Diagnosing Mental Health Disorders in Primary Care:
Evaluation of a New Training Tool

by

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ABSTRACT

Major Depressive Disorder (MDD) and Posttraumatic Stress Disorder (PTSD) are highly prevalent illnesses that can result in profound impairment (Alegria et al., 2006; CTPTSD, 2007). While many patients with these disorders present in primary care, research suggests that physicians under-detect and suboptimally manage MDD and PTSD in their patients (Olfson et al., 2005; Satter et al., 2012). The development of more effective training interventions to aid primary care providers in diagnosing mental health disorders is of the utmost importance. This research focuses on evaluating computer-based training tools (Avatars) for training family physicians to better diagnose MDD and PTSD. Three interventions are compared: a "choice" avatar simulation training program, a "fixed" avatar simulation training program, and a text-based training program for training physicians to improve their diagnostic interviewing skills in detecting and diagnosing MDD and PTSD. Two one-way ANCOVAs were used to analyze the differences between the groups on diagnostic accuracy while controlling for mental health experience. In order to assess specifically how prior mental health experience affected diagnostic accuracy the covariate of prior mental health experience was then used as an independent variable and simple main effects and pairwise comparisons were evaluated. Results indicated that for the MDD case both avatar treatment groups significantly outperformed the text-based treatment in diagnostic accuracy regardless of prior mental health experience. For the PTSD case those receiving the fixed avatar simulation training more accurately diagnosed PTSD than the text-based training group and the choice-avatar training

group regardless of prior mental health experience. Confidence ratings indicated that the majority of participants were very confident with their diagnoses for both cases. Discussion focused on the utility of avatar technology in medical education. The findings in this study indicate that avatar technology aided the participants in diagnosing MDD and PTSD better than traditional text-based methods employed to train PCPs to diagnose. Regardless of experience level the fixed avatar group outperformed the other groups for both cases. Avatar technology used in diagnostic training can be user-friendly and cost-effective. It can also have a world-wide reach. Additional educational benefit could be provided by using automated text analysis to provide physicians with feedback based on the extent to which their case diagnostic summaries cover relevant content. In conclusion, avatar technology can offer robust training that could be potentially transferred to real environment performance.

DEDICATION

I dedicate this solely to my amazing husband Chris for his unyielding support and unequivocal devotion to me and my dream. I could not have done it without you and will be eternally grateful. Love You. YYOL

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To the family and friends that supported me throughout my life, through my trials and tribulations and successes and failures. Regardless of the outcome you were always there for me. Thank you Mom, Candice, Chris, Dr. Kinnier, Jerry, Cheryl, Anita and Reese.

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Chapter 1

INTRODUCTION AND REVIEW OF LITERATURE

Mood disorders and anxiety disorders are highly prevalent psychiatric illnesses that are being diagnosed at an increasing rate in the United States (Alegria et al., 2006; Committee on Treatment of Posttraumatic Stress Disorder [CTPTSD], 2007; Committee on Gulf War & Health, 2006). Major Depressive Disorder is considered to be the leading cause of disability worldwide (as cited in Pratt & Brody, 2008; World Health Organization, 2004) and Posttraumatic Stress Disorder (PTSD) is one of the fastest-growing anxiety disorders being diagnosed in our society to date (CTPTSD, 2007). According to the Surgeon General's Report on Mental Health (U.S. Department of Health and Human Services [USDHHS], 1999), almost two-thirds of people identified in community surveys as having a diagnosable mental disorder do not receive any treatment. These disorders can cause considerable impairment to individuals who are afflicted (CTPTSD, 2007; Pratt & Brody, 2008). Both of these disorders are strongly associated with impaired daily functioning and increased medical expenditures.

Many patients with serious depression and anxiety symptoms present in primary care settings (Coyne et al., 1994; Lecrubier, 2004). Primary care is defined as, "care provided by physicians specifically trained for and skilled in comprehensive first contact and continuing care for persons with any undiagnosed sign, symptom, or health concern (the "undifferentiated" patient) not limited by problem origin (biological, behavioral, or social), organ system, or diagnosis" (American Academy of Family Physicians [AAFP], 2010, p. 1). Primary care

physicians (PCPs) can be considered an umbrella term that encompasses a variety of different medical specialties because primary care providers are trained to be first contact generalist practitioners (AAFP, 2010). Physician specialties that fit under the criteria as a generalist practitioner and provide primary care services include: family medicine, general internal medicine, and general pediatric medicine (AAFP, 2010; Saultz, 1996). Many of the responsibilities these different physician specialties cover overlap, but there are still some distinct differences. One of the primary differences between these specialties relates to the patient population they treat (Saultz, 1996). Specifically, general pediatric medicine specialists provide care for children and adolescents (AAFP, 2010). Family medicine practitioners provide care for both adults and children, and usually for several members of a family (AAFP, 2010; Saultz, 1996). Internal medicine practitioners treat adult patients and in the past were more known for treating severe and chronic conditions in older patients, but more recently family medicine and internal medicine practices have greatly overlapped (Saultz, 1996). Of particular relevance to the current study are family medicine practitioners, which is the sample this study utilized. Family medicine physicians and primary care physicians are not the same and should not be considered interchangeable (AAFP, 2010), but some researchers in the past have not distinguished these differences in their studies. When these distinctions are made in the literature, they will be referenced as such, but when they are not they will be referenced by the terminology that particular researcher(s) used (i.e., when the term primary care

physician [PCP] or provider is used then that will be stated, but if internist or family practitioner is used then that will be differentiated).

Major depressive disorder (MDD) is the most common affective disorder, and posttraumatic stress disorder (PTSD) is amongst the more common and severe anxiety disorders that are encountered in primary care (Rapaport et al., 2005). The MDD diagnosis was chosen for the case 1 protocol because it is the leading disability worldwide (as cited in Pratt & Brody, 2008; World Health Organization, 2004) and for its commonality in the primary care setting (Rapaport et al., 2005). The PTSD diagnosis was chosen for the case 2 protocol because it is the fastest growing anxiety disorder diagnosis to date (CTPTSD, 2007) and it has very specific diagnostic criteria, whereas generalized anxiety is not as precise (APA, 2000). Primary care physicians are unlikely to have received much formal training in the diagnosis and management of these disorders with internal medicine specialists receiving the least amount of formal mental health training (Strain et al., 1985; Strain et al., 1986). In addition, both of these disorders appear to be dramatically under-diagnosed, and therefore inadequately treated by PCPs (Hirschfeld et al., 2003; Schonfeld et al., 1997; Schulberg et al., 1996).

Management of these disorders is likely suboptimal, due to the difficulty of obtaining clear guidelines (in the case of PTSD), limited time, deficits in physicians' knowledge and skills (Goldman, Nielsen, & Champion, 1999; Hirschfeld et al., 2003), and the relative unavailability of psychosocial treatment alternatives for patients who do not want medication for either disorder in primary

care environments (Goldman et al., 1999). Primary care providers' ability to effectively diagnose and manage these disorders is of the utmost importance.

The American Psychiatric Association (APA) has developed guidelines and recommendations for use by physicians in the diagnosis of MDD and PTSD (APA, 2000). However, many PCPs do not refer to or adhere to such guidelines (Nutting et al., 2002; Schulberg et al., 1995, 1996). Furthermore, the nature of PCPs diagnostic and therapeutic reasoning in the context of these disorders has not been studied until recently (Satter et al., 2012). Recent research provides a greater understanding of the cognitive, socio-cultural and environmental factors that facilitate and impede correct diagnosis and treatment (Satter et al., 2012). Studies conducted by Patel and colleagues compared primary care providers, which included internal medicine and family medicine specialists in primary care environments, and psychiatrists on their ability to diagnose and treat mental health disorders presented in realistic text-based case form or avatar simulation form (Satter et al., 2012). Each PCP was assigned to be in either one of two experimental treatment groups. The first study involved data collected from the cases in paper-based form and the second study involved data collected from the cases using avatar technology and computer-based questions and responses. PCPs recruited to participate in the first study were presented with two case scenarios on paper sequentially, and asked to "think-aloud," or verbalize their thoughts without editing or explaining them, as they read through each case. After each case, subjects summarized the key findings, and presented a diagnosis and management plan. PCPs recruited to participate in the second study interacted

with a simulated patient presented on screen as a virtual avatar. The interface permits some freedom in the choice of questions asked, as well as the order in which these questions are asked. As subjects navigated through the available questions and responses, they were encouraged to verbalize their thoughts as in the paper-based cases. At the end of the interaction, subjects were asked to type in a summary, diagnosis and management plan. These cases were used to study PCPs thought processes, using a think aloud methodology to gather verbal protocols during the task of interpreting the developed case scenarios, based on real problems in order to make a diagnosis. The think-aloud protocol has been an important source of data in the study of problem solving, and is thought to reflect the contents of working memory (Ericcson & Simon, 1993). Propositions, or object-relation-object triplets (considered to be the fundamental unit of text representation in cognitive theories of comprehension; Kintsch, 1988) were grouped from these protocols and were incorporated into semantic networks, allowing for the characterization of relationships (such as causal connections) between propositions. So, each propositional unit was analyzed by grouping them into themes as to their relevance to diagnosing. Then the content was analyzed by categorizing the content as either recall, implicit inference, or explicit inference in relation to the case content, and this was then compared to the reference model created based on APA guidelines (APA, 2000) and expert data. This research is based on a theoretical and methodological framework that has been developed over several decades by Patel and her colleagues (Patel, Evans & Kaufman, 1989c). This approach to the study of medical expertise is based on the idea that a

physician's construction of a clinical case representation is similar to the construction of a text representation. This research provides a foundation for improving delivery of care. Of particular relevance to the current study, is that expert subjects were better able to selectively attend to information relevant to the generation of a correct diagnostic solution than the resident PCPs and seasoned faculty PCPs (amongst other findings; Satter et al., 2012). Research in clinical text comprehension suggests that selective recall of relevant information is a defining characteristic of expertise (Patel & Groen, 1991).

Preliminary results of the Satter et al. study (2012) provided data on the PCP's cognitive processes involved in the diagnostic process. Results indicated that PCPs, overall, did not perform as well as the experts in diagnosing and treatment planning (Satter et al., 2012). In some instances it appeared as though the PCPs from the text-based group were able to recall more and draw inferences more often than the PCPs in the avatar simulation group. This could be due to the fact that PCPs were permitted more flexibility when reviewing the avatar simulations, whereas the PCPs in the text-based group were instructed to review all the case material.

Although, the study provided critical information about PCPs decision making and cognitive reasoning ability when diagnosing MDD and PTSD, it was also limited in its ability to evaluate the avatar simulations as a training tool. This is due to the fact that the PCPs in the avatar-based simulation group were allowed to choose which questions to ask the avatar and they were also free to quit and go straight to diagnosis at any time, which many of them did without going through

all the questions (Satter et al., 2012). This is very telling of the physicians' diagnostic processing in that some of them, perhaps, reached their conclusions prematurely. This in turn gave the text-based group a possible advantage since the physicians were instructed to review each case in its entirety.

In the current study, this limitation is addressed by incorporating three levels of treatment groups in an experimental study. Treatment groups one and two will be the same as the previous research study (Satter et al., 2012) and experimental treatment group three will involve the same avatar simulation-based cases, but the participants will be led down a fixed path of questions in order to ensure viewing of all the diagnostically vital information. Specifically, the difference between the two avatar conditions is that the "choice" treatment group will have more freedom with the questions they choose and when they decide to end viewing the materials, whereas the "fixed" treatment group will view the same avatars, but they will be instructed to view all the question/response material in a fixed path. Both groups will have the same list of questions to ask the avatars. Characterizing the family physicians' performance in three separate treatment groups using advanced avatar technology and text-based case review will help identify the best training tool. This is a new and important focus for services research, driven by the overarching goal of finding more effective ways to deliver psychiatric care in the primary care context.

The literature on Major Depressive Disorder, Posttraumatic Stress Disorder, APA Guidelines for Diagnosing MDD and PTSD, Detection and Management of MDD in Primary Care, Detection and Management of PTSD in

Primary Care, Training Primary Care Providers to Diagnose, and Avatars in Education is reviewed below.

Major Depressive Disorder

APA diagnostic criteria for MDD. The American Psychiatric Association has developed diagnostic criteria for diagnosing a MDD episode. The criteria has been directly quoted from the DSM-IV-TR and is outlined in Table 1 (2000, p. 356).

Table 1

APA Diagnostic Criteria for Major Depressive Episode

	Symptom criterion/description
A.	Five (or more) of the following symptoms have been present during the same two-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure.
	<ul style="list-style-type: none"> (1) Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). Note: In children and adolescents, can be irritable mood. (2) Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others). (3) Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. Note: In children, consider failure to make expected weight gains. (4) Insomnia or hypersomnia nearly every day. (5) Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down). (6) Fatigue or loss of energy nearly every day. (7) Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick). (8) Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others). (9) Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

	<i>(continued)</i>
B.	Symptom criterion/description The symptoms do not meet criteria for a Mixed Episode.
C.	The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
D.	The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hypothyroidism).
E.	The symptoms are not better accounted for by bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than two months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic features, or psychomotor retardation.

Major Depressive Disorder is the leading cause of disability in the U.S. for ages 15 - 44 (The World Health Organization, 2004; U.S. Preventative Services Task Force, 2009), with MDD lifetime prevalence ranging from 6.7% to 17% (Kessler et al., 1994; Waraich et al., 2004). Mood disorders affect approximately 20.9 million people a year, 9.5% of the population; Major Depressive Disorder alone affects approximately 14.8 million American adults a year, which is about 6.7% of the U.S. population (Kessler et al., 2005; World Health Organization, 2004); between 2005 – 2006 this rate slightly decreased to 5.4% (Pratt & Brody, 2008).

More than one in 20 Americans in the United States 12 years of age and older had depression between 2005 - 2006 (Pratt & Brody, 2008). Depression rates differed significantly by age group range with ages 12 -17 at 4.3%, 18-39 at 4.7%, 40-59 had the highest rate at 7.3%, and 60 and older at 4% (Pratt & Brody, 2008). Rates of depression significantly differed for men and women with women having a higher rate at 6.7% and men at 4% (Pratt & Brody, 2008). Rates also differed across ethnic groups with Mexican Americans at 6.3%, Non-Hispanic

Blacks significantly higher at 8%, and Non-Hispanic Whites 4.8% (Pratt & Brody, 2008). Depression rates also varied significantly by poverty status between older adult age groups with ages from 40-59 at or above poverty status at 5.9%, 40-59 below poverty level at 22.4%, 60 and older at or above poverty status at 3.8% and 60 and older below poverty level at 7.4% (Pratt & Brody, 2008).

