilized had 3.15 times higher odds of stating that they intend to refer than residents without such experience.

These results regarding types of exposure are somewhat surprising, as research in the field of psychiatry suggests that types of exposure that provide direct, hands-on experience should more strongly influence referral intentions than theoretical, academic types of exposure. While clinical experiences involving neuropsychological services constitute direct, hands-on forms of exposure, didactic teaching is a theoretical, academic type of exposure. Moreover, writing orders for neuropsychological services—arguably the most hands-on form of exposure—did not significantly predict referral intentions. These findings indicate that the dichotomy of hands-on versus theoretical might not be the only relevant consideration. The impact of multiple didactics suggests that depth and/or frequency of exposure might also be influential factors. At first glance, this seems to contrast with research in psychiatry, which has shown positive impacts from very short (including single day; Mortlock et al., 2017), relatively superficial types of exposure. However, research in psychiatry has not compared the relative influence of various lengths and depths of exposure; perhaps if such a study were conducted there would be greater clarity. Regardless, current results suggest that deeper and/or more frequent exposure to

neuropsychology, potentially spanning a longer period of time, might be more important than the specific modality in which that exposure occurs.

Benefits to Patients of Neuropsychological Services

Three primary themes emerged. The most common theme, endorsed by over half of respondents (55.56%), centered on diagnostics. Residents most frequently mentioned benefiting from increased diagnostic clarity (43.43%), noting that neuropsychological testing is helpful for determining the most appropriate diagnosis. Residents also expressed appreciation for neuropsychologists' ability to identify patients' current level of functioning (14.65%), including strengths, weaknesses, and functional limitations.

The second major theme focused on patient care (50.00%). Many residents (31.82%) expressed that they find neuropsychological test results and the recommendations that neuropsychologists provide helpful in their treatment planning. Residents also cited the value of the intangible therapeutic benefits that neuropsychological services offer to patients and their families (10.61%), such as psychoeducation, emotional support, and closure. About seven percent (7.07%) of respondents identified the important contributions neuropsychologists can make on a multidisciplinary treatment team, such as sharing their specialized knowledge about brain functioning and cognition, while 5.56% of residents cited the utility of documenting diagnoses and deficits for helping patients access community supports, such as disability or school or work accommodations. A few residents (3.54%) noted that neuropsychological services can increase patients' quality of life and decrease suffering.

The third primary theme involved neuropsychology as a specialty area (16.16%). Residents expressed appreciation for neuropsychologists' expertise in cognition and conditions that impact cognition (9.09%), as these are areas in which other specialties often do not receive

much training. As a result, providers value being able to consult neuropsychologists when working with patients with cognitive concerns. Residents also noted that neuropsychologists can perform in-depth, comprehensive evaluations (6.57%), whereas most medical providers do not have the time to conduct such extensive testing. A final benefit within this theme was the objective nature of neuropsychological test data (2.02%), which was noted to be more accurate than clinical judgment.

These responses about benefits assist in understanding a puzzling quantitative finding: that while only half of residents (54.85%) reported understanding what neuropsychologists do, they endorsed overwhelmingly positive attitudes toward neuropsychology. Specifically, 94.81% of residents indicated that neuropsychology could benefit their patients, 83.14% endorsed positive impressions, and 86.05% reported intending to refer during independent practice. Perhaps the key to understanding these discrepancies lies in residents' awareness of the beneficial outcomes of neuropsychological services both for themselves (e.g., diagnostic clarity and guidance on treatment planning) and for their patients (e.g., intangible therapeutic benefits). Understanding the neuropsychological process might not be required in order to appreciate its results.

Residents' perceived benefits are consistent with the reasons physicians refer for neuropsychological evaluations. According to previous neuropsychology-focused research, the most common reasons for referral include gaining diagnostic clarity, establishing baseline or evaluating current cognitive functioning, informing discharge or treatment planning (including obtaining treatment recommendations), assessing competency or other legal-related concerns, and acquiring a second opinion (Bishop et al., 2003; Temple et al., 2006; Tremont et al., 2002).

