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FROM THE EDITOR'S DESK

Hello, World!

For all the readers of the *Journal of Psychological Inquiry*, you may have begun to wonder if another issue of the journal would ever see the light of day; the most recent issue of JPI was published in Fall of 2016. After serving for five years as managing editors of JPI, Jennifer Bonds-Raacke and John Raacke moved on to greater challenges, so a search was initiated to find someone to assume the role in their absence.

Over the past several years, my students and I published numerous articles in JPI, so I was well aware that it is a terrific outlet to showcase the research projects of undergraduate students in psychology. When I became aware of the vacancy at JPI, I wondered if there was any way I could fill the role myself, but I hesitated because Jennifer and John are a tough act to follow. At the same time, the journal has always been a precious resource for undergraduate psychology students, so I realized that taking the helm at JPI would be an extremely worthwhile pursuit.

In putting together this issue of JPI, I have benefited from lots of help from lots of people. When the previous issue was published, Jennifer and John had already accepted all the articles that appear in this issue. By accessing the articles already in the pipeline, I was able to put together this issue without having to solicit any new submissions. However, that means that the researchers who wrote the articles that appear here have had to wait patiently for their hard work to be presented to the public. I am grateful for all their patience. My graduate assistant, Autumn Taylor, and I spent much of the fall learning about how to edit and

get a journal issue into final form, making many mistakes along the way. I have to marvel at Autumn's hard work, and I could not have done it without her help. And finally, with new management, I thought it was a good opportunity to present a new face for the journal. With no discernible artistic skills of my own, I turned to Lisa Davis, a talented graphic artist at the University of Central Arkansas. Lisa created the wonderful cover art, which is reminiscent of the previous cover, but is also freshly reimagined. Lisa also provided guidance for me and Autumn as we learned how to become copyeditors.

Now that JPI is back online, I hope that all the undergraduate students who have carried out research projects and hoped to publish their work will submit their papers to us. I will do everything I can to emulate the success enjoyed by JPI while Jennifer and John were managing editors. This includes continuing their policy to publish articles describing empirical work, literature reviews, and special features. Special features include articles evaluating a controversial issue; analyzing a movie, television show, or current event in light of psychological concepts; or describing a teaching technique used by a professor that the student considered to be particularly useful.

I hope to see students presenting their work at conferences in the spring. If you see me, please stop me to ask any questions about the journal.

Ken Sobel
University of Central Arkansas
Managing Editor

TRAUMATIC BRAIN INJURY AND POSTTRAUMATIC STRESS DISORDER
IN RECENT COMBAT VETERANS

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Abstract - Military deployments in support of Operations Iraqi and Enduring Freedom have been associated with an increased incidence of both posttraumatic stress disorder and traumatic brain injury among soldiers. These disorders are recognized as the signature injuries experienced by military personnel who served Iraq and Afghanistan during these conflicts. Both disorders can significantly impair the functioning of soldiers, and are frequently comorbid conditions among the recent combat veteran population. This paper provides information about traumatic brain injury and posttraumatic stress disorder, investigates the convergence of these diagnoses in recently deployed combat veterans, and discusses implications for future management and treatment options.

Since October 2001 approximately 2 million members of the United States armed services have deployed to Iraq and Afghanistan in support of Operations Iraqi and Enduring Freedom (OIF/OEF), and these conflicts have resulted in the greatest proportion of wounded-to- killed soldiers ever recorded in US history (Bush, 2010). A higher rate of survivability is a result of improved body armor worn by soldiers in combat, and also the availability of medical care on the front line in combat theatres; however, surviving military personnel are also left with complex physical and psychological injuries. Thousands of veterans returning home following deployment are suffering from symptoms of posttraumatic stress disorder (PTSD), traumatic brain injury (TBI), and frequently both (Fischer, 2014). The two diagnoses are found to have a high comorbidity, in addition to a high occurrence among these soldiers. Collectively referred to as the signature injuries associated with OIF/OEF veterans, these disorders are distinguished as particularly prevalent results of the Iraq and Afghanistan conflicts.

The relationship between combat acquired TBI and PTSD has received considerable attention and discussion in the context of these military operations, and many studies reveal a high rate of both conditions in

service members deployed to combat theatres in Iraq and Afghanistan. Independently, these invisible injuries prove difficult to understand, diagnose, and treat; co-occurrence further complicates treatment planning. In order to provide the best possible care to soldiers returning from combat, a great deal of recent research is dedicated to investigating each diagnosis and exploring the relationships between the two. It essential to develop an understanding of the complex physical and psychological similarities and interactions that are present in this population to provide ideal clinical outcomes.