Depression is considered one of the major public health concerns for Americans and its amelioration is viewed as a vital health goal and national objective for 2010 (U. S. Department of Health & Human Services, 2000). The cost of depression is estimated to be over 31 billion dollars a year measured through loss of productivity of workers suffering with depression (Stewart et al., 2003). Major depressive disorder can lead to greater devastating consequences if untreated with some individuals attempting suicide (Thomas Healthcare, 2007). The Center for Disease Control and Prevention reports that 30,000 people a year commit suicide and hundreds of thousands attempt suicide (as cited in Thomas Healthcare, 2007).

Posttraumatic Stress Disorder

APA diagnostic criteria for PTSD. The American Psychiatric Association has developed diagnostic criteria for diagnosing PTSD. The criteria have been directly quoted from the DSM-IV-TR and are outlined in Table 2 (2000, pp. 467 – 468).

Table 2

APA Diagnostic Criteria for Posttraumatic Stress Disorder

	Symptom criterion/description
A.	The person has been exposed to a traumatic event in which both of the following were present:

	<p style="text-align: right;"><i>(continued)</i></p> <p>Symptom criterion/description</p> <ol style="list-style-type: none"> (1) The person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others. (2) The person's response involved intense fear, helplessness, or horror. Note: In children, this may be expressed instead by disorganized or agitated behavior.
B.	<p>The traumatic event is persistently reexperienced in one (or more) of the following ways:</p> <ol style="list-style-type: none"> (1) Recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. Note: In young children, repetitive play may occur in which themes or aspects of the trauma are expressed. (2) Recurrent distressing dreams of the event. Note: In children, there may be frightening dreams without recognizable content. (3) Acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). Note: In young children, trauma-specific reenactment may occur. (4) Intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event. (5) Physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
C.	<p>Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:</p> <ol style="list-style-type: none"> (1) Efforts to avoid thoughts, feelings, or conversations associated with the trauma. (2) Efforts to avoid activities, places, or people that arouse recollections of the trauma. (3) Inability to recall an important aspect of the trauma. (4) Markedly diminished interest or participation in significant activities. (5) Feeling of detachment or estrangement from others. (6) Restricted range of affect (e.g., unable to have loving feelings). (7) Sense of a foreshortened future (e. g., does not expect to have a career, marriage, children, or a normal life span).
D.	<p>Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:</p> <ol style="list-style-type: none"> (1) Difficulty falling asleep or staying asleep (2) Irritability or outbursts of anger (3) Difficulty concentrating (4) Hypervigilance (5) Exaggerated startle response
E.	<p>Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.</p>
F.	<p>The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.</p>
	<p><i>Specify</i> if: Acute: if duration of symptoms is less than 3 months Chronic: if duration of symptoms is 3 months or more <i>Specify</i> if: With delayed onset: if onset of symptoms is at least 6 months after the stressor</p>

Lifetime prevalence estimates of PTSD are 10% for women and 5% for men in the U.S. (Kessler et al., 1994). PTSD rates indicate that individuals who are commonly at risk for PTSD are professional firefighters (18%), adolescent survivors of motor vehicle crashes (34%), rape victims (48%), and prisoners of war (67%; American Family Physician, 2000).

Considering the current issues facing American society today and based on the diagnostic criteria just mentioned, it is not surprising to hear that an extraordinary amount of PTSD victims are war veterans (CGWH, 2006). What is surprising is the fact that there is not a sufficient amount of empirically-based evidence on the unique aspects that veterans with PTSD might encounter (CTPSD, 2007). Due to the recent wars in Iraq and Afghanistan it is not surprising that one of the most common stressors PTSD has been linked to is war and combat (CTPSD, 2007). Recent research indicates that 15.2% of Vietnam veterans suffer lifetime PTSD and 9.1% suffer current PTSD. U. S. military personnel from the Iraq and Afghanistan wars suffer from PTSD as well. It has been estimated that out of all the veterans who have seen some sort of combat, Iraq veterans are afflicted at the highest rate at 12.6% and Afghanistan veterans are afflicted at 6.2%. There are some studies that even estimate the percentage to be as high as 30% (CGWH, 2006; CTPSD, 2007). These percentages triple in size when veterans who have PTSD also experience military sexual trauma along with combat/war trauma (Kang et al., 2004; Yaeger et al., 2006). Unfortunately, these numbers could be even higher because findings indicate that PTSD subjects reported important barriers to receiving mental health services due to the stigma

associated with seeking treatment (Hoge et al., 2004). The Department of Veterans Affairs reports that the VA provides health care services to 7 million veterans (2004). According to Seal et al. (2007), "...PTSD is the most commonly diagnosed military service-related mental health diagnosis ..." (p. 2). During 2006 the VA medical center programs reported servicing over 346,000 veterans for PTSD in specialized outpatient programs and general mental health clinics (Seal et al., 2007).

In military personnel who suffer from PTSD comorbidity is a factor. The National Vietnam Veterans Readjustment Survey (NVVRS) has concluded that 98.8% of the individuals who suffer from lifetime PTSD also met the criteria for at least one other psychiatric disorder (CTPSD, 2007; Kulka et al., 1990). The two most common comorbid disorders that were found among war veterans were alcohol abuse and Major Depressive Disorder (MDD). Individuals who suffer from comorbid illnesses have greater impairment than individuals who suffer from one only (CTPSD, 2007). PTSD may affect civilians differently, but comorbidity is also common for them (Breslau et al., 2007; CGWH, 2006; CTPSD, 2007; Kessler, 2000; Ruzek, 2003).

Detection and Management of MDD in Primary Care

Recent advances in MDD research have led to an array of empirically supported treatments, but few low SES and minority individuals receive adequate care for depression (Schulberg et al., 1996; Tai-Seale et al., 2005). Depressed individuals more often receive treatment from PCPs than from mental health specialists (Louch, 2009; Manderscheid et al., 1993; Regier et al., 1993), and most

antidepressants are prescribed by non-psychiatrists (Simon et al., 1993). Few individuals receive even minimally adequate treatment for mental health disorders according to effective practice guidelines based on the Agency for Health Care Policy and Research guidelines and the American Psychiatric Association's guidelines (as cited in Wang, Demier, & Kessler, 2002; Wang et al., 2005). MDD is also under-diagnosed by PCPs (Coyne et al., 1995; Katon & Schulberg, 1992). Detection may be complicated by co-occurring medical conditions that compete for the physician's attention (Klinkman, 1997; e.g., hypothyroidism). Many depressed patients present with somatic symptoms, which may be due to a comorbid psychiatric or medical disorder (Ballenger et al., 1999), such as anxiety (Sartorius et al., 1996), substance use (Wittchen et al., 1999), or chronic pain (Katon & Sullivan, 1990). Untreated depression can result in impaired functioning (Pratt & Brody, 2008), suicidality (Wunderlich et al., 1998), and increased healthcare use and medical expenditures (Katzelnick et al., 1997; The World Health Organization, 2004; U.S. Preventative Services Task Force, 2009).

Family medicine physicians in a primary care context use different cues than psychiatrists in making a diagnosis, relying on patients' history, distress, and symptom severity (Klinkman et al., 1997). Research indicates that the low rates of depression diagnoses in patients could be partially due to expressed symptomatology; 80% of depression patients present with non-specific physical symptoms and they fail to mention any symptoms relating to emotions (University of York, 2002). Prior research indicates that this may not necessarily be due to the varied types of symptoms discovered or the severity of them, but the

different competing demands for diagnosing and treating other medical problems within a short span of time, which affect the likelihood of assessing depression (Tai-Seale et al., 2005).

The diagnosis of depression is also influenced by other patient characteristics: females and older patients are more likely to be diagnosed with depression (Bertakis et al., 2001; Klinkman et al., 1998; Potts et al., 1991). Late-life depression in primary care settings is often incorrectly diagnosed and inadequately treated (Tai-Seale et al., 2005). Racial/ethnic biases also affect the diagnosis and treatment of mental disorders (Atdjian & Vega, 2005). Research also indicates that disparities could be due to white physicians missing signals of depression among minority populations (Tai-Seale et al., 2005).

Primary healthcare physicians are providing mental health care services (assessments, referrals, and treatment) at an increasing rate to a proportion of ethnic minority subgroups and individuals with low socioeconomic status (as cited in Wagner et al., 2005). Ethnic minorities are less likely to receive a wide range of medical services compared to Caucasians. Goldstein et al. (2005) wrote, “Despite improvements in health care, racial and ethnic disparities still exist in medical care for minorities. Although these disparities have been largely related to patient preference or barriers to accessing care, it has been postulated that these differences may be due in part to physicians’ unconscious biases or their lack of understanding of cultural behaviors” (p. 998).

Latinos/Hispanics specifically, are less satisfied with the medical care they receive by physicians than whites and they also report being less trustful of

physicians (Hunt, Gaba, & Lavizzo-Mourey, 2005). This can effect what symptoms they report and to the extent they are willing to report symptoms possibly deemed more embarrassing, such as mental health symptoms. The time from the onset of a disorder to the first treatment is often years; minorities have a much longer time delay in seeking treatment compared to non-Hispanic whites. This finding could be accounted for by the negative portrayal of treatment of minorities (Wang et al., 2005).

Physicians may use different diagnostic approaches, such as considering depression only after ruling out all possible medical diagnoses, and using antidepressants to rule in depression (Baik et al., 2005; Carney et al., 1998). Diagnosis also varies with physician specialty: Harman et al. (2001) found that family and general practice physicians were 65% more likely than internists to diagnosis depression. Detection of mental health disorders, including depression, also varies based on the gender of the physician. Linzer et al. (1996) found that female physicians diagnosed mental health disorders significantly more often than male physicians in male patients and detection rates for female patients were about the same for either physician gender. Effective primary care management of depression requires regular follow-up visits, which can be supplemented by psychotherapy referrals (Depression Report, 2006). The main treatment provided by primary care physicians for depression is antidepressants. Due to long wait lists or the lack of available therapists, evidence-based psychological treatment is not frequently employed (Depression Report, 2006). Once diagnosed, physicians' management of depression is often suboptimal due to inadequate medication

management and insufficient intensity or duration of psychotherapy, when this treatment modality is employed (Depression Report, 2006; Goldman et al., 1999). Primary care providers also tend to prescribe less than the dose and duration of antidepressant medications recommended by clinical practice guidelines (Louch, 2009). Barriers to physician guideline adherence include lack of awareness, familiarity, or agreement with guidelines; lack of self-efficacy in depression screening and treatment; low outcome expectancies of implementing the guidelines; an emphasis on inpatient, rather than outpatient detection and management; and environmental and organizational factors (Cabana et al., 2002).

Although there is a large amount of research that examines assessment and treatment of depression, there are few studies that use direct observation to determine if and how physicians assess different kinds of patients for depression in primary care settings (Tai-Seale et al., 2005). Research in this area in the past has been limited because researchers have relied on panels of experts to do global assessments of clinical practice through the use of secondary data, which includes hospital/patient records, insurance claims data, patient or physician surveys, and chart reviews (Tai-Seale et al., 2005). All of these different resources are subject to the physician's personal style or writing practices, which do not provide reliable information on the detection and treatment of psychiatric disorders by physicians when used by itself due to individual differences. In a controlled setting with predetermined outcomes using medical guidelines, which is incorporated into the current study, accurate evaluation of diagnostic accuracy can be better determined. Research has been conducted to evaluate the efficacy of

treatment of psychiatric illnesses in primary care settings. But what about the vital steps before an intervention can begin? Assessment and diagnosis are critical.

Detection and Management of PTSD in Primary Care

It is very likely that individuals with PTSD are seen in primary care (Bruce et al., 2001; Dickinson et al., 1998; Samson et al., 1999; Staub et al., 2001; Stein et al., 2000; Taubman-Ben-Ari et al., 2001; Yang et al., 2003). Of those diagnosed with PTSD, about half reported healthcare use (half treated by general practitioners). However, only 13% of those visiting a general medical practitioner (vs. 57% of those visiting a mental health specialist) received at least minimally adequate treatment (Kessler et al., 2005). Individuals with PTSD have high rates of psychiatric comorbidity (e.g., MDD, anxiety disorders, substance abuse; Kessler, 2000). PTSD is also associated with daily functional impairment, physical health problems (Schnurr et al., 2002), relationship difficulties (Cook et al., 2004), and lower educational attainment (Kessler et al., 1995).

Patient barriers to receiving an accurate PTSD diagnosis include a lack of awareness that current symptoms are related to past trauma; embarrassment or fear about disclosing the trauma to the physician, particularly for sexual trauma and domestic violence (Cloitre et al., 2005) or comorbid psychiatric problems such as depression or substance abuse (Grinage, 2003). There is limited research on how primary care or general care providers manage PTSD. In one study, Munro and colleagues (2004) found that only 42.9% of general practitioners specified the drug treatment of choice for PTSD, 28.3% had the knowledge to recognize PTSD and prescribe appropriately, and only 10.2% described the best

practice for the disorder. Lack of knowledge may be among the reasons for suboptimal recognition and management of PTSD in primary care. However, the nature of this knowledge deficit is not currently known.

Training Primary Care Providers to Diagnose

Medical reasoning theories. Medical research investigating medical expertise and clinical inquires began in 1959 (Patel, Arocha & Zhang, 2004). These investigations led to the proposal of a two-staged model of clinical reasoning in physicians involving a hypothesis-generation stage followed by a hypothesis-evaluation stage (Patel et al., 2004). This involves physicians being presented with clinical data and based on prior knowledge they have and the content of the data, the physician generates hypotheses. Once the physician thinks he or she has generated all the relevant possible hypotheses he or she then evaluates each hypothesis to narrow down and select the accurate hypothesis. Later extensive experimental research in problem solving validated the early two-stage hypothetical-deductive model of reasoning. Patel and colleague's state, "...physicians reasoned by first generating and then testing a set of hypotheses to account for clinical data (i.e., reasoning from hypothesis to data). This model of problem solving had a substantial influence on both medical practice and medical education" (2004, p. 728).