In the current study, residents identified all of these activities as important benefits to patients of neuropsychological services.

Finally, it is important to note that these results emerged from an open-ended question in which participants were asked to identify benefits to patients of neuropsychological services. The fact that residents volunteered these benefits, as opposed to selected them on a provided list, suggests that they are truly valued.

Barriers to Making Referrals

The two primary themes consisted of logistical difficulties and barriers related to residents' education and training about neuropsychology. Seventy percent of respondents cited logistics as an obstacle to making referrals. Residents most often identified lack of access to neuropsychological services as the problem (50.00%), due to a limited number of neuropsychologists in their local area or neuropsychologists not conducting evaluations at convenient times or in residents' work setting. The cost of neuropsychological services (23.33%) was another commonly reported barrier; residents explained that testing is simply too expensive if insurance does not cover it. Residents also cited wait time for appointments as an issue (14.58%), noting that this can prevent referral questions from being answered in a timely fashion.

The other major theme was related to residents' limited education and training about neuropsychology (40.42%). Residents expressed that not understanding the nature of neuropsychological services, their benefits, or when or how to refer presents barriers to making referrals (34.17%). Residents also identified lack of awareness of local neuropsychological services as a problem (12.08%). After all, it is challenging to make referrals if residents do not know of anyone to whom they can refer.

These barriers are consistent with previous research in both neuropsychology and the mental health field. Past research has identified availability and accessibility of services as important (Kravitz et al., 2006; Temple et al., 2006); lack of local services and difficulties or delays in securing appointments have been found to be barriers to physician referrals (Connors et al., 2017; Heneghan et al., 2008; Kainz, 2002; Walders et al., 2003). Not understanding the scope of services or their utility (Connors et al., 2017; Kainz, 2002; Temple et al., 2006) and insurance-related problems (Connors et al., 2017; Kainz, 2002; Walders et al., 2003) have also been implicated as obstacles.

Reasons for Ordering Neuropsychological Services

When asked about reasons for ordering neuropsychological services, the most commonly endorsed activities, selected by the majority of residents, were establishing or confirming a neurocognitive diagnosis (84.07%), differentiating neurocognitive disorders from psychiatric disorders (74.71%), establishing baseline cognitive functioning (57.61%), and providing treatment recommendations (56.67%). These results are generally consistent with previous research in the field of neuropsychology about the most common reasons why medical providers make referrals. Previous research has identified gaining diagnostic clarity, establishing baseline or evaluating current cognitive functioning, and informing discharge or treatment planning (which includes obtaining treatment recommendations) as common referral questions (Bishop et al., 2003; Temple et al., 2006; Tremont et al., 2002). The current findings are also consistent with the benefits residents perceive of neuropsychological services. Gaining diagnostic clarity, understanding current functioning, and informing treatment planning were the most commonly reported benefits.

Activities less frequently endorsed by residents included documenting functional limitations (44.03%), determining capacity/competency for making decisions (43.33%), and serving as an expert witness (15.93%). These results contrast somewhat with past research in neuropsychology, as assessing competency or other legal-related concerns has been identified as a common reason for physician referrals (Bishop et al., 2003; Temple et al., 2006). There are at least two potential reasons why these activities were selected less often than the others in the current study. First, the less frequent selection of these activities might reflect lower awareness of neuropsychologists' ability to address these referral questions. Alternatively, these results might be a function of residents' demographic characteristics. For example, residents who are not in a hospital setting might not perceive questions of competency or capacity for decision-making as relevant to their day-to-day practice. Residents might have interpreted the question "For which activities would you consider ordering neuropsychological services?" literally and only selected activities they believed would be personally relevant, rather than selecting all possible reasons they are aware of for making referrals.