Overview of Traumatic Brain Injury

TBI is reportedly the most common type of physical injury sustained by combat soldiers returning from Iraq and Afghanistan. High winds and flying debris produced by powerful explosions, and exposure to blast pressure waves are identified as the most common mechanisms of injury (Maguen, Lau, Madden, & Seal, 2012; Bush, 2010; Kennedy & Moore, 2010). According to the U.S military casualty statistics for OIF/OEF veterans, there have been approximately 339,400 service members treated within the Veteran's health system for combat-acquired TBI (8,500 of those cases defined as penetrating and severe trauma) since 2000 (Fischer, 2014; U.S.

Department of Defense, 2015). A second report suggests that an additional 30,000 veterans are seeking treatment outside of the U.S. Department of Veteran Affairs

Definition and Diagnosis

There is some ambiguity among health care agencies and persons who provide care to veterans of overseas operations in regards to a specific definition of traumatic brain injury. The diagnosis may imply different meanings to each clinician or researcher, as it encompasses a wide range of injury characteristics and eventual recovery outcomes (Bush, S. S., 2010; Kennedy & Moore, 2010; Vasterling, Bryant, & Keane, 2012). However, both the Department of Defense (DOD), and U.S. Department of Veteran Affairs (VA) agree upon the following specific diagnostic criteria for determining TBI: a) loss of or decreased level of consciousness, b) loss of memory for events immediately before or after the injury, c) alteration in mental status at the time of the injury (confusion, disorientation, slowed thinking), d) neurological deficits (weakness, balance disturbance, sensory alterations), and e) possible findings of intracranial abnormalities (contusion, axonal injury, hemorrhage) (Kennedy & Moore, 2010; Vasterling et al, 2012). TBI can be either penetrating, when the meninges of the brain are disrupted by a foreign object or fragment of bone from the skull; or closed, where there is no penetration into the brain, yet the brain is damaged by an outside force acting on the head. The selection criteria for inclusion in this review excludes all instances of penetrating head trauma, but include any instance of blunt trauma resulting in disruption of, or alteration in, normal brain function that also meets the aforementioned DOD and VA criteria for TBI.

There are a number of forces that can lead to a traumatic alteration in brain structural integrity and/or disruption of brain function. Among these forces are direct external mechanisms that lead to blunt force trauma, such as the head being hit by an object that was in motion, or the head violently striking a stationary object. Another common mechanism of injury is not related to external trauma, but rather is due to rapid, forceful acceleration and deceleration movements causing the brain to come into violent contact with the inside of the skull. A third common mechanism, which is typically limited to combat veterans, is exposure to forces generated by a blast wave or an explosion (Bush, 2010; Chen & Huang, 2011; Kennedy, Leal, Lewis, Cullen, & Amador, 2010). Being exposed to a blast may also cause soldiers to strike their head on objects or on the ground, compounding the brain injury with exposure to multiple mechanisms.

Pathophysiology and Symptoms

Regardless of the mechanism of injury, the pathophysiology of each traumatic brain injury will have very similar characteristics, and injuries should be considered on both micro- and macroscopic levels. The first physiological changes that occur within the brain following significant insult relate to microscopic changes; at the moment of impact, severe strain is placed on the central white matter of the brain, and immediate axonal damage occurs. At this stage there is interruption in the integrity of cellular and vascular membranes, leading to a release of intracellular contents, and resulting in cerebral edema (an accumulation of intra-and extracellular fluid leading to swelling of brain tissue), and impairment of the cerebral blood flow. Failure of the cell membrane leads to necrotic cell death, which is rapid following injury. A number of chemical changes within the brain during the immediate post-trauma period cause an abnormal imbalance of ions and neurotransmitters that leads to neurotoxicity and eventual apoptotic cell death (Bush, 2010; Kaplan, Vasterling, & Vedak, 2010; Kennedy & Moore, 2010; Brenner et al., 2010).

Shortly after a TBI occurs, additional complications related to impaired oxygenation of brain tissue and decreased blood flow may become apparent. These complications occur as a result of hypotension and blood vessel damage, which are a secondary response to the mechanical injury. Cerebral edema, and in some more severe cases, brain hemorrhage, may lead to increased intracranial pressure (ICP); this brain swelling is a direct consequence of disruption of the blood-brain barrier that occurs during traumatic injury (Kennedy & Moore, 2010; Schneiderman, Braver, & Kang, 2008). Consequences of increased ICP can be catastrophic; worsening neuronal injury, seizures, coma, and death are all potential outcomes.

The most common macroscopic manifestations of TBI are found to be gray matter contusions. These contusions are most frequently, although not exclusively, located in the inferior, lateral, and anterior aspects of the frontal and temporal lobes. Also observable in some cases is subdural hemorrhage, most frequently isolated to frontal and parietal convexities (Schneiderman et al., 2008).