Two basic forms of reasoning are: *deductive* and *inductive*. Deductive reasoning involves arriving at one valid conclusion from a set of general premises. Inductive reasoning involves arriving at a likely general conclusion from a set of particular statements (Patel et al., 2004). Research has indicated that

both forms of reasoning can occur and usually do co-occur during the diagnostic decision-making process. A third form of reasoning is the combination of the two basic forms and has been labeled *abductive* reasoning (Patel et al., 2004). Patel and colleagues concluded, “Basically, all theories of medical reasoning characterize diagnosis as an abductive, cyclical process of generating possible explanations (i.e., identification of a set of hypotheses that are able to account for the clinical case on the basis of the available data) and testing those explanations (i.e., evaluation of each generated hypothesis on the basis of its expected consequences) for the abnormal state of the patient at hand” (as cited in Patel et al., 2004, p. 730). It is important to note that with most mental health disorders it is difficult to formulate hypotheses. It is easier to refute or disconfirm hypotheses, narrowing down diagnostic possibilities.

There is very little research to date involving medical training models for diagnostic training of mental health disorders, but traditionally, medical students learn to diagnose diseases and/or disorders through many different media depending upon their program of training, but most involve training that incorporates some if not all the following elements: specific coursework, medical texts, lectures, seminars, experiential and didactic training, and specialized clinical rotations (Strain et al., 1985; Tiemens et al., 1999). Once physicians-in-training have developed foundational knowledge schemas for diseases and disorders through those different media, their learning must be evaluated. Text-based case scenarios have traditionally been used to teach medical students to

diagnose early in their training, as well as to evaluate their diagnostic capabilities (Patel et al., 2004).

Text-based methods. As previously mentioned, medical students have traditionally learned how to diagnose using text-based case scenarios (Patel et al., 2004). These cases tend to present a scenario of a hypothetical patient, usually based on a real patient, with a specific disease or disorder. The scenario usually includes a past medical history, current and past prescription medication inventory, laboratory test results, physical examination results, and presenting patient problem (Patel et al., 1997). Based on the clinical data presented and the physician's previously learned knowledge, the physician is expected to be able to use the various reasoning methods previously mentioned to generate a valid diagnosis (Patel et al., 2004).

These methodologies are currently used in diagnostic training for physicians (Patel et al., 2004). Other modalities used to train physicians include: study groups; pairing physicians with professionals in mental services in ambulatory settings; and encounter groups (Strain et al., 1986). Due to advances in technology in the last few decades other more technologically advanced methods of training have been used to deliver more cost efficient and realistic ways of training physicians to diagnose. For example, video recordings of standardized patients using actors to portray real cases have been used (Patel et al., 2004; Strain et al., 1986). This form of training gives a more realistic feel to the cases by challenging the physician to interpret verbal and body communication. It is also more of a challenge to the physician because they need

to analyze the content of the patient's use of descriptors when presenting the clinical information. It is more complex and realistic than a simple list of presenting problems in the text-based cases (Patel et al., 2004). More recently, technology has advanced to the use of simulated virtual patients (i.e., avatars) that permits interaction between the virtual patient and the physician (Satter et al., 2012). A review of avatars in education is presented later. In addition, to understanding medical reasoning theories used to explain how physicians learn and how to evaluate that learning, it is also important to have an understanding of clinical comprehension in order to evaluate learning from using text-based methods.

Clinical Comprehension. A few models have been applied to the study of clinical comprehension, specifically, the use of knowledge structures to generate problem representation and the Evans and Gadd hierarchical framework (Evans & Gadd, 1989; Kintsch & Greeno, 1985). Kintsch and Greeno (1985) proposed a model when studying problem solvers solving algebra word problems in which experienced problem solvers use a set of knowledge structures in order to generate a problem representation. Patel and her colleagues applied the theoretical framework developed by Kintsch and his colleagues (Dijk & Kintsch, 1983) to the study of clinical comprehension (Patel et al., 1986), examining think-aloud protocols gathered during the process of clinical comprehension (Patel, 1986; Satter et al., 2012). Think-aloud protocols have been an important source of data when studying the process of decision-making, and is thought to reflect the contents of working memory (Ericsson & Simon, 1993). Gathering think-aloud

data involves instructing subjects to orally describe what they are thinking, without censoring or analyzing their decision-making process. Propositions, or object-relation-object triplets, sometimes referred to as, "... the fundamental unit of text representation in cognitive theories of comprehension" (Kintsch, 1998; as cited in Satter et al., 2012, p. 16), have been incorporated into semantic networks (i.e., knowledge is represented through ideas or meanings and their relations among concepts). Categorization into semantic networks allows for further characterization of relationships (such as causal connections) among propositions. Of particular relevance to the current study, it was noted in recent research (Satter et al., 2012) that expert subjects were better able to selectively attend to information relevant to the generation of a correct diagnostic solution. Research in clinical comprehension indicates that a defining characteristic of expertise and correct diagnosis is the ability of experts to selectively recall diagnostically relevant information (Patel, 1991).

The Evans and Gadd hierarchical framework (Figure 1) was originally proposed as a framework for understanding mathematical equations (Evans & Gadd, 1989). In previous studies on decision-making in the medical field, the Evans and Gadd hierarchical framework was proposed as an outline for understanding the organization of expert medical knowledge, in order to show distinct levels of categorization used in the process of diagnostic reasoning of medical disorders (as cited in Satter et al., 2012).

Figure 1: The Evans-Gadd framework for clinical knowledge representation (Evans & Gadd, 1989).

The Evans-Gadd hierarchy distinguishes five levels of clinical knowledge organization. The lowest level is the *observation level* which consists of all the perceived information relating to a particular clinical case, including information that is of no clinical significance. The *finding level* contains facts that are of clinical significance. Above this is the *facet level* which contains clusters of findings grouped into categories that are diagnostically relevant, but not sufficient to constitute a diagnosis. For example, hemiparesis is linked to a number of findings including weakness of one side of the body and coordination problems with balance. However, it is not in itself diagnostic as it can be the consequence of several causes (e.g., stroke, head injury, transient ischemic attack, infective endocarditis, brain tumors, multiple sclerosis etc...). As stated in Satter et al. (2012), “In the domain of psychiatry and psychology, where causal connections are less understood, facets consist of clusters of symptoms such as psychosis.

Psychosis is linked to findings such as hallucinations and delusional beliefs, but can be a feature of many different diagnostic categories including alcohol withdrawal, psychotic depression and schizophrenia” (p. 17). The *diagnostic* level is considered the basis for management and treatment and is formed by the sets of facets specific to that particular disease. The *complex* level consists of other propositions that may direct reasoning towards a particular diagnosis, for example disease-enabling conditions such as environmental risk factors or patient profiles, such as, a recent trip to a tropical foreign country might suggest the diagnosis of tuberculosis along with the symptom presentation.

Of particular relevance to the current study is the finding that a distinguishing feature of clinical expertise is the ability to construct accurate hypotheses at the facet level (Arocha & Patel, 1995). Facet-level hypotheses are constructed to partition the problem space and direct the physician toward accurate diagnostic hypotheses (as cited in Satter et al., 2012). Sharda (2006) investigated the effect of expertise on the clinical comprehension of psychiatric narrative. Observed differences between expert and novice practitioners were consistent with research in other medical domains. Specifically, differences in the selectivity of recall and inference accuracy were indicated. This inability to generate accurate facet-level hypotheses at the expert level has also been demonstrated in non-expert practitioners in a psychiatric context (Cohen, 2007).

When trying to help physicians learn how to diagnose mental health disorders it is important to understand how they comprehend clinical learning materials and the difference between experts and novices in order to adapt tools to

aid physicians in their learning process. The clinical tools used in the current study (i.e., text-based cases and avatar simulation cases based on the text-based cases) were developed with the Evans-Gadd framework for clinical knowledge in mind, paying critical attention to incorporate all relevant diagnostic features at the finding level. The physicians can use the findings to help them accurately hypothesize at the facet level by giving them all the diagnostically necessary information.

Primary care providers training in diagnosing mental health

disorders. Primary care providers are considered to be the comprehensive care provider as well as the gatekeeper or first contact of patients suffering from a mental health disorder (Cole et al., 1995; Louch, 2009; Strain et al., 1986; Tiemens et al., 1999) However, it is reported that few individuals receive even minimally adequate training for diagnosing mental health disorders according to the Agency for Health Care Policy & Research guidelines and the American Psychiatric Association's guidelines (as cited in Wang, Demier, & Kessler, 2002; Wang et al., 2005). So, what is physician's training in diagnosing mental health disorders like?

There are very few studies on training models for teaching physicians about diagnosing mental health disorders. The latest research in this area dates back to the mid-1980s and it proposes six models of mental health training for primary care physician residents (Strain et al., 1985; Strain et al., 1986). These models are listed in order of the amount of time spent on training in mental health disorders: Consultation model, Liaison model, Bridge model, Hybrid model,

Autonomous model, and Postgraduate Specialty-Trained model. The amount of training involved within these models ranges from as little as 4 hours (less than 1% of teaching hours) training within 1 year provided in the consultation model, to a 12 to 36 months of specialized training in a mental health setting provided in the postgraduate specialty-trained model (Strain et al., 1986). The consultation model involves the physician initiating a consult as the consultee and it doesn't involve any formal structure or teaching methods. In addition, the physician has to take it upon herself or himself to seek out the training. The liaison model involves more formal structured exercises to teach basic knowledge and skills, and a psychiatrist-teacher becomes part of the medical team. This model involves 1.5 months of small amounts of training. The bridge model is another psychiatrist-teacher model, which is formally connected to a department of psychiatry where a single psychiatrist teaches physicians. The length of time varies in this model up to 3.75 months, but it is often for small amounts of time within the 3.75 months and there is no one-on-one training. The hybrid model involves training by a psychiatrist or a clinical psychologist who is considered part of the medical team. This model also involves the faculty physicians, if properly trained, to also do some of the teaching in collaboration with the psychologist. This model also has a varying amount of time with the possibility of training time up to a little over 3.75 months. The autonomous model involves the primary care group hiring a mental health specialist from outside the practice to teach group members. This model's training time varies and can range from a few hours of training to extensive weekly training depending upon what the practice wants. The final model, which

also is a very rarely utilized model, and ironically, the model with the most amount of time utilized to train in mental health disorders, is the postgraduate specialty-trained model. This model involves physicians being trained in a mental health setting for 1-2 years allowing them to get a considerable amount of experience detecting and diagnosing mental health disorders (Strain et al., 1986). Unfortunately, the majority of primary care clinics adopt the models with the least amount of training in mental health disorders with 1/3 of hospitals and clinics adopting the consultation model (Strain et al., 1986). This model involves the least of amount of training in mental health disorders. Among others, Tiemens, et al. (1999) call for more efficacious teaching programs that aid physicians in learning to detect and diagnose mental health disorders (Tiemens et al., 1999). Due to cost effectiveness, global capabilities, and advanced technologies, the use of avatars could enhance medical training.

Avatars in Education

Training using traditional methodologies presents challenges involving simulating realistic doctor-patient interactions. Paper-based methods of training lack the physical reality of different types of patients, specifically different ethnic variations, and video technology lacks realistic communication interactions and body movements including facial expressions. Avatar technology allows for more naturalistic doctor-patient interactions with the virtual patient. Virtual patients have a number of advantages over conventional training methodologies in diagnostic reasoning, some of which include: global capabilities that are cost effective; simulated realistic doctor-patient interactions; and the possible ease of

user-friendly training sessions (Satter et al., 2012). The ability to overcome challenges involving realistic doctor-patient interactions through using avatars can offer robust training that could be transferred to real environment performance.

There have been attempts at developing virtual patients for enabling medical students and residents to learn the diagnostic nuances associated with major depressive disorder (Triola et al., 2006). Triola and colleagues (2006) performed a randomized controlled trial comparing standardized patients to virtual patients. The Triola et al. (2006) study indicated that the virtual patient group performed as well as the standardized patient group in diagnosing MDD; providing evidence that virtual patients are a valid method for delivering quality learning environments.

Another study developed a virtual PTSD patient named “Justina” (Kenny et al., 2008). Justina was developed to improve child and adolescent psychiatry residents’ and medical students’ interviewing skills and diagnostic knowledge through practicing with an adolescent virtual human with Posttraumatic Stress Disorder. Kenny and colleagues (2008) studied the system and its ability to generate cognitive responses to enable users to identify PTSD in Justina. Virtual patient interaction provided a context where immediate feedback could be disseminated, providing trainees’ valid feedback on their interviewing skills in terms of psychiatric knowledge, sensitivity, and effectiveness (as cited in Satter et al., 2012). Results suggest that a standardized patient in the form of an avatar can generate responses that elicit user questions relevant for PTSD classification.

In another study, Kenny et al. (2009) compared experts and novices on their interviewing skills and diagnostic decision-making interactions with Justina. They found that expert clinicians were better able to maintain rapport than the novices. Novices consistently tended to ask questions about general things and failed to ask about specific criteria that would lead to a diagnosis. The novices repeatedly visited the same topics and questions significantly more often than the clinical experts. The novices overall spent an exorbitant amount of time on the “incident” rather than the diagnostic criteria relevant to the case. From a clinical perspective they also found that the virtual patients were more accurately diagnosed by the experts than novices (Kenny et al., 2009). These studies strongly suggest the validity of virtual patients as viable resources used in medical education. The latest research conducted by Patel, Cohen and colleagues (Satter et al., 2012) extended their work by including more than one case and providing a larger number of cognitive nuances for diagnosing PTSD. The purpose of the current study is to take this research another step further, utilizing the same cases to evaluate the utility of the virtual avatars as a training tool for physicians to learn how to improve their diagnostic interviewing skills.

Summary and Purpose of the Current Study

In summary, many individuals suffer from PTSD and/or MDD and go undiagnosed every year. MDD and PTSD are prevalent and debilitating disorders that appear to be increasing in prevalence. Specific subpopulations of military members and ethnic minority immigrant groups are at an even greater risk of experiencing mental health disorders because of the traumatizing events in their

lives. These individuals are also less likely to seek professional help because of social stigmatization of mental disorders, lack of trust in mental or medical health professionals, and/or lack of resources to seek help. It is no surprise that these subpopulations are usually first seen for a physical ailment in primary care settings, which is why making an accurate diagnosis is crucial. Physicians may not be adequately diagnosing and treating those disorders. It is imperative that physicians be effectively trained to accurately diagnose these disorders. The purpose of this study is to evaluate the effectiveness of three training programs.