Implications

Awareness, Understanding, and Perceived Benefits. Awareness of local neuropsychological services, understanding the nature of neuropsychological services, and perceiving neuropsychology as a service that can benefit patients were all positively correlated with probable referral practices, such that greater awareness, understanding, and perceived benefits were associated with an increased likelihood of intending to refer. Hypothesis 1 was consequently supported. Because almost all residents (94.81%) endorsed believing that neuropsychological services could benefit their patients, perceived benefits could not be included in a follow-up binary logistic regression. However, this finding is notable in and of itself and is

highly encouraging for the field of neuropsychology. In the follow-up analysis, awareness and understanding both predicted referral intentions. For residents who endorsed being aware of local neuropsychological services, the odds of stating that they intend to refer were 4.03 times higher, while residents who reported understanding the nature of neuropsychological services had 2.67 times higher odds of stating that they intend to refer.

Given the impact of awareness and understanding on referral intentions, it is important to note that psychiatry and neurology residents were significantly more likely to endorse being aware of local neuropsychological services and understanding the nature of neuropsychological services than residents in primary care programs. This is consistent with past research conducted by Temple and colleagues (2006), in which primary care physicians more often cited lack of familiarity with neuropsychology as a barrier to making referrals than other specialties. These results highlight a particular need for neuropsychology educators to focus on teaching primary care residents about neuropsychology and the presence of neuropsychologists in their area. This is especially important in light of the fact that family medicine and internal medicine are larger specialties than psychiatry and neurology (Association of American Medical Colleges, 2021), and consequently constitute a larger potential referral base.

While psychiatry and neurology residents as a group were significantly more likely to endorse awareness and understanding, a sizeable minority of residents in these specialties (approximately 30%) denied awareness and understanding as well. Given that most psychiatry and neurology residents endorsed receiving some form of exposure to neuropsychology during their training (e.g., 96.91% and 90.20% during residency, respectively), this suggests that simply being exposed to neuropsychology is not sufficient. Instead, specific education targeted toward

the nature of neuropsychological services and the presence of local neuropsychologists is needed.

Type and Timing of Exposure to Neuropsychology. Regarding timing of exposure to neuropsychology, only exposure during residency significantly predicted referral intentions. Participants who were exposed to neuropsychology during residency had 4.29 times higher odds of stating that they intend to utilize neuropsychological services during independent practice. Notably, significantly more psychiatry and neurology residents endorsed receiving exposure during residency than residents in primary care programs. While more than 90% of psychiatry and neurology residents reported being exposed to neuropsychology during residency, only 73.05% of family medicine residents and 58.91% of internal medicine residents endorsed exposure during this timeframe. Since the current study found that exposure to neuropsychology had the strongest impact on referral intentions during residency, educators might usefully focus on increasing family medicine and internal medicine residents' exposure to neuropsychology during this stage of training. Again, this is particularly important given the fact that primary care constitutes a larger specialty area—and therefore a larger potential referral base—than the other disciplines.

Among the types of exposure participants received during residency, the only significant predictors of referral intentions were multiple lectures, seminars, or other didactic teaching and clinical rotations or other clinical experiences in which neuropsychological services were ordered or utilized. For participants who were exposed to neuropsychology during residency via multiple didactics, the odds of stating that they intend to refer were 3.25 times higher, while those who participated in rotations with orders had 3.15 times higher odds of stating that they intend to refer. As previously noted, research in the field of psychiatry suggests that types of

exposure that provide direct, hands-on experience should more strongly influence referral intentions than theoretical, academic types of exposure. While rotations with orders constitute direct, hands-on forms of exposure, didactic teaching is a theoretical, academic type of exposure. Further, while writing orders for neuropsychological services is arguably the most hands-on form of exposure, it did not significantly predict referral intentions. Consequently, Hypothesis 2 was partially supported. As explained earlier, these results indicate that the dichotomy of hands-on versus theoretical might not be the only relevant consideration; the impact of multiple didactics suggests that depth and/or frequency of exposure might be additional influential factors.

Given the impact of multiple didactics and rotations with orders on referral intentions, it is encouraging that these were the most frequently endorsed forms of exposure to neuropsychology during residency. However, they were selected by only 31.85% and 32.32% of residents, respectively. These relatively low percentages demonstrate room for improvement in the number of residents receiving these types of exposure. Importantly, significantly more psychiatry and neurology residents reported participating in multiple didactics or rotations with orders during residency than residents in primary care programs. This discrepancy suggests that it might be beneficial for neuropsychology educators to place particular emphasis on increasing these types of exposure among family medicine and internal medicine residents, especially since these specialties constitute a larger potential referral base.