As a consequence of the structural injury, persistent postconcussive syndrome (PPCS) can develop. PPCS is characterized by a pattern of lingering symptoms after recovery from acute TBI, and is likely related to persistent cerebral dysfunction. There are a number of physical symptoms that can be measured objectively, as well as by subjective report, that are associated with TBI and are typical of PPCS. These complaints include chronic

headache, generalized weakness, dizziness, poor coordination and balance, numbness and tingling in the extremities, hearing impairment, tinnitus, visual disturbances, fatigue, insomnia, and endocrine disorders (Bush, 2010; Kennedy & Moore, 2010).

In addition to these somatic manifestations, a number of psychological complaints may also be present with both acute TBI and associated PPCS. These include attention deficits, decreased information processing speed, difficulties with short-term memory, symptoms of depression and anxiety, anger, hyperarousal, irritability, aggression, and substance abuse (Thomas & Harris, 2012; Vasterling et al., 2012).

Overview of Posttraumatic Stress Disorder

The Congressional Research Service reports approximately 119,000 recently deployed service members have been or are being treated by VA health services for new-onset symptoms of PTSD since 2001. An additional 34,000 veterans who were not deployed, but served in the United States during OIF/OEF have been treated at VA health facilities for symptoms of PTSD. Population based studies, which include veterans who seek care outside of the VA system, estimate 14% of OIF/OEF combat veterans currently experience PTSD (Fischer, 2014).

Definition and Diagnosis

Military duties, particularly those common to veterans who experience wartime deployment, are frequently associated with a risk of exposure to threats to life and health, as well as other forms of extreme psychological stress. Posttraumatic stress disorder is an anxiety disorder that can occur when an individual has experienced direct exposure to a terrifying or life-threatening event, such as warfare and the associated consequences. The traumatic event may be either physically or psychologically experienced; it may be experienced personally by the individual suffering from symptoms of PTSD, or that person may witness the traumatic event as it is experienced by another individual. The traumatic events most frequently reported by recently deployed service members include: witnessing the unnatural death or serious injury of a fellow soldier, incurring a serious injury in the course of deployment and combat, experiencing and witnessing acts of brutality and assault, experiencing or witnessing a severe motor vehicle accident, and/or being involved with any incident that is associated with the detonation of an explosive device (Brenner et al., 2010; Bush, 2010; Capehart & Bass, 2012).

Not every person who experiences a traumatic event develops symptoms and a subsequent diagnosis of PTSD. Why some individuals are susceptible to experiencing symptoms of PTSD following a traumatic

event and others are not is a point of continuing investigation. It is suggested in recent studies that among deployment-related factors, combat experience, repeated deployments, and close proximity to explosions and blasts all are positively correlated with the development of post-deployment PTSD (Golding, Bass, Percy, & Goldberg, 2009; Jones, Young, & Leppma, 2010; Schneiderman et al., 2008). In addition, separate studies have suggested that TBI incurred in combat may increase, and potentially double, the risk for PTSD (Chen & Huang, 2011; Kennedy et al., 2010; Walker, Clark, & Sanders, 2010; Yurgil et al., 2014).

Pathophysiology and Symptoms

PTSD is a disorder that manifests itself in physical and psychological symptoms. Physically, frequent complaints include chronic headache, various somatic/pain complaints with no medical explanation, an increased psychomotor response, intermittent muscle weakness, fatigue, insomnia, and frequent dizziness. Psychological complaints that are hallmark to the diagnosis of PTSD include: feelings of fear and helplessness, mental flashbacks to the traumatic event, frequent nightmares, intrusive memories that may interfere with daily functioning, feeling of dissociation, avoidance of people and situations, irritability, anxiety, emotional numbness, inability to experience pleasure, emotional blunting, anger, poor short term memory, difficulty concentrating, depression, aggression, and hyperarousal. Veterans who are diagnosed with PTSD also demonstrate an increased risk of developing patterns of substance abuse, and are at risk for experiencing suicidal ideations, plans, and attempts (Brenner, Vanderploeg, Haley, & Terrio, 2009; Moore & Penk, 2011).

Although PTSD is largely regarded as a psychological phenomenon, increasing research provides evidence that there are biological components to this disorder as well. Neuroimaging techniques are employed to study the brains of OIF/OEF veterans who return from deployments experiencing symptoms of PTSD. These images provide support for theories that suggest alterations in normal structural and functional neuroanatomy, particularly in the hippocampus and prefrontal cortex, contribute to the development and experience of PTSD. In addition, there are a number of neuroendocrine abnormalities found in individuals who have been diagnosed with PTSD, as well as the suggestion that genetic influences may account for vulnerability to traumatic event response (Kaplan et al., 2010; Pittman et al., 2012).