This study evolved from a previous investigative study which indicated that PCPs, when compared to experts, perform poorly when diagnosing mental health disorders, specifically MDD and PTSD. Clearly there is a need to develop more efficient, organized, and cost effective training tools, as well as training tools that can be widely disseminated and reach PCPs globally from big cities to remote areas.

The current study compares three training programs designed to teach physicians how to diagnose MDD and PTSD accurately. The three treatment groups consist of a text-based case program that presents MDD and PTSD cases in text, the “choice” avatar simulation program that allows participants the freedom to review the avatar simulations as they choose, and the “fixed” avatar simulation program that leads participants down a specific path when viewing the avatar simulations.

Questions & Hypotheses

Specifically, the following questions are addressed:

1. Which of the three training programs (i.e., the text-based training program, “choice” avatar simulation training program, and the “fixed” avatar simulation training program), will most effectively train physicians how to accurately diagnose MDD and PTSD?
2. Will the previous amount of training obtained by the physicians influence the effectiveness of the training programs?

It is hypothesized that:

1. The fixed avatar group will outperform in diagnosing MDD and PTSD both the text-based group and the choice avatar group for both cases at all levels of prior mental health training.
2. Of the physicians who have had the least previous training, those receiving the fixed avatar simulation training will outperform in diagnosing MDD and PTSD than those receiving the other two training programs.
3. Physicians who have had the most previous training (i.e., graduates) will more accurately diagnose MDD and PTSD physicians who have had the least previous training (i.e., residents).

Chapter 2

METHOD

Participants and Recruitment Procedures

A total of 30 family physicians, specifically from family and community medicine, were recruited from different family healthcare clinics located in a southwestern state and southern state by the investigator with help from a consulting psychologist familiar with this population. An effort was made to recruit physicians with varying levels of experience (i.e., from 1st year residents to graduated physicians or seasoned faculty). I obtained a list of physician's names from each clinic and contacted approximately an equal number of males and females. Participants were also recruited by the investigator visiting local primary clinics and dropping off recruitment letter forms (See APPENDIX C for Recruitment Form). Physicians were recruited from different public and private primary healthcare clinics located in southwestern and southeastern states by the investigator with help from a consulting psychologist familiar with this population. Each physician recruited was invited by phone or email to participate in the research study. They were specifically asked, "Please participate in a research study that will involve diagnosing 2 cases. The total time spent to administer the study will range between 10 and 40 minutes." Upon acceptance to the study participants were randomly assigned to one of three conditions. Each participant was then given an appointment. The physicians' response to the phone call or email to set up an appointment to participate served as their consent to participate in the study until the scheduled data collection appointment where

each participant was presented with a recruitment form explaining the study (See APPENDIX A for Recruitment Form).

Interventions

Three interventions were compared (i.e., a text-based training program, a “choice” avatar simulation training program, and a “fixed” avatar simulation training program), to evaluate the effectiveness of these training programs in training physicians how to detect and diagnose MDD and PTSD. The development of the interventions are explained in detail in the following sections.

Text-based training program. Case scenarios for PTSD and MDD (See APPENDIX C for Case 1: MDD and Case 2: PTSD in text format) have been developed based on the DSM-IV casebook (Spitzer et al., 1994), which has been used to train psychiatric residents (Cohen 2007; as cited in Satter et al., 2012). The initial versions of these cases were adapted into a more suitable format by one of the investigators of the previous study, who is a physician with experience in both the primary care and psychiatry settings (Satter et al., 2012). A clinical team composed of a psychiatrist; primary care practitioner, clinical psychologist, and counseling psychology graduate student reviewed and provided feedback for the cases. The clinical team provided this feedback with the primary goal of generating case scenarios that are suggestive without being obvious. The psychiatrist had 20 years of experience working with patients with MDD and PTSD, and is knowledgeable about DSM-IV diagnostic guidelines for these disorders. The psychiatrist and counseling graduate student further refined the cases with the goal of making them as realistic as possible. In order to simulate

realistic cases, certain of the criteria for diagnosis from the DSM-IV-TR were included for each of the cases, in addition to one “red herring” that was incorporated throughout the script (Satter et al., 2012). This misleading clue and/or additional symptom was alcohol abuse for the PTSD case and headaches and hypertension for the MDD case. Since it is unusual for a patient to present with every single criterion for any disorder listed under the DSM-IV-TR (J. MacKenzie & C. Olson, personal communication, November 12, 2008), an effort was made to include only the most salient symptoms. For example, in the PTSD case the patient presented with all of findings for clusters B and D, but only five of the seven finding criteria under cluster C. This process was done for both the text-based case scenarios. Efforts were made to include elements of history or symptomatology which would be typical in a primary care practice population and would need to be considered in the differential diagnosis. These case scenarios are available in the form of narrative text (Satter et al., 2012; See APPENDIX C for the Case 1: MDD and for Case 2: PTSD). These cases in narrative form are what the text-based group reviewed and diagnosed. Specifically, each participant was given each individual case in paper format. First, they read through Case 1. Specifically, they were instructed to “Please read through each case in its entirety and after each case please write a diagnosis for each case on the diagnostic form provided” (See APPENDIX D for the Diagnostic Form). After diagnosing each case the participant was instructed to rate their confidence level in their diagnosis. Upon completion of the test protocol each participant was instructed to fill out the demographic questionnaire (See

APPENDIX B). Data on gender, age, ethnicity, and amount of previous mental health training experience is included.

“Choice” avatar simulation training program. In order to compare the traditional text-based method with the new avatar simulation method, it was imperative to base the simulated cases on the same content as the text-based cases. There were several distinct stages to the script creation. Both case scripts passed through the following stages (Satter et al., 2012):

1. As previously mentioned, the clinical team developed case scenarios that went through several rigorous reviews. The clinical team then developed character descriptions based on the case scenario presentations and previous patients seen in members of the clinical team’s practices who had similar diagnoses.
2. Next, a script was created based on the content of the text-based cases and their character description. Each case script included multiple variations and paths of questions utilized by the user in accordance with responses from the avatar. “Several pathways or narrative trajectories were written that converged on the same key evidence (criteria)” (as cited in Satter et al., 2012, p. 22).
3. In the final stages of development members from the development team and clinical team reconvened again to review the script in order to revise points of concern, as well as to put in any final touches to make the scripts more natural and realistic.

4. The last stage of development consisted of professional actors reading the scripts using several different variations in speech, tone, and accent to give a variety of possible real-life emotional reactions. The actors' audio recordings were used for the avatars' "voices."

Avatar development. After the "voices" for the avatars were recorded the avatar's "characters" were created, which consisted of visual characteristics and simulated mannerisms. The avatars were created by the technology development team, which consisted of a computer science professor, software program writer, and master's level student in computer science and engineering. Meetings were held between the technology team and clinical team to consult on the development of realistic avatars. The consultations consisted of broad interviews and/or discussions with the clinical team on their expectations from the training modules and how the virtual patient's characteristics and mannerisms should be developed. Emphasis was placed on the importance of developing modules that are learning tools and not just designing a visually appealing simulation. Based on the technology team and clinical team's interactions a guideline and requirement specification document was developed and this enabled the technology team to design effective interfaces (Satter et al., 2012).

Next, the technology team created pilot patient-doctor interaction scripts based on the scripts that were developed by the clinical team. Members of the technology team wrote, "These scripts were organized as a multiple branch tree wherein a question from the doctor or in this case software user, may solicit different types of responses from the virtual patients (See APPENDIX F for

Question/Response Tree for both cases). The responses could vary at a simple level of using equivalent phrases for the same semantic content or variation in semantic content themselves” (as cited in Satter et al., 2012, p. 24). A standardized notation to represent the multiple branch structures was developed. This permits the investigator to use these notations for newer simulations at a later date. The team chose xml based representations, citing, “its relative ease of representing data and its interoperable characteristics” (Satter et al., 2012, p. 24).

Next, pilot simulation clips of the virtual patient were developed. The technology team used Poser® software for patient simulation and then Maya® software was employed to put the animated patient into a realistic environment. Dialogues of the scripts were rendered and then reviewed by the clinical team to ensure they incorporated a natural and realistic visual look and feel. Again, the clinical team was solicited to evaluate the realistic look of the virtual patients; they provided feedback to improve the avatars. Specifically, they evaluated the affect demonstrated by the avatars to make sure it was consistent with expressed symptoms they had experienced with actual cases they have seen during practice. The team also focused on learning possibilities with these systems rather than simply aspiring for visual realism. Guidelines were revised based on the initial feedback provided and all the suggested changes were incorporated. The team then rendered all the scripts and the associated clips, and the initial virtual patient ensembles were developed.

Next, the web-based platform for the simulations was developed. The team reports, “The web-based platform encoded in .Net and C# has a learning

management system, a decision engine and a simulation playback system in it. The learning management system is the common platform for students and evaluators to access the training modules” (as cited in Satter et al., 2012, p. 25). The decision engine in this system enables the virtual patient to generate responses in order to answer questions initiated by users. As previously mentioned, scripts were designed in a multiple tree-branch format. This system allows the search engine to automatically choose an appropriate response to a question from one of the multiple paths. Randomization to choose between multiple equally probable values was employed. For example, a virtual patient may use Yes, Sure, or Yeah interchangeably to simulate a realistic patient.

Participants randomly assigned to the “choice” avatar simulation training program interacted with simulated patients presented on screen as virtual avatars (See APPENDIX E for Virtual Avatar Screenshots). First they were instructed to go to the web site, <http://symbiosis.asu.edu/anim/> and they were instructed to click on the highlighted link and create a username and password. Then they were directed back to the home page where they were instructed to login using the username and password they just created. The investigator was available throughout the process and aided any of the participants to make sure they were able to gain access to the avatars. They were verbally instructed to click on the first case module to view the avatar. The interface for this group permits some freedom in the choice of questions asked, as well as the order in which these questions are asked. Participants in the choice avatar group were allowed this freedom of choosing questions from a list of questions provided and ending early

if they choose to. Specifically, they were instructed to, “Please go through each case and write in your diagnosis once you think you are aware of the accurate diagnosis on the diagnostic form provided.” To go through the case the participant clicked on a drop-down menu box to view and pick questions to ask the avatar. Upon choosing a question by clicking on it with a computer mouse the avatar played a clip that answered the chosen question. This process was repeated until the user decided to quit. At the end of the interaction, participants wrote in their diagnosis on the Diagnostic Form.

“Fixed” avatar simulation training program. The participants assigned to the fixed avatar simulation training program went through the same process of logging in as the choice avatar group and they viewed the same avatars and questions and responses as the choice avatar group. There is one critical difference in this intervention – participants are required to proceed in a “fixed” manner. They were specifically instructed to, “Please go through each avatar question and response command for each avatar in order. Make sure you completely view all the questions and answers for each avatar before you write in your diagnosis for each avatar on the diagnostic form provided.” This treatment group was required to view all of the diagnostically relevant information. As with the other training program participants, each participant was then presented with a demographic questionnaire after the treatment protocol was administered.

Measures

Each participant completed a Diagnostic Form after reviewing each case. The Diagnostic Form consists of one question per case specifically asking the participant to write in their diagnosis for each case. The written diagnosis was coded for accuracy based on the DSM-IV-TR diagnostic categorizations/guidelines (APA, 2000) on a scale from 1 - 7 with 1 being not at all accurate, 4 being somewhat accurate, and 7 being very accurate. Three different Clinical Psychology PhD students served as raters and coded the diagnoses for accuracy. A written guide was provided (See APPENDIX G Written Instructions for Raters Written Instructions for Raters Diagnosing MDD & PTSD), which is outlined in the following paragraph.

Specifically, raters were instructed to: “Using the written guidelines below please rate each of the diagnoses. Please rate each diagnosis on a scale from 1 - 7 with 1 being not at all accurate, 4 being somewhat accurate, and 7 being very accurate. Please use the following guidelines to help make your decisions.” The accurate diagnosis for case 1 is *Major Depressive Disorder (single episode)*. An example of a somewhat accurate MDD diagnosis is “depression.” An example of a MDD diagnosis that is not at all accurate is “borderline personality disorder.” Additional somewhat accurate MDD diagnostic responses include, “mood disorder” and any other disorders that fit under the mood disorder spectrum. The accurate diagnosis for case 2 is *Posttraumatic Stress Disorder and Alcohol Abuse*. Somewhat accurate PTSD diagnostic responses include, “anxiety disorder,” “acute stress disorder,” “substance abuse,” and “substance dependence.” An

example of a diagnosis that is not at all accurate PTSD is “paranoid personality disorder.” An ending statement of instructions to clarify any confusion was provided: “These are not precise ratings, but using your best judgment please rate the diagnoses to the best of your ability on a scale from 1 to 7 (i.e., 1, 2, 3, 4, 5, 6, or 7).”

Acceptable somewhat accurate diagnostic responses were evaluated based on facet level categories that were closest in content to the accurate diagnoses based upon the Evans Gadd framework (Evans & Gadd, 1989) and APA guidelines from the DSM-IV-TR (APA, 2000). For example, anxiety disorder is considered a somewhat accurate diagnosis for the PTSD case because it is at the facet level and PTSD is an anxiety disorder, whereas “anxious” or “trembling” would not be because they are both symptoms which are at the finding level. After diagnosing each case the participant was then instructed to rate how confident they are in diagnosing each case accurately on a scale from 1 to 7. A rating of 1 indicates “not at all confident,” a rating of 4 indicates “somewhat confident,” and a rating of 7 indicates “very confident” in their ability to diagnose the case. Following completion of the Diagnostic Form each participant completed a demographic questionnaire; data were gathered on gender, age, ethnicity, and the amount of previous mental health training experience.

The written previous mental health training experience was coded by raters for level of experience/training in mental health on a scale from 1 - 7 with 1 being no experience or training, 4 being some prior experience or training, and 7 being a high level of training or experience. Prior experience was rated by quality

and quantity of experience. Three different Clinical Psychology PhD students served as raters for level of experience/training in mental health. A written guide was provided (See APPENDIX H Written Instructions for Raters Rating Training Experience in Mental Health), which is outlined in the following paragraph.