Benefits to Patients of Neuropsychological Services. The three primary themes regarding benefits to patients of neuropsychological services centered on diagnostics (55.56%), patient care (50.00%), and neuropsychology as a specialty (16.16%). Within these categories, the most commonly reported benefits were gaining diagnostic clarity (43.43%), informing treatment

planning (31.82%), understanding current level of functioning (14.65%), and intangible therapeutic benefits (10.61%). Other benefits were endorsed by less than 10.00% of respondents.

Given that all of the aforementioned benefits are core components of neuropsychological practice, it is encouraging that residents recognize their value. Nonetheless, the relatively low percentages of endorsement suggest room for improvement in residents' awareness of these and other benefits. Neuropsychology educators might consequently make providing information about the benefits of neuropsychological services an area of focus. Along with reinforcing the currently recognized benefits, they might also teach residents about less commonly known benefits, with the goal of maximizing the number of reasons residents perceive for making referrals.

While these results suggest important areas of future educational emphasis, they also illuminate the aspects of neuropsychological services that residents currently identify as important. Such findings are significant because, as research in neuropsychology and the mental health field show, believing services will be helpful in addressing both patients' and providers' goals facilitates referrals (Alvidrez & Areán, 2002; Kainz, 2002; Temple et al., 2006). It is consequently useful to know how residents believe services can be beneficial, as this likely provides insight into their future goals for referrals. Thus, when interacting with medical providers in training, neuropsychologists might emphasize their skills in diagnosis, treatment planning, therapeutic interventions (e.g., psychoeducation), and evaluating current functioning. By highlighting their ability to provide services that residents value, neuropsychologists might increase the likelihood of future referrals.

Barriers to Making Referrals. The two primary themes regarding barriers to making referrals consisted of logistical difficulties (70.00%) and lack of education and training about

neuropsychology (40.42%). Within these categories, the most frequently reported barriers were limited availability of neuropsychological services (50.00%), lack of knowledge about the field of neuropsychology (34.17%), the cost of neuropsychological services (23.33%), wait time for appointments (14.58%), and lack of awareness of local neuropsychologists and/or of being able to consult them (12.08%). Other barriers were reported by less than 5.00% of participants.

These findings suggest several ways in which medical residents' education about neuropsychology can be tailored to reduce barriers to making referrals. Useful targets for training might include instructing residents about the field of neuropsychology, including what neuropsychologists do, when neuropsychological services are indicated, potential benefits, and the referral process. Another area of emphasis might be sharing information about local providers of neuropsychological services and residents' ability to consult them.

To address the high cost of neuropsychological services, neuropsychologists and neuropsychology advocates might consider lobbying for increased coverage by insurance. In doing so, they could cite the results of this study, which show that approximately 95% of future doctors believe that neuropsychological services could benefit their patients, and 86% state that they intend to refer, but they report that cost can be a barrier to doing so. Decreasing the length of assessment batteries could also reduce cost. This might reduce wait time for appointments as well; by reducing the time required to conduct neuropsychological evaluations, neuropsychologists might be able to see more patients.

Additionally, the results show that there is an unmet need for neuropsychological services. Limited availability of neuropsychologists and long wait times for appointments were commonly reported barriers. While the long-term solution to these problems might be training more neuropsychologists, especially ones willing to work in remote or rural areas, short-term

stopgaps might include disseminating a national list of neuropsychologists organized by geographic area and a list of neuropsychologists who are willing to travel, as suggested by Temple and colleagues (2006). Conducting services over telehealth and providing lists of neuropsychologists who offer telehealth services could also increase access and reduce wait time. Reducing barriers by implementing these strategies might increase the likelihood of future referrals.

Reasons for Ordering Neuropsychological Services. The most commonly endorsed reasons for ordering neuropsychological services, selected by the majority of participants, were establishing or confirming a neurocognitive diagnosis (84.07%), differentiating neurocognitive disorders from psychiatric disorders (74.71%), establishing baseline cognitive functioning (57.71%), and providing treatment recommendations (56.67%). Less frequently endorsed activities included documenting functional limitations (44.03%), determining capacity/competency for making decisions (43.33%), and serving as an expert witness (15.93%). Neuropsychology educators might emphasize how neuropsychologists can be helpful in these less commonly endorsed situations. Increasing residents' awareness of the diverse array of questions neuropsychologists can answer might increase their likelihood of making referrals for those purposes in the future.

Limitations

A few factors might limit the generalizability of this study's results, some of which relate to the survey methodology. First, residents who were not in accredited residency training programs were excluded, so the results might not accurately represent the opinions and experiences of all medical residents. Second, the study utilized non-probability sampling rather than random sampling. As a result, selection bias might be present; participants who responded

to the survey might differ in some way from the overall population of medical residents. For example, the survey might have attracted residents with strong positive or negative feelings about neuropsychology, while residents with more neutral attitudes might not have felt as compelled to spend time on the survey. Third, since snowball sampling was used, the response rate is unknown. This makes it difficult to ascertain to what extent respondents might differ from non-respondents.

Additional limits to generalizability might include family medicine and internal medicine residents' overrepresentation in the sample, compared to other specialties. There were particularly few participants from neurology programs ($n = 51$). On the other hand, family medicine and internal medicine are larger specialties than psychiatry and neurology, with neurology being the smallest specialty (Association of American Medical Colleges, 2021). In this regard, the composition of the current study's sample is relatively reflective of the overall distribution of medical residents across specialties. Finally, most residents hailed from the Midwest, Northeast, and Southeast regions of the United States.

Another limitation is that it was not possible to assess participants' actual referral practices, given their in-training status. Instead, this study's primary dependent variable was the behavioral intention to refer, which is the closest approximation of future referral behavior. It is worth noting, however, that empirical research has demonstrated the utility of the Integrated Behavioral Model in explaining and predicting a wide variety of behaviors. Further, changes in behavioral intentions have been shown to result in changes in actual behavior (Webb and Sheeran, 2006). Consequently, the behavioral intention to refer should act as a useful proxy for referral behavior in situations where referral behavior itself cannot be measured.

Last, a low number of participants endorsed having clinical experiences that involved shadowing a neuropsychologist. Consequently, this variable could not be included in the regression analysis on types of exposure. Somewhat similarly, relatively few participants endorsed having negative attitudes toward neuropsychology or reported that they would not refer to neuropsychologists during independent practice. While this limited which variables could be included in certain analyses and precluded some comparisons by specialty, these findings are highly promising for the future of the field and should be considered not as a limitation, but rather a cause for celebration.

Future Research

Future studies with larger samples, ideally using random sampling, could address some of the aforementioned limitations. It would be particularly helpful for research to identify if shadowing a neuropsychologist is a form of exposure that positively affects referral intentions. Opportunities to shadow local neuropsychologists might be relatively easy for residency programs to implement, and as a direct, hands-on type of experience, research in psychiatry would suggest that it is likely to be impactful. It would also be useful to explore the role of depth and consistency or frequency of exposure to neuropsychology in influencing referral intentions, since the effect of multiple didactics indicates that these factors may be important. Future research might benefit from assessing education, attitudes, and practices surrounding neuropsychological services among other referral sources (e.g., additional types of medical providers), individuals in unaccredited residency programs, and/or international populations as well. Studies of these groups would speak to generalizability.