Specifically, raters were instructed to: “Using the written guidelines below please rate each of the mental health training experiences of each of the PCPs. Please rate each experience on a scale from 1 - 7 with 1 being no experience or training at all, 4 being some prior experience or training, and 7 being a high level of experience. Please use the following guidelines to help make your decisions.

A rating of ‘1’ would be characterized by responses like, “zero experience” or “zero hours of training.” A rating of ‘4’ (or some prior experience of training) would be characterized by responses like, “A workshop, “One class/coursework,” “Attended lectures or consults,” “Part of side job,” “Part of internship, residency, or fellowship rotation as an elective.” A quantitative response of “anything less than 6 months” would be considered as “some prior experience of training.” Responses indicating 6 months or more experience and responses like, “Fellowship training program in Psychiatry or Psychology,” “Residency training program in Psychiatry or Psychology,” Internship training program in Psychiatry or Psychology,” “Major rotation in internship, residency or fellowship training program,” or “Significant part of medical school training” would be rated as a high level of experience. An ending statement of instructions to clarify any confusion was provided: “These are not precise ratings, but using

your best judgment please rate the person's level of experience to the best of your ability on a scale from 1 to 7 (i.e., 1, 2, 3, 4, 5, 6, or 7)."

Experiment Procedures

The investigator traveled to the participant's office with all paper protocols, writing utensils, and a laptop. The investigator requested a space from each participant, most likely the participant's office, where the participant was seated at a table. The participant was then either presented with paper materials or they had a laptop placed in front of them depending on what treatment group they were in. Participants who were located several states away from the investigator were provided with an appointment time to conduct the study and communicate with the investigator via email or over the phone if there were any questions or technical difficulties. At the beginning of the appointment time the investigator emailed the participants the link to the web site hosting the avatars or emailed the text-based protocol as an attachment. In addition, the investigator also emailed the Diagnostic Form and Demographic Questionnaire as attachments. The participants were instructed to only use the knowledge they have gained through their training and not to use any additional aides. Participants were also instructed to complete the protocol and measures within one sitting. Upon completion participants emailed the completed measures to the investigator.

All participants were randomly assigned to one of the treatment groups. Physicians randomly assigned to participate in the text-based group were presented with two case scenarios on paper sequentially in text format. Physicians randomly assigned to participate in the choice avatar simulation group

interacted with simulated patients presented on screen as virtual avatars (See APPENDIX E for Virtual Avatar Screenshots) and they were permitted the choice of what questions they chose and when they exited the training. The final group of participants in the study were randomly assigned to the fixed avatar training program. These participants went through the same process of logging in as the choice avatar participants did. They viewed the same avatars, as well as the same questions and responses as the choice avatar participants except these participants were required to view all of the diagnostically relevant information. All participants in the study, were then administered a demographic questionnaire after the treatment protocol was administered (See APPENDIX B for the Demographic Questionnaire). Once the protocol was completed participants were thanked for their participation and then they received compensation for their participation in the study in the amount of \$30 cash.

Design and Analyses

The effect of training on diagnostic accuracy was evaluated with two one-way ANCOVAs. For Question and Hypothesis 1 the independent variable is the type of training method used to train physicians to diagnose MDD and PTSD. The levels of the independent variable are the text-based training program, the “choice” avatar simulation training program, and the “fixed” avatar simulation training program. The covariate is the amount of training experience in mental health disorders the participant had prior to the initiation of the study. The covariate is the amount of prior training experience measured by a single rating on the quality and quantity of prior mental health training or experience of each

participant. For Questions and Hypotheses 2 and 3, the amount of prior training experience was treated as an independent variable with three levels in order to assess how level of experience may have affected diagnostic accuracy; simple main effects and pairwise comparisons were computed and evaluated. Three independent raters provided ratings on the PCPs diagnostic accuracy and prior experience in mental health training; prior experience scored on a scale of 0 (no experience) to 7 (high level of experience). The main dependent/outcome variable is the measure of accuracy of diagnosing MDD and PTSD; ratings scored on a scale of 0 (not at all accurate) to 7 (very accurate). Reliability ratings of the raters were computed using the Kappa statistic to determine consistency among raters (Landis & Koch, 1977). Descriptive statistics were used to analyze participant's demographics, prior mental health training experience, and confidence ratings of their diagnostic accuracy.

Chapter 3

RESULTS

Physicians ($n = 30$), were recruited from well-known public and private healthcare institutions by a consulting psychologist and/or the investigator from 10 different locations in a southwestern and a southeastern state. The participants' demographics are presented in Table 3.

Table 3

Demographic Characteristics of Physician Participants

Characteristic	Percentage (number) ($n = 30$)
Race/Ethnicity	
White	70 (21)
Asian	13 (4)
Hispanic	10 (3)
Indian	7 (2)
Gender	
Male	57 (17)
Female	43 (13)
Age	
20s – 30s	70 (21)
40s – 50s	23 (7)
60s – 70s	7 (2)

A majority of participants were Caucasian (70%) and male (57%) and 70% were in their 20s or 30s. Additional demographic data was gathered about the participants' previous mental health training, which is presented in Table 4.

Table 4

Mental Health Training of Physician Participants

Rated Level of Experience or Training (Rating 1 – 7)	Percentage (number) (<i>n</i> = 30)
No Experience (1)	13 (4)
Some Prior Experience (2 – 4)	60 (18)
High Level of Experience (5 – 7)	27 (8)

A majority (or 60%) of participants had some prior experience in mental health training. They reported receiving training through consultations with mental health professionals, coursework, seminars, and workshops. None of the participants reported getting training through a specialty residency training program in mental health or in conjunction with psychiatry; although three participants reported mental health training as being a “regular” part of their residency training. The majority of participants (60%) stated that the most amount of time they received in mental health training was less than 6 months out of their entire training experience.

The effect of training on diagnostic accuracy was evaluated with two one-way ANCOVAs. A one-way analysis of covariance was conducted to evaluate the relationship between type of training method used and diagnostic accuracy for each case. The independent variable, type of training method used to train physicians to diagnose MDD and PTSD, included three levels: the text-based training program, the “choice” avatar simulation training program, and the “fixed” avatar simulation training program. The dependent variable was the measure of

accuracy of diagnosing MDD and PTSD. The covariate was the amount of prior experience and training in mental health prior to receiving the treatment.

Three raters were recruited to rate the participants' diagnostic accuracy for MDD and PTSD and prior mental health experience. The interrater reliability for the raters rating diagnostic accuracy for the MDD case was .90 (Kappa), which indicates Almost Perfect Agreement (Landis & Koch, 1977). The interrater reliability for diagnostic accuracy for the PTSD case was .92 (Kappa), which indicates Almost Perfect Agreement (Landis & Koch, 1977). The interrater reliability for level of prior mental health experience was .73 (Kappa), which indicates Substantial Agreement (Landis & Koch, 1977).

Hypothesis 1 predicted that the fixed avatar group would outperform in diagnosing MDD and PTSD compared with the text-based group and the choice avatar group for both cases at all levels of prior mental health training. ANCOVA was used to test that hypothesis. For the MDD case a preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationships between the covariate and the dependent variable did not differ significantly as a function of the independent variable, $F(2, 24) = .22$, $MSE = .54$, $p = .81$, partial $\eta^2 = .02$, thus an ANCOVA was allowed to be conducted as it did not violate this assumption (Tabachnick & Fidell, 2007). The ANCOVA conducted for the MDD case was significant, $F(2, 26) = 7.20$, $MSE = 16.98$, $p < .01$. The strength of the relationship between training program used and diagnostic accuracy was strong, as assessed by partial η^2 , with the training method accounting for 36% of the

variance of the dependent variable, holding constant the level of prior mental health experience and training (Green & Salkind, 2008).

The means of diagnostic accuracy for MDD adjusted for initial differences were ordered as expected across the three training groups. The fixed-avatar training group had the largest adjusted mean ($M = 5.10$, $SD = 1.52$), followed by the choice-avatar training group ($M = 5.00$, $SD = 1.76$), and then the text-based training group had the smallest adjusted mean ($M = 2.80$, $SD = 1.40$). Follow-up tests were conducted to evaluate pairwise differences among these adjusted means with an alpha level of .05 or better. Based on the LSD procedure, the adjusted means for both avatar training groups differed significantly from the text-based training group, but the adjusted means for the two avatar groups did not differ significantly from each other. In conclusion, the results of the one-way ANCOVA supported the hypothesis that those receiving the avatar simulation training outperformed the text-based training group in diagnosing MDD, but there was no difference in training between the choice-avatar training group and the fixed-avatar training group.

For the PTSD case a preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationships between the covariate and the dependent variable did not differ significantly as a function of the independent variable, $F(2, 24) = .58$, $MSE = 1.57$, $p = .57$, partial $\eta^2 = .05$, thus an ANCOVA was allowed to be conducted as it did not violate the assumption (Tabachnick & Fidell, 2007). The ANCOVA for the PTSD case was significant, $F(2, 26) = 4.03$, $MSE = 10.51$, $p = .03$. The strength of the relationship between training program

used and diagnostic accuracy was moderately strong, as assessed by partial η^2 , with the training method accounting for 24% of the variance of the dependent variable, holding constant the level of prior mental health experience and training (Green & Salkind, 2008).

The means of diagnostic accuracy for PTSD adjusted for initial differences were ordered as expected across the three training groups. The fixed-avatar training group had the largest adjusted mean ($M = 5.50$, $SD = 1.58$), the choice-avatar training group had a smaller adjusted mean ($M = 4.70$, $SD = 1.64$), and the text-based training group had the smallest adjusted mean ($M = 3.50$, $SD = 1.72$). Based on the LSD procedure, the adjusted means for the fixed-avatar training group differed significantly from the text-based training group. However, the adjusted means for the choice-avatar training group did not differ from the text-based training group and the adjusted means for the two avatar groups did not differ significantly from each other. In conclusion, the results of the one-way ANCOVA supported the hypothesis that those receiving the fixed avatar simulation training outperformed both the text-based training group and the choice-avatar training group in diagnosing PTSD.

Hypothesis 2 predicted that of the physicians who have the least previous training, those receiving the fixed avatar simulation training will outperform those receiving the other two training programs in diagnosing MDD and PTSD.

Hypothesis 3 stated that physicians who have had the most previous training (i.e., graduates) will more accurately diagnose MDD and PTSD than physicians who have had the least previous training (i.e., residents). Simple main effects were

conducted to test these hypotheses. Simple main effects tests were conducted for both cases to assess differences among groups at low (1 *SD* below the mean), middle group, and high (1 *SD* above the mean) values on the covariate in order to assess how prior experience in mental health may have affected diagnostic accuracy. A *p* value of .02 (.05/3) was set for significance for each of these tests. If any one simple main effect was significant, pairwise comparisons would be evaluated at the same level (i.e., .02) as the simple main effects test following the LSD procedure.

For the MDD case the simple main effects test was not significant for a lower level (1 *SD* below the mean) of previous training in mental health, $F(2, 24) = 3.86, p = .04$, partial η^2 of .24. The simple main effects test was significant for a medium value (at the mean) on the covariate, $F(2, 24) = 6.94, p < .01$, partial η^2 of .37. Upon examination of pairwise comparisons the choice and fixed avatar treatment groups yielded significantly higher scores on diagnostic accuracy than the text-based group for medium ratings of previous experience or training in mental health. The simple main effects for a high level (1 *SD* above the mean) on the covariate was not significant, $F(2, 24) = 3.16, p = .06$, partial η^2 of .21.

The fixed avatar treatment group yielded higher scores on diagnostic accuracy more than the text-based group for all levels of the covariate for the MDD case, but not at the .02 value needed for significance when evaluating the effect of prior experience in mental health. The differences were very close to statistical significance ($p < .04$ and $p = .06$). Differences between the choice avatar group and fixed avatar group were not significant at all levels of the

covariate. These findings indicate that the fixed avatar training group with a medium level of experience significantly outperformed the text-based group with a medium level of experience, but overall prior mental health training did not affect diagnostic accuracy for the MDD case.

For the PTSD case the simple main effects test was not significant for a lower level (1 *SD* below the mean) of previous training in mental health, $F(2, 24) = 3.76, p = .04$, partial η^2 of .24. The simple main effects test was not significant for a medium value (at the mean) on the covariate, $F(2, 24) = 3.69, p = .04$, partial η^2 of .24. The simple main effects test was not significant for a high level (1 *SD* above the mean) on the covariate, $F(2, 24) = 1.17, p = .33$, partial η^2 of .09.

The fixed avatar treatment group yielded higher scores on diagnostic accuracy than the text-based group for both low and medium ratings of previous experience or training in mental health for the PTSD case, but not at the .02 value needed for statistical significance. The differences were very close to statistical significance ($p < .04$ and $p = .04$). High values on the covariate were not close to statistical significance ($p < .33$). The fixed avatar treatment group, choice avatar treatment group, and text-based treatment group did not differ from each other for high values on the covariate, indicating that high levels of prior mental health training or experience did not affect the groups' diagnostic accuracy at a statistically significant level. Differences between the choice avatar group and text-based group were not significant and differences between the choice avatar group and fixed avatar group were not significant at all levels of the covariate. These findings indicate that prior mental health training at any level did not affect

diagnostic accuracy for any group for the PTSD case.

After the participants diagnosed each case they were asked to rate how confident they were in their diagnosis for each case. Specifically, all participants were asked how confident they were that their diagnoses were accurate on a scale of 1 (not confident at all) to 7 (very confident). For the MDD case the mean confidence rating was 5.97 ($SD = 1.10$). A majority (93%) of participants were highly confident with their diagnosis (i.e., they had ratings between 5 – 7) and none of the participants indicated that they were not confident at all with their diagnosis (i.e., none of the participants rated their confidence a 1). For the PTSD case the mean confidence rating was 5.63 ($SD = 1.19$). Thus, virtually all of the participants were very confident about the accuracy of their diagnoses.