Additionally, while the current study suggests that the Integrated Behavioral Model is helpful for understanding medical residents' behavioral intention to utilize neuropsychological

services, more research is needed to determine how well the model fits and in what ways. For example, the results of this study confirm that education, awareness, and understanding surrounding neuropsychological services influence referral intentions, but the route through which behavioral intention is affected (whether via attitudes, perceived norms, and/or personal agency) was not assessed. It also remains to be seen whether these variables directly impact referral behavior in addition to behavioral intention. Education might plausibly exert direct effects by improving knowledge and skills regarding making referrals, increasing the salience of making referrals, and/or rendering the process of making referrals habitual. Similarly, lack of awareness may serve as an environmental constraint to making referrals, and if residents do not understand neuropsychology, they may lack the knowledge needed in order to refer when it would be most useful. Because the primary dependent variable in this study was behavioral intention rather than actual behavior, none of these posited relationships could be explored. Future research might consequently target specific variables and mechanisms of effect in the Integrated Behavioral Model among not only medical residents, but also providers engaged in independent practice.

Conclusions

Given that neurologists, psychiatrists, and primary care physicians make the majority of referrals to neuropsychologists (Sweet et al., 2015), it is important to understand how to facilitate their continued engagement with the field of neuropsychology. With that goal in mind, the current study assessed predictors of medical residents' intention to utilize neuropsychological services during independent practice. The results demonstrate the importance of educating medical residents about neuropsychology in order to promote future referrals. Exposure to neuropsychology during residency seems likely to have the strongest impact, particularly if it

takes the form of multiple lectures, seminars, or other didactic teaching or clinical rotations or other clinical experiences in which neuropsychological services are ordered or utilized.

In terms of specific topics for education, making residents aware of local neuropsychological services and helping them understand the nature of neuropsychological services appears to be key. Another useful target might be the variety of questions neuropsychologists are equipped to answer, including less commonly endorsed reasons for referral, such as serving as an expert witness. Highlighting the benefits of neuropsychology and addressing specific barriers to making referrals are also important. Regarding the former, educators might reinforce currently recognized benefits, such as diagnoses and treatment recommendations, as well as increased awareness of lesser-known benefits, such as assisting patients in accessing community resources.

In terms of barriers, residents' responses again highlight the importance of providing thorough training about neuropsychological services and information about the availability of those services. Neuropsychologists and neuropsychology advocates might also consider lobbying for increased coverage by insurance, which would reduce the impact of cost as a barrier to making referrals. Decreasing the length of test batteries would be another way to decrease cost as well as wait time for appointments. To address difficulties in accessing providers, it might be helpful to follow Temple and colleagues' (2006) suggestions of disseminating lists of neuropsychologists organized by geographic area and of those who are willing to travel. Neuropsychologists could also consider offering telehealth services, and a list could be disseminated of providers who are willing to do so.

Additionally, the current study demonstrates a particular need to educate internal medicine and family medicine residents. Compared to psychiatry and neurology residents,

residents in primary care programs were less aware of local neuropsychological services, less likely to report understanding neuropsychology, less often received exposure to neuropsychology during residency, and less frequently received the types of exposure that most strongly affected referral intentions. These findings might explain the higher proportions of primary care residents who selected “N/A” regarding their overall impressions of neuropsychology. After all, if they do not feel knowledgeable about neuropsychology, it would be challenging to form an adequate impression of the field. Further, the finding that psychiatry residents more often endorsed referral intentions than internal medicine residents might be due to the discrepancies between psychiatry and internal medicine residents’ awareness, understanding, and exposure surrounding neuropsychological services. Psychiatry residents possessed among the highest levels of awareness of local neuropsychological services, the greatest understanding of neuropsychology, and most frequently received the most impactful forms of exposure to neuropsychology during residency. In contrast, internal medicine residents reported the lowest levels of awareness and understanding and were the least likely to receive the most influential types of exposure. Since awareness, understanding, and exposure to neuropsychology all impact referral intentions, if the neuropsychology-related education of primary care residents can be improved—particularly the education of internal medicine residents—they might be more likely to make referrals after their training is complete. This is especially important in light of the fact that primary care is a much larger specialty, and consequently much larger potential referral base, than psychiatry or neurology.

A summary of the key recommendations based on this study’s results can be found in Table 27.