Some Qualitative Observations

Overall, the fixed avatar-based PCPs outperformed both the text-based PCPs and choice avatar-based PCPs. In my informal observations of the data and participants' comments, the following are my impressions. The text-based PCPs' diagnoses had greater variability, were less accurate, lacked proficient clinical terminology, lacked specificity, and included numerous diagnoses. For example, one of the participants from the text-based group wrote "Anxiety and Tension Headaches" for the MDD case. This response reveals a lack of knowledge of the DSM-IV diagnostic categories and criteria related to Major Depressive Disorder (DSM-IV-TR, 2000). This was even more apparent in the PTSD case by the lack of recognition of the importance of the traumatic event. Some participants failed to ask questions related to the traumatic event, which is imperative in making the

PTSD diagnosis (DSM-IV-TR, 2000). There were a few instances where physicians listed several diagnoses for each case, for example for the PTSD case, one participant from the text-based group wrote “Generalized Anxiety, Alcohol Abuse, Posttraumatic Stress, Reactive Depression, and Postconcussive Syndrome.” The generation of multiple poorly formulated diagnostic hypotheses in this manner is characteristic of the diagnostic reasoning of intermediate-level non-expert physicians (Patel & Groen, 1986).

Chapter 4

DISCUSSION

MDD and PTSD are highly prevalent illnesses that can result in profound impairment (Alegria et al., 2006; CTPTSD, 2007). While many patients with these disorders present in primary care, research suggests that physicians underdetect and suboptimally manage MDD and PTSD in their patients (Olfson et al., 2005; Satter et al., 2012). Barriers to effective recognition of mental health disorders by PCPs include: “inadequate knowledge of the diagnostic criteria, uncertainty about the best questions to ask to evaluate whether those criteria are met, and time limitations inherent in a busy office setting” (Spitzer et al., 1994, p. 1749). Many research studies have been conducted in order to understand, assess, and treat these disorders (American Family Physician, 2000; Baik et al., 2005; Cabana et al., 2002; CTPTSD, 2007; Grinage, 2003; Kessler et al., 2005; Lecrubier, 2004; Louch, 2009; Olfson et al., 2005; Pratt & Brody 2008; Staub, 2001), but few studies have examined the use of avatar technology to aid in the training of assessment and diagnosis of these disorders (Kenny et al., 2008; Satter et al., 2012; Triola et al., 2006). This research focused on evaluating computer-based training tools (Avatars) for training family physicians to better diagnose MDD and PTSD. Such a study could offer a better understanding of how avatar technology can be used as a training tool in diagnostic interviewing for mental health disorders in the primary care setting. Based on the literature several specific hypotheses were tested regarding which kind of training tool would best aid in training PCPs to diagnose MDD and PTSD.

Summary of the Results

It was hypothesized that the fixed avatar group would outperform both the text-based group and the choice avatar group for both cases at all levels of prior mental health training. The results for the MDD case supported the hypothesis that those receiving the avatar simulation training outperformed the text-based training group in diagnosing MDD, but the choice-avatar training group and the fixed-avatar training group did not differ. This indicates that even without a fixed format of leading the participants down a specific path, but just allowing them to review the questions and responses on their own that participants were still able to diagnose the MDD case better than the text-based group using avatar technology. For the PTSD case the fixed avatar treatment group significantly outperformed both the text-based treatment group and choice avatar treatment group regardless of prior mental health experience in diagnostic accuracy. The results of the one-way ANCOVA supported the hypothesis that those receiving the fixed avatar simulation training outperformed in diagnosing PTSD than the text-based training group and the choice-avatar training group. The choice avatar group did not outperform the text-based training group. This indicates that for the PTSD case having a fixed format of leading the participants down a specific path aided the fixed avatar participants in outperforming the choice avatar group and the text-based group.

It was also hypothesized that the physicians who have had the least previous training and who received the fixed avatar simulation training would outperform in diagnosing MDD and PTSD than those receiving the other two

training programs, and that physicians who have had the most previous training (i.e., graduates) would more accurately diagnose MDD and PTSD than physicians who have had the least previous training (i.e., residents). Simple main effects tests were conducted to evaluate diagnostic accuracy for the MDD case and PTSD case at different levels of the covariate. The choice and fixed avatar treatment groups obtained significantly higher scores on diagnostic accuracy than the text-based group for medium ratings of previous training in mental health. Simple main effects tests were conducted to evaluate diagnostic accuracy for the PTSD case at different levels of the covariate. No significant effects were found at any levels of the covariate indicating that prior mental health training did not affect the groups' diagnostic accuracy for the PTSD case.

Avatar Technology

Training using text-based cases presents challenges involving realistic symptom presentation and doctor-patient interactions (Kenny et al., 2008). Research evaluating web-based education found that information on the way symptomatology was presented, varying examples of how depression symptomatology may be viewed from within different cultures, and assessment and evaluation methods that can be utilized to diagnose was requested from providers (Wisner, Logsdon & Shanahan, 2008). These requests can easily be fulfilled through the use of avatar technology. Traditional methods of training do not provide a physical image of different types of patients (Triola et al., 2006). The use of avatar technology incorporating virtual patients offers several other advantages over the text-based training methodologies in diagnostic reasoning.

They include: global capabilities that are cost effective; simulated realistic doctor-patient interactions; and user-friendly training sessions (Satter et al., 2012). Using avatars can offer robust training that could be transferred to real environment performance (Triola et al., 2006).

The virtual patient enables medical students and residents to learn the fine diagnostic distinctions associated with a Major Depressive Disorder diagnosis (Triola et al., 2006). Triola and colleagues (2006) performed a randomized controlled trial comparing standardized patients to virtual patients. The Triola et al. (2006) study indicated that the virtual patient group performed equally as well as the standardized patient group in diagnosing MDD; providing evidence that virtual patients are a valid method for delivering quality learning environments.

Another medical education study developed a virtual PTSD patient named “Justina.” Kenny and colleagues (2009) compared experts and novices on their interviewing skills, assessment abilities, and diagnostic decision-making interactions with Justina. They found that novices tended to ask consistent questions about general criteria and failed to ask about specific criteria that would lead to a diagnosis. The novices repeatedly returned to the same topics and questions significantly more often than the clinical experts. The novices spent an inordinate amount of time on the “incident” rather than the diagnostic criteria relevant to the case (Kenny et al., 2009). The Kenny et al. (2009) study is relevant to the findings of the current study in that avatar training can guide such novices with appropriate assessment questions to ask to gather diagnostically relevant criteria, increasing the likelihood of an accurate diagnosis. The findings

from this study strongly support the current literature of the validity of virtual patients as viable resources used in medical education.

During administration of the MDD case in the current study, participants in the choice avatar group were given free reign as to which questions they would ask and when they would end the protocol. I observed that some of the participants in the choice condition proceeded through all of the questions in the MDD case protocol, thus completing a similar protocol as the fixed avatar group. The difference between the choice avatar participants and the fixed avatar participants for the MDD case is the order in which they viewed the questions. So, it is possible that some of the choice avatar participants are more similar to the fixed avatar group's participants because they viewed the exact same material. This also may mean that the order in which the participants review the questions and responses may not matter since there was no difference in the choice avatar and fixed avatar groups' performance. Thus, in order for the avatars to be an effective training tool it is necessary that participants view all the questions and responses to reveal the assessment process and the relevant diagnostic criteria.

Findings for the PTSD case revealed that the fixed avatar group did significantly better than both the choice avatar group and the text-based group, but there was no difference between the text-based group and the choice avatar group. One possible explanation for the choice avatar group performing poorer on the PTSD protocol than on the MDD protocol is that MDD is more prevalent in the U.S. than PTSD (National Institute of Mental Health, n.d.) thus, PCPs may be getting more exposure to MDD than to PTSD which could make it easier for the

choice avatar group to diagnose MDD than PTSD. Another potential explanation for the choice avatar participants' poorer performance on the PTSD case is that some of the participants in the choice avatar group may have quit the PTSD protocol early formulating a diagnosis prematurely. In the pilot study that this study is based on, conducted in 2010, the researchers concluded that there was a limitation in the study because it only compared two groups: an avatar group and a text-based group. The researchers discovered that there were some participants in the avatar group who opted to end early and others who opted to complete the entire protocol (Satter et al., 2012). This limitation was addressed in the current study by adding a "fixed" avatar group and a "choice" avatar group.

In the current study it is possible that some of the MDD symptoms were more recognizable to the choice avatar group because of familiarity, so even if they did not complete the entire protocol they still had previous understanding of or experience with depression, whereas the lack of familiarity with PTSD symptoms combined with not being exposed to all of the protocol questions and responses made an accurate diagnosis of PTSD less likely. For the fixed avatar group, even if they did not have prior experience in assessing PTSD, the questions clearly directed them to multiple symptoms of the disorder making a PTSD diagnosis more likely, which might explain why the fixed avatar group outperformed the choice avatar group.

PCPs in the choice avatar-based simulation group were allowed to choose which questions to ask the avatar and they were also free to quit and go straight to diagnosis at any time. I noticed that during administration of the PTSD case

protocol for the choice avatar participants that several of the participants would end early and would miss the opportunity to ask questions that would highlight the traumatic event needed to make a PTSD diagnosis. In addition, they also neglected to ask probing questions concerning sleep and social functioning. Questions concerning the latter two symptom clusters would have provided more traditional hints towards a PTSD diagnosis (i.e., nightmares and startle response). Several of the participants in the current study seemed to reach a diagnosis prematurely. This tendency of making a “quick” diagnosis has been observed with lack of expertise in previous studies (Arocha & Patel, 1995; Satter et al., 2012). Participants may have ended early during the PTSD protocol because they were confident that the diagnosis was alcohol related, whereas in the MDD case the presenting problem of headaches could be caused by a number of different medical conditions (Wedro & Marks, 2011), likely leading the PCPs to continue with further assessment. In the choice avatar group, 40% of participants made an alcohol related diagnosis as a standalone diagnosis or in addition to another diagnosis that was not PTSD related, whereas the text-based group and the fixed avatar group each had only 10% of their participants with similar diagnoses under the same parameters. This supports the idea that some of the choice avatar group participants came to a diagnosis prematurely and were unable to make a definitive diagnosis of PTSD because they lacked the required symptomatology to do so.

Somatic Symptomatology Versus Traditional Psychological Complaints

Disorders related to depression and anxiety are common in primary care, but research indicates that the diagnosis and treatment of these disorders is poor

because of the absence of psychological complaints by patients (Ghosh, 2006). One study indicated that the low rates of depression diagnoses in patients could be partially due to expressed symptomatology; 80% of depressed patients present with non-specific physical symptoms and they fail to mention any symptoms relating to emotions (University of York, 2002). Another research study indicated that patients suffering with mental health disorders in primary care present with somatic symptoms that may suggest a physical disease, but upon further examination there is a failure to find any organic cause (Ghosh, 2006). These physical symptoms have a tendency to be misinterpreted by physicians because they are searching for a somatic etiology (Ghosh, 2006). This tendency could explain why the choice avatar group did poorly in diagnosing the PTSD case; the participants may have thought that the patient's problems or concerns were related to his alcohol abuse and not necessarily that the patient's alcohol abuse is a symptom related to his struggle of trying to cope with his PTSD. The fixed avatar protocol guides participants through questions that help them learn to continue to probe and assess other areas related to the alcohol abuse, specifically his sleep and how he uses alcohol to help him fall asleep. With further assessment of sleep patterns the PCP then learns the patient is having nightmares about a traumatic event. All of these symptoms combined help direct the PCP to a thorough assessment of the patient's experience and an accurate diagnosis of PTSD.

Prior Mental Health Training & Experience

In the current study it was hypothesized that of the physicians who have had the least previous training, those receiving the fixed avatar simulation training would outperform in diagnosing MDD and PTSD than those receiving the other two training programs and that physicians who have had the most previous training (i.e., graduates) would more accurately diagnose MDD and PTSD than physicians who have had the least previous training (i.e., residents). Results did not support the hypothesis that physicians who had the most previous training in mental health more accurately diagnosed MDD and PTSD than physicians who had the least previous training in mental health. Results did support the hypothesis that participants in the fixed avatar simulation training group did outperform the text-based group across all levels of experience, but the fixed avatar group and the choice avatar group did not significantly differ on any level of prior experience. There was only a significant effect for prior experience in mental health for the MDD case at a medium level of experience (i.e., the covariate) with the fixed avatar group and choice avatar group both significantly outperforming the text-based group with a medium level of experience. These findings indicate that those with no experience or little experience were effectively trained in diagnosing MDD and PTSD through the use of the avatar training program.

There is little research on the effectiveness of training programs for physicians in learning to diagnose mental health disorders. Few individuals receive even minimally adequate training for diagnosing mental health disorders according to the Agency for Health Care Policy & Research guidelines and the

American Psychiatric Association's guidelines (Wang, Demier, & Kessler, 2002; Wang et al., 2005). Six models of mental health training for primary care physician residents have been proposed (Strain et al., 1985; Strain et al., 1986) which include: the Consultation model, the Liaison model, the Bridge model, the Hybrid model, the Autonomous model, and the Postgraduate Specialty-Trained model. The amount of training involved for each of these models ranges from as little as 4 hours (less than 1% of teaching hours) to 1 year provided in the consultation model, to a 12 to 36 months of specialized training in a mental health setting provided in the postgraduate specialty-trained model (Strain et al., 1986). Unfortunately, the majority of primary care clinics adopt the models with the least amount of training in mental health disorders with 1/3 of hospitals and clinics adopting the consultation model (Strain et al., 1986). None of the participants in the current study reported getting training through a specialty residency training program in mental health or in conjunction with psychiatry; although a small portion (10%) or three participants reported mental health training as being a "regular" part of their residency training. The majority of participants (60%) in the current study stated that the amount of time they received in mental health training was less than 6 months out of their entire training experience. In spite of their minimal training the majority of participants were very confident with both their MDD case and PTSD case diagnoses. Among others, Tiemens, et al. (1999) call for more comprehensive programs that teach physicians how to detect and diagnose mental health disorders more accurately (Tiemens et al., 1999). Results indicate the use of avatars could enhance medical training due to its validity as a

training tool in diagnosing both MDD and PTSD, cost effectiveness, global capabilities, and advanced technologies (Kenny et al., 2008, 2009; Triola et al., 2006).

According to Patel et al. (1986) diagnostic errors occur because of lack of knowledge or background to make an informed accurate decision, or the process utilized to make a decision is not effective and efficient. In the current study it appears that diagnostic error occurred in the text-based PCP group due to the lack of knowledge and/or experience in diagnosing MDD and PTSD, or the participants were not utilizing previous knowledge obtained in this area. Perhaps an important component of the inability of PCPs to diagnose these conditions is a lack of the prerequisite knowledge involved in the assessment process. For example, it is possible these PCPs would acknowledge a relationship between poor concentration and a depressive episode in the Patient Health Questionnaire (PHQ-9) test, a brief measure of depression commonly used in primary care (Kroenke, Spitzer, & Williams, 2001), but this link may not be sufficiently strong to facilitate recognition of the importance of this finding in the context of a clinical case. The fixed avatar protocol can resolve this problem because it aids physicians who lack knowledge or experience in screening for and diagnosing these disorders by directly guiding them through the clinical encounter, showing the participants the exact questions they should be asking in order to properly assess and diagnose MDD and PTSD in a primary care setting. For participants who had a higher level of experience they may not have made the cognitive links between the symptoms being expressed and the requirements needed for the

diagnosis. Avatar technology can resolve this problem by further developing the avatar patients to incorporate immediate feedback through the use of automated text analysis on participants' performance. Automatic text analysis can evaluate whether or not participants' case diagnostic summaries cover relevant content and are accurate which can aid in learning and evaluation performance, a method that has been utilized previously for educational purposes for training psychotherapy trainees (Caspar, Berger & Hauttle, 2004).

Limitations

Several limitations of this study include the sample size, potential sampling error, limited number of cases, additional technological upgrades to include evaluative training feedback to participants and a rudimentary dependent measure. The current study only sampled 30 participants due to difficulty in recruiting. In this study a sample of convenience was used. Stratified random sampling with an equal number of participants divided into subgroups based on level of prior mental training, and assigned to each treatment group, would have been preferable (Cozby, 2004). Stratified sampling was not used in the current study because grouping based on prior mental health training may have revealed that the cases were mental health diagnoses prior to the participants completing the protocol.

As previously mentioned, not all patients report the same symptoms. For example, in one study a majority of patients (80%) who were diagnosed with depression presented with non-specific somatic symptoms and failed to mention any emotional symptoms (University of York, 2002). It is vital to develop and

test a diverse assortment of cases that incorporate a variety of ways disorders present themselves, as well as cultural and ethnic variations. Future research should address this.

I informally observed that when participants ended the protocol several of them wanted to know how well they did and if their diagnoses were accurate. Another limitation of this study is that the participants were not provided with feedback on the appropriateness of the methods used to reach their conclusions (i.e., which questions they chose to ask versus the questions they chose not to ask). Additionally, they were not informed of the accuracy of each of their diagnoses. Incorporating these features through technological upgrades to include evaluative training feedback to participants can aid in diagnostic medical training and performance evaluation (Triola et al, 2006).

Another limitation of the current study was the dependent measure. Admittedly it is a crude measure. Diagnosing mental illness is an imprecise process. Evaluating the accuracy of such diagnoses is yet another imprecise process. Resulting scores are thus fraught with imprecision. The measurement of diagnostic accuracy should improve as more is learned about specific psychopathologies and the art of diagnosing becomes more precise.

Future Directions

Future research should focus on recruiting larger sample sizes and participants from diverse populations in order to improve generalizability. It would also be preferable to use stratified sampling in regard to prior training (Cozby, 2004). More variety of avatar patient cases would also improve

generalizability. Developing a multitude of cases that incorporate cultural and ethnic variations including how symptoms are expressed differently based upon demographic characteristics can aid in the study's generalizability and utility towards real patient care (Triola et al., 2006). Enhancing the avatar simulations to incorporate immediate feedback through the use of automated text analysis on participants' performance, specifically evaluating if their case diagnostic summaries cover relevant content and are accurate can aid in learning and evaluation performance (Caspar, Berger & Hauttle, 2004). Finally, further refinement of the measure of diagnostic accuracy will yield more valid and precise outcome research.

Conclusion

MDD is considered to be one of the most debilitating disorders worldwide (Pratt & Brody, 2008; World Health Organization, 2004) and PTSD is one of the fastest-growing anxiety disorders being diagnosed in our society currently (CTPTSD, 2007). Primary care physicians are considered to be the comprehensive care provider as well as the gatekeeper or first contact of patients suffering from a mental health disorder (Cole et al., 1995; Louch, 2009; Strain et al., 1986; Tiemens et al., 1999). It is vital that they accurately diagnose and treat mental health disorders. In the current study, PCPs in the fixed avatar-based group performed better at diagnosing PTSD than the text-based group and the choice avatar group. PCPs in the choice avatar group and fixed avatar group diagnosed MDD at about the same rate, but both avatar groups performed significantly better than the text-based group. The results of this study generally support the use of

avatar technology in medical and mental health training. There remains a need to train PCPs to diagnose mental health disorders and to develop more efficient, organized, and cost effective training tools, as well as training tools that can be widely disseminated. Due to cost effectiveness, online presentation, and advanced technologies, avatars offer such advantages (Kenny et al., 2008; 2009; Triola et al., 2006). Avatar-based clinical encounters show potential as a means of rapidly disseminating much-needed medical education on the detection and eventually possible management of mental health disorders (Caspar, Berger & Hauttle, 2004; Satter et al., 2012; Triola et al., 2006).

Many physicians have little training in diagnosing and treating mental health disorders (Schonfeld, 1997; Wang, Berglund, & Kessler, 2000; Wang, Demier, & Kessler, 2002; Wang et al., 2005). In the current study most participants had moderate to low levels of such training. Researchers have concluded that primary care practitioners without mental health training indicated that the lack of knowledge of how to diagnose depression was an important barrier to effective management of depression (Richards et al., 2004). Richards et al. (2004) concluded, “Participation in mental health training by [general practitioners] appears to be related to their attitude toward depressed patients and to their confidence and abilities to diagnose and manage the common mental disorders effectively” (p. 795).

Physicians need to become more knowledgeable about diagnostic criteria, but they also need to learn how to effectively gather the diagnostically relevant information in order to detect these disorders (Richards et al., 2004). Using

avatars to aid physicians in posing appropriate diagnostic questions offers advantages over using text-based cases. Additional educational benefit may be gained by using automated text analysis to provide physicians with feedback based on the extent to which their case diagnostic summaries cover relevant content (Caspar, Berger & Hauttle, 2004).

The findings in this study indicate that avatar technology aided the participants in diagnosing MDD and PTSD better than traditional text-based methods employed to train PCPs to diagnose. Regardless of experience level the fixed avatar group outperformed the text-based group for both cases. Avatar technology used in medical training can be user-friendly and can reach physicians world-wide to further expand physicians' diagnostic capabilities with mental health disorders. The ability to overcome challenges involving realistic doctor-patient interactions through using avatars to simulate those interactions instead of the traditional text-based methods can offer robust training that could be potentially transferred to real environment performance (Triola et al., 2006).

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APPENDIX A
RECRUITMENT FORM

Dear Potential Participant,

I am a graduate student under the direction of Professor Richard Kinnier in the Counseling Psychology Department at Arizona State University. I am conducting a research study to evaluate diagnostic training tools.

I am recruiting individuals to complete a training program where you will be asked to diagnose 2 cases. Three types of training programs including traditional paper-based and two different types of online training tools incorporating virtual avatars will be evaluated for their efficacy as types of training programs. You will be randomly assigned to one of the three training programs. The total time spent to administer the study will range between 10 and 30 minutes. Your participation in this study is voluntary.

Identifying information will not be reported. If you have any questions concerning the research study or would like to be a participant, please email me at

Rachel.satter@asu.edu or call me at (608) 295 - 7202. I will set up an appointment with you to meet at your office at your convenience.

Your participation is greatly valued and I understand the time constraints that you may have and so you will be paid for your participation in the amount of **\$30.00 cash** upon completion of your participation. Thank you for your consideration of being a participant, your feedback is vital to this research.

Sincerely,

Rachel Satter

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

Instructions: Please fill out the following form by either circling or write out your response as it pertains to you.

What is your gender? Female Male

What is your ethnic/racial identity?

Caucasian (White) Latino/a (Hispanic) African American (Black) Native American Asian
or Other (if other please specify):_____

Please write out your response:

What type of previous training have you received in mental health disorders? Please be specific (e.g., consulted on a couple cases 1st year of residency with a psychiatric faculty member or attended a workshop on..., etc...):

Please indicate the length of time spent on the previous training you received in mental health disorders? Again, please be specific (e.g., 4 hours in one year or 3 weeks out of the year, etc...):

APPENDIX C

CASE 1: MDD AND CASE 2: PTSD IN TEXT FORMAT

Instructions: Please read through each case in its entirety and after each case please write a diagnosis for each case on the diagnostic form provided.

Case 1:

Ms. E, a 34-year old single mother of two, presents with a six month history of recurrent headaches and sleeplessness. The symptoms began when she lost her secretarial job on account of staff cutbacks. She has been unable to find work since, and presently finds she does not have the energy to search for further work, and instead spends her days in bed. Her headache is inconsistent in nature, and she describes this as a general tightness about her forehead. It affects her concentration, and makes it difficult for her to consider preparing a resume, or looking for further work. These symptoms vary in their intensity, but she cannot remember the last time she slept well.

Upon further questioning, the patient reports that although she is able to fall asleep, she is unable to sleep through the night. When waking during the night she becomes agitated, and paces frenetically worrying about her lack of work, and the financial demands of supporting her two children. She admits that these concerns preoccupy much of her thoughts during the day also. She says that she does not feel very good during the day: she describes herself as being very tired almost every day, feeling generally “sluggish” and has trouble concentrating for more than a few minutes at a time.

Currently, she is no longer able to enjoy her usual recreational activities reading, playing with her children or watching movies. The patient describes feeling very guilty about her inability to cope with the financial demands of her two children. She says she feels like a failure as a parent, and is constantly apologizing to her mother, who is looking after the children presently, for the additional burden placed on her.

This is the patient’s first visit at this clinic. The patient's medical history includes an episode of Hepatitis A contracted in her early twenties which resolved without residual effects. She also complains of frequent lower back pain, for which she self-medicates with non-prescription analgesics. She also takes Propranolol twice daily for hypertension, which was first diagnosed just under a year prior to this visit. She drinks socially, has no other history of substance use. Over the past few weeks she has tried using over-the-counter treatments for insomnia; these have not been tremendously helpful. Ms. E reports that she has lost her appetite over the past few months. She rarely eats and when she does it is usually once a day in the evening with her kids. Physical examination and laboratory tests reveal no abnormalities.

Case 2:

Mr. D is a 32-year-old construction worker, who was referred by the ER after sustaining mild whiplash when reversing his car into a tree while intoxicated. His records show that he was recently hospitalized after being badly beaten when attempting to break up a bar fight involving strangers who turned out to be members of a notorious local gang. He sustained several fractured ribs, as well as a fractured cheekbone. Although he lost consciousness during the assault, imaging investigations conducted in the hospital were normal. He complains of feeling anxious since the incident, which took place five weeks previously.

Although Mr. D appears confident, he was observed chain-smoking prior to the interview, and is constantly fidgeting and glancing around the room. He confesses to a concern that the gang members, who are known to frequent his neighborhood, will return to “finish what they started.” He reports having no other events like this occurring in his life now or prior to the incident. He is also having difficulty sleeping on account of this fear, and finds himself thinking back to the incident frequently, and blames himself for meddling in affairs that are none of his concern. He admits to drinking more than before the incident, to “help him sleep,” as he is afraid to drink at his local bar and he has been drinking alone at home where he will finish off half a bottle of Jim Beam. Prior to the incident he would go to the local bar once or twice a week to socialize and watch sports games; and when he was there he would only have a few beers.

He felt he was happier in hospital, where the staff members were friendly and he felt safe. Since returning home he has had frequent nightmares about the assault. He is scheduled to begin a contract in a week's time, but is afraid to leave the house on his own. He feels numb inside, and says he would rather not talk to his old friends as he no longer feels like himself. He also states his relationship with his girlfriend of 3 months is also suffering because he always wants to stay home and she complains that he is drinking too much. She has been pressuring him to see someone. He describes his current situation as hopeless and is afraid he is going to lose his job, his friends, and his girlfriend. He has no prior psychiatric history, nor any history of head injury preceding the recent assault.

APPENDIX D

DIAGNOSTIC FORM

Please provide a diagnosis for Case 1:

Please indicate how confident you are with diagnosing case 1. On a scale from 1 to 7 rate how confident you are with accurately diagnosing this case by circling your rating. A rating of 1 indicates no confidence in your ability to diagnose case 1 accurately up to 7 which indicates extremely high confidence in your ability to diagnose case 1.

Not at all confident		Somewhat confident			Very confident
1	2	3	4	5	6 7

Please provide a diagnosis for Case 2:

Please indicate how confident you are with diagnosing case 2. On a scale from 1 to 7 rate how confident you are with accurately diagnosing this case by circling your rating. A rating of 1 indicates no confidence in your ability to diagnose case 2 accurately up to 7 which indicates extremely high confidence in your ability to diagnose case 2.