TABLE 27

RECOMMENDATIONS FOR INCREASING THE LIKELIHOOD OF FUTURE REFERRALS

How:	A neuropsychology-specific training curriculum
For whom:	All medical residents, particularly primary care residents
When:	During residency
What:	Multiple lectures, seminars, or other didactic teaching Clinical rotations or other clinical experiences in which neuropsychological services are ordered or utilized
Topics:	Availability of neuropsychological services What neuropsychologists do The variety of questions neuropsychologists can answer The benefits of neuropsychological services Perceived barriers to making referrals

In conclusion, the current study contributes to the growing body of research on factors that influence physicians' referral decisions by identifying factors that affect medical residents' intention to refer during independent practice. Results suggest that neuropsychology educators who wish to increase the likelihood of future referrals should implement a neuropsychology-specific training curriculum during residency, particularly for primary care residents. This curriculum should consist of multiple lectures, seminars, or other didactic teaching and/or clinical rotations or other clinical experiences in which neuropsychological services are ordered or utilized. Specific topics for education should include the availability of neuropsychological services, what neuropsychologists do, the types of questions neuropsychologists can answer, and the benefits. Perceived barriers to making referrals should also be elicited and, when possible, addressed. By focusing on the next generation of medical providers, this study provides insights

that can be used by neuropsychology educators to positively impact the referral sources of the future.

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APPENDIX

APPENDIX (continued)

- Residency Year:
- 1
 - 2
 - 3
 - 4
 - Other

(If other) What is your residency year?

- Residency Specialty:
- Psychiatry
 - Family Medicine
 - Internal Medicine
 - Neurology
 - Other

(If other) What is your specialty?

- Region:
- Northeast
 - Southeast
 - Midwest
 - Southwest
 - West
-

APPENDIX (continued)

PRIOR to medical school, I was exposed to neuropsychology via:

(select all that apply)

(If other) Please list your OTHER exposure to neuropsychology:

- A single lecture, seminar or other didactic teaching
 - Multiple lectures, seminars or other didactic teaching
 - A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized
 - A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred
 - Reading of medical literature
 - Other
 - I had no exposure to neuropsychology
-

DURING MEDICAL SCHOOL, I was exposed to neuropsychology via:

(select all that apply)

(If other) Please list your OTHER exposure to neuropsychology during medical school:

- A single lecture, seminar or other didactic teaching
 - Multiple lectures, seminars or other didactic teaching
 - A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized
 - A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred
 - Reading of medical literature
 - Other
 - I had no exposure to neuropsychology
-

APPENDIX (continued)

DURING RESIDENCY, I was exposed to neuropsychology via:

(select all that apply)

- A single lecture, seminar or other didactic teaching
- Multiple lectures, seminars or other didactic teaching
- A clinical rotation or other clinical experience in which neuropsychological services were ordered or utilized
- A clinical rotation or other clinical experience in which shadowing of a neuropsychologist occurred
- Writing orders/consultations for neuropsychological evaluations
- Reading of medical literature
- Other
- I had no exposure to neuropsychology

(If other) Please list your OTHER exposure to neuropsychology during residency:

	Strongly Disagree	Disagree	Agree	Strongly Agree
I am aware of neuropsychological services available in my community	○	○	○	○
I understand the nature of the services provided by a neuropsychologist	○	○	○	○
Neuropsychology is a service that could benefit my patients	○	○	○	○
I am likely to consult/order neuropsychological services when I practice independently	○	○	○	○

APPENDIX (continued)

	Very Negative	Negative	Positive	Very Positive	N/A
Overall, my impressions of neuropsychology are:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For which activities would you consider ordering neuropsychological services?
(select all that apply)

- Establishing baseline cognitive functioning
- Establishing or confirming a neurocognitive diagnosis
- Differentiating neurocognitive disorders from psychiatric disorders
- Documenting functional limitations (driving, independent living, etc.)
- Providing treatment recommendations
- Determining capacity/competency for making decisions
- Serving as an expert witness
- Other

(If other) Please list OTHER activities:

What do you see as barriers to ordering neuropsychological services?

In what ways do you see neuropsychological services as beneficial to patients?