Not at all confident		Somewhat confident			Very confident
1	2	3	4	5	6 7

APPENDIX E

VIRTUAL AVATAR SCREENSHOTS

Avatar Screen shot of Scenario 1 (MDD Case)

Avatar Screen shot of Scenario 2 (PTSD Case)

APPENDIX F

QUESTION/RESPONSE TREE

MDD: Question/Response Tree

Question	Response
1 What brings you here today?	<i>2 I have been having headaches off and on for the past six months. I never used to get headaches and now I have them well, all the time really.</i>
3 Tell me about: your headaches?	<i>4 It's like a tightness in the front of the head, not real sharp, more dull. It's always there. Definitely it's more on than off lately.</i>
5 What else? (<i>first time</i>)	<i>6 Well, maybe because of the headaches I can't sleep – or who knows maybe because I don't sleep I get the headaches. It's awful. I just lie there and stare at the ceiling... I don't want to read because I heard once that turning on the light sends, you know, a signal to your brain that it's time to wake up and start the day. So I just sorta lie there.</i>
7 Have you been taking anything? Have you found anything that helps?	<i>8 I find that Advil can help me sleep – but only for a two hours. That also seems to help with the back pain that I have. I can't remember the last time I slept well and woke up refreshed.</i>
9 Do you take any other medications (drugs)? (<i>second time</i>)	<i>10 Yes, last year, my doctor, well the one before I lost my job prescribed Pro...uh... Propranolol for high blood pressure. I guess it's helped. Does the sleeping tea count as a medication? 13/57</i>
11 When exactly did your symptoms start?	<i>12 About six months ago, not a year ago when I started the blood pressure meds. That was rough time, six months ago, because my company had to cut back 50% and I was one of the newer employees, so they let me go. I mean, I had been there four years, but I was still one of the newest. 45/13/47</i>
13 Tell me more about: Your job?	<i>14 Not much to tell. I really liked the job. I have not been able to find another one. The market is tight I guess... Also, I just don't have the energy to rewrite my resume, with not sleeping and the headaches and all. 17</i>

15 Tell me about: your living situation?/Tell me about home?

16 Well, me and the kids. I have two in middle school, we're now back living with my mother. That is difficult. Not because she isn't a great help – but you know – I feel guilty. I am a grown woman living with my mother again. How embarrassing is that. But my ex doesn't make much money either, and I guess times are hard for everyone. 49

17 How do you feel now?

18 I feel sluggish all the time

19 Have you ever felt this way before?

20 Well, remember when you would have a big test or something and you study a few nights in a row, or you just don't sleep like when you come home with a newborn – I feel sorta like that. Um, drained. I guess when Brent and me got divorced I felt like this. Trouble sleeping. But, back then I would pace the room all night, you know, I had like no sleep but I did

21 How did that resolve itself?

22 It all stopped after a few months and I was able to sleep again.

23 Tell me about: your drinking?

24 I drink socially. 25

25 Could you be more specific?

26 When I am at a party or out with people I will have a wine or a Jack and coke, but, you know, never more than two.

27 Do you use anything else?

28 (pause) Oh, I know what you mean. No.

29 Have you ever thought about killing yourself?

30 Jeez, no. I mean I have two kids.

31 Have you ever been hospitalized?

32 When I was 25, I got Hepatitis. I think it was the A kind. Anyway, I took what they prescribed and it went away. It's never been a problem. I guess I have high blood pressure, too, but I take the Propranolol, so maybe I don't have it anymore. Yeah, and I do have this lower pain thing as well, and I take Advil for that.

33 Are you taking anything: to help you sleep?

34 I need something to help me sleep. That's really why I'm here to see you. I tried Nyquil one night but felt even worse in the morning. I bought some of that tea – uh, Valerian – you know it smells like stinky socks but it tastes ok. I slept almost

- four hours with that – but I felt weird the next day. Kind of sad. I just want something that will make me feel refreshed in the morning.*
- 37 How is your appetite? (Are you eating?; Tell me about meals?) *38 Mmmm, I have no interest in food now, it's like I'm too tired to eat. I pretty much just eat only with the kids at dinner time. I used to love to cook, too. But my mom seems to be doing more of that now I guess...*
- 39 Have you lost or gained weight recently? *40 I really don't know. I don't have a scale.*
- 41 Do headaches run in your family? *42 No, my mother never mentioned them. My father died when I young, it was an accident. I don't think he had them. My brother doesn't complain about that, but I will ask him next time we talk, around the holidays.*
- 43 Do you talk to anyone else about this? *44 I try not to bring my mom down. Her plate is full. I guess I used to call my old co-workers at first and chat, but who wants to heard about how icky I feel? Yeah, I guess I don't call them anymore anyway, the ones who were let go with me already found new jobs...*
- 45 Tell me about: your hobbies? What do you do during the day? *46 Well I used to like to read and garden, when the kids come home from school we would always go out somewhere either to the park or a movie, but now I am just so tired I don't go out much*
- 47 Tell me about: The stress in your life *48 Ha, where to start. I know I have to work on my resume. I think my unemployment runs out next month. It's hard to get them on the phone to really find out. I guess that's the main one.*
- 49 Are you a member of a support group? Would you join a support group? *50 Uh, I don't know. Why? Like for what? "Loser single moms who can't find a job"?*
- 51 Tell me about: Family history of * mental illness *52 My grandfather – on my father's side - had a thing where he wouldn't leave the house. As he got older, he just refused to leave. He died kinda young too, like 60.*
- 53 Tell me about: Family history of - * suicides *54 There are none... that I know of.*
- 55 Tell me about: Family history *56 I don't know of anyone like that. I*

of - * high energy or mania

57 Tell me about: Family history
of - * high blood pressure

59 Tell me about: Family history
of - * insomnia

61 Have you ever been
diagnosed with sleep apnea?

63 Is there anything you haven't
mentioned yet that you think I
should know?

71 Were there any manic
symptoms in her previous
episode of possible depression?

73 How did your father die?

77 Do you engage in any self-
harming behaviors, like cutting?

Do you have thoughts of
harming others? Do you ever
forget where you are or totally
forget what you are doing? Do
you hear voices? Do you ever
feel more stressed or tense
around your menstrual cycle?

79 How long have you been
taking Propranolol?

Tell me more about your sleep

What else do you want to tell
me?

could use a little of that right now!

*58 My mother has that, too. And she said
that probably her mother had it as well,
but they didn't know what it was at that
time.*

*60 No one has ever talked to me about
that. I don't guess we have one. Although
my kids never want to sleep - maybe they
caught it from me?*

62 What's that?

*64 (pause) It was hard to even come here.
It's hard to just get dressed and out of the
house now.*

*72 No. (pause) No, I don't think so.
(pause) Not really.*

*74 He was in a car wreck. It was strange.
It was a single car accident so we don't
really know what happened.*

78 No

*80. "It's been a few years now. Three
maybe four."*

*69 I have some trouble falling asleep
initially, but I usually wake up around 3
or 4 and I can't get back to sleep*

*69 I have some trouble falling asleep
initially, but I usually wake up around 3
or 4 and I can't get back to sleep*

PTSD: Question/Response Tree

Question

1. So, what brings you here?

3. Let's start with why you were in the hospital (1).

5. What happened at the hospital after the accident?... at the ER? Why did they take you to the hospital?

7. Why do you think they referred you to me? Why do you think you're here? (2)

9. Had you been drinking before the accident?

11. How much (alcohol) do you drink a day? Tell me about your drinking.

13. Exactly how much do you drink?

15. In the past year, have you drunk or used drugs more than you meant to?

? When and where do you drink?

18. Why do you think you drink so much?

20. Do you feel annoyed when some talks to you about your drinking?

22. Have you felt you wanted or needed to cut down on your drinking in the last year?

24. Do you agree, do you think you should cut down?

Answer

2. You tell me. My insurance made me come for a follow-up. 3/7

4. I backed into a tree. It sounds lame, but I was really mad at someone and I wasn't concentrating. I have a very clean record. No one was hurt. 5/7/9

6. They were worried I had whiplash. And I guess I do, but it's pretty mild. It's no big deal. Not sure why I'm here now. 7/9

8. I don't know.... to get a follow-up? Make sure there is nothing lasting that would make my insurance increase? I guess my neck did hurt for a week or so. 9/15

10. Umm, yeah, I had been drinking a little at the time, but believe me I have a very clean record. I work construction, you can't have a bad driving record. I'm training to be a manager. 11/15/20/50/?

12. Probably like the average guy. It's just beer. It helps me sleep. 13/15/?/20/44/54

14. I dunno. Half a case a day... 15/?/18/20/22

16. Well, I don't use drugs. (Dead end)

17. After work, of course. So, you know, when I get home at 4:00PM. I don't go out much anymore. 22/26/42

19. I guess for the reasons we all do. Feels good, helps me sleep. That is so not a problem in my life 20/44/54

21. Oh yeah, like now. (Dead end)

23. I don't know. My girlfriend would say yes. 24/40

25. Who knows. She seems mad about a lot these days 10Be complains we don't go out

any more, too. 26/40/52

26. Why don't you go out any more?

27. *It's just not fun anymore. There are too many jerks out there, man.* 28

28. What do you mean there's too many jerks out there?

29. *Well, I guess I did something stupid, though it didn't seem like it at the time. There was a fight in my old bar and I tried to break it up. I didn't even know the guys, but they were tearing up my bar! Anyway I got knocked around, broke three ribs. It doesn't hurt anymore.* 31/34/36/38

31. If you stay out of fights you'll be ok, right? Are you still having problems with that. (2).

31. *No, I dunno. They were members of gang. I really think they are looking for me. (Dead end)*

34. What did the doctors do at the hospital after the fight? (What happened at hospital? What was prognosis? (2)

35. *They fixed my ribs and stitched my fractured cheekbone. Really, it was no big deal. (Dead end)*

36. Tell me more about the fight.

37. *Man, I don't really want to talk about it, ok? (Dead end)*

38 Did they give you pain medication after the fight? How do you feel now?

39. *I finished those meds off. There's no pain now. It's just that everything feels sorta crappy... My life feels different after that fight.* 50

40. Tell me about your relationship with your girlfriend.

41. *Well, my girlfriend says I am different. That I never talked much to begin with, but now I don't really at all. And um, I don't think about sex all the time now - but that's pretty normal after three months with someone, right? Really, I just want to hang at home.* 42/52

42. What do you do in the evenings?

43. *Well, one thing we DON'T do is go to my old bar down the street anymore. Just driving past it makes me feel weird. We watch TV a lot. I dunno, she used to like watching TV. I can't sleep now unless the TV is on.* 44/54

44. Tell me about your sleep.
46. How often do you have nightmares?

45. *There's not much to tell. I don't sleep anymore! I drink beer to get me down, but if I wake up in the middle of the night then I can't get back down. If I have a nightmare that's it for the night.* 46/48/54
47. *(Long pause.) Every night now. (Dead end)*

48. What are the nightmares about? What do you dream at night?

49. Well. I guess...about the fight, always the fight. I wake up all sweaty and have to shower before work now. Funny, huh? I'm the sweetest smelling construction worker in town. 50

50. How is work going? What about other aspects of your life?

51. That's all fine. I really like my job, like being outside- but I am training to be a manager. I don't wanna be outside when I'm older, you know, those old guys always have physical problems. That won't be me. (Dead end)

52. Do you want to go out more with your girlfriend? Do you miss getting out?

53. (Looks profoundly sad as he relates this) Well, we tried last week. We actually went to a restaurant with some friends. And this, like, waitress she drops a huge tray of plates and things and it was so loud that it made me jump out of my seat. That was unlike me...but then I couldn't get settled back down. I made her leave before we finished eating... 54

54 Anything else I should know?

55.No. Can I ask you a question? How long do you think I will be jumpy? And how can I sleep through the night? Maybe you should prescribe me some sleeping pills today. (Dead end)

APPENDIX G

WRITTEN INSTRUCTIONS FOR RATERS DIAGNOSING MDD & PTSD

Instructions: Using the written guidelines below please rate each of the diagnoses. Please rate each diagnosis on a scale from 1 - 7 with 1 being not at all accurate, 4 being somewhat accurate, and 7 being very accurate. Please use the following guidelines to help make your decisions.

Rating Guidelines for MDD Case

Rating	Example Diagnoses Matching Corresponding Rating
7 = Very Accurate	<i>Major Depressive Disorder (single episode)</i>
4 = Somewhat Accurate	“depression,” “mood disorder,” and any other disorders that fit under the mood disorder spectrum
1 = Not at all Accurate	“borderline personality disorder”

Rating Guidelines for PTSD Case

Rating	Example Diagnoses Matching Corresponding Rating
7 = Very Accurate	<i>Posttraumatic Stress Disorder & Alcohol Abuse</i>
4 = Somewhat Accurate	“anxiety disorder,” “acute stress disorder,” “substance abuse,” and “substance dependence”
1 = Not at all Accurate	“paranoid personality disorder”

*These are not precise ratings, but using your best judgment please rate the diagnoses to the best of your ability on a scale from 1 to 7 (i.e., 1, 2, 3, 4, 5, 6, or 7).

APPENDIX H

WRITTEN INSTRUCTIONS FOR RATERS RATING TRAINING EXPERIENCE IN

MENTAL HEALTH

Instructions: Using the written guidelines below please rate each of the mental health training experiences of each of the PCPs. Please rate each experience on a scale from 1 - 7 with 1 being no experience or training at all, 4 being some prior experience or training, and 7 being a high level of experience. Please use the following guidelines to help make your decisions.

Rating Guidelines for Training Experience in Mental Health

Rating	Example Diagnoses Matching Corresponding Rating
7 = High Level of Experience or Training	Quality = “Fellowship training program in Psychiatry or Psychology,” “Residency training program in Psychiatry or Psychology,” Internship training program in Psychiatry or Psychology,” “Major rotation in internship, residency or fellowship training program,” “ Significant part of medical school training” or “Combination of 2 or more of listed experiences in category below, with 6 months or more of experience” Quantity = 6 months or more
5, 6	
4 = Some Prior Experience or Training	Quality = “A workshop; “ One class/coursework,” “Attended lectures or consults,” “Part of side job” “Part of internship, residency, or fellowship rotation as an elective” Quantity = “Several hours,” “2-3 weeks,” “1 month – 3 months,” Basically, “anything less than 6 months”
2, 3	
1 = No Prior Experience or Training	No training, “zero hours”

*These are not precise ratings, but using your best judgment please rate the person’s level of experience to the best of your ability on a scale from 1 to 7 (i.e., 1, 2, 3, 4, 5, 6, or 7).

APPENDIX I
IRB APPROVAL

Office of Research Integrity and Assurance

To: Richard Kinnier
EDB

From: Carol Johnston, Chair
Biosci IRB

Date: 07/02/2010

Committee Action: Exemption Granted

IRB Action Date: 07/02/2010

IRB Protocol #: 100600288

Study Title: Diagnosing Mental health Disorders in Primary Care: Evaluation of a New Training Tool

The above referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46, 101(b)(2).

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

You should retain a copy of this letter for your records.

APPENDIX J

COPYRIGHT PERMISSION FOR THE EVANS & GADD FIGURE (EMAIL
CORRESPONDENCE)

Hi Rachel,

No, no fee for dissertation use.

I look forward to hearing from you.

Very best,

Pamela Quick
MIT Press Permissions

On 2/17/12 1:57 PM, "Rachel Satter" <rsatter1@yahoo.com> wrote:

Hello Pamela,

Do I also have to pay the charge for my dissertation?

Regards,
Rachel

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From: Pamela L Quick <quik@MIT.EDU>
To: Rachel <rsatter1@yahoo.com>
Sent: Friday, February 17, 2012 11:19 AM
Subject: Re: Permissions & Rights Info, Books

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Very best,

Pamela Quick
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