PTSD and TBI Comorbidity

As a result of the conflicts in Iraq and Afghanistan, there is an increased focus on both the psychological and

biomechanical effects of combat. Until recently, the overlapping pathophysiology and neuropsychological components of TBI and PTSD, and frequency of co-occurrence, received little attention. This may reflect traditional ideas that PTSD and TBI are diagnoses in which the component of trauma means very different things to care providers: Mental health professionals generally understand trauma to signify a psychological event that involves the threat of harm or loss of life, and is associated with extreme fear. Whereas, practitioners of physical medicine associate the term trauma with biomechanical forces acting on the anatomy of a person's body (Brenner et al., 2009; Bush, 2010). By recognizing that there is a convergence of the two disorders, a significant step can be taken towards understanding how best to care for combat veterans who have been exposed to both psychological and biomechanical insults.

OIF/OEF: The Veteran Experience

During recent troop mobilization in Iraq and Afghanistan, U.S. soldiers have been exposed to multiple conditions that increase their risk of incurring a traumatic brain injury and developing PTSD. Predominant deployment-related risk factors common to both PTSD and TBI are identified as: combat exposure, being in close vicinity to blasts and explosions, and repeated deployments.

Sustained ground combat is a defining characteristic of the OIF/OEF conflicts, with deployed personnel reporting very high levels of combat experience. Many combat veterans who served in the Iraq and Afghanistan conflicts report seeing multiple instances of injury and death, and being exposed to multiple blast/shock waves. A study by Hoge et al. (2004) found that more than 90% of their sample ($n = 6201$) reported being shot at during their deployment. Very high percentages also reported handling dead bodies, knowing someone who was injured or killed, seeing someone else killed or injured, or killing an enemy combatant. Other significant combat related experiences reported by military personnel include: receiving artillery, rocket, and mortar fire; being responsible for the death of a civilian; participating in demining operations; being shot at and hit, but saved by protective gear; clearing and searching homes and buildings. All of these elements are common risk factors for both PTSD and TBI.

Another defining characteristic of OIF/OEF operations is the necessity for soldiers to serve multiple tours in combat theatres. Multiple deployments are repeatedly and strongly correlated with high risk for PTSD in military personnel (Bush, 2010; Vasterling et al., 2012). In 2008, the Office of the U.S. Army Surgeon General reported approximately 12 percent of soldiers returning

from deployment disclosed serious combat-related stress symptoms following their first tour, compared to 19 percent following their second, and 27 percent after their third (US Army Surgeon General, 2008). At that time, 38 percent of 2.5 million deployed soldiers had been deployed more than once; approximately 400,000 service members had been deployed three or more times; and 37,000 had been deployed more than five times. Additionally, multiple deployments increases the risk of exposure to physical hazards, increasing the likelihood of sustaining or worsening a TBI (Maguen, Lau, Madden, & Seal, 2012; Morissette et al., 2011).

Convergence of Symptoms

There is a relationship between PTSD and TBI that is demonstrated repeatedly, by multiple researchers, in numerous studies. Schneiderman et al. (2008) reports service members who are wounded during combat are at very high risk for developing PTSD, with cases where the soldier lost consciousness as a result of TBI demonstrating the highest prevalence of PTSD. This study reveals evidence suggesting combat related TBI doubles the risk for PTSD, and also suggests the strongest factor associated with PPCS is PTSD. In addition, veterans with TBI are more likely to develop PTSD than those who did not incur a brain injury (Hoge et al., 2004; Maguen, Lau, et al., 2012; Maguen, Madden, et al., 2012).

Overlapping symptoms make it difficult to understand the exact nature of the relationship between PTSD and TBI. It is theorized that if both conditions are present, each can amplify symptoms of the other; psychological factors can affect physical conditions, and physical conditions can exacerbate psychological symptoms (Brenner et al., 2010). Brenner et al. (2010) and Hoge et al. (2004) suggest TBI may cause damage to an individual's cognitive function, inhibiting their access to previously successful coping skills. This lack of coping mechanisms hinders the person's ability to manage the effects of psychological trauma. In addition, a TBI incurred during combat reflects exposure to an intense life-threatening event, which generates a very high risk of developing PTSD (Hoge, 2004).

A common clinical presentation in combat veterans who seek treatment is a mixture of symptoms that could be classified as PTSD, PPCS, or both. Overlapping symptoms commonly reported during assessment of PTSD and TBI include: insomnia and other sleep disturbances; fatigue; generalized depression and anxiety; irritability, anger, and aggressive tendencies; attention deficit and memory problems; substance abuse tendencies; and suicidality (Capehart & Bass, 2012; Vasterling et al., 2012). Research efforts directed toward understanding substance abuse disorder and suicide

among combat veterans are extensive, and beyond the scope of this paper. While it remains unclear if any particular characteristics of combat exposure can be utilized to predict which symptoms will dominate and persist in each individual, further studies may serve to clarify these details.

Persistent symptoms. One predictor of persistent symptoms following TBI is the presence of a psychiatric disorder, such as PTSD. This raises questions regarding whether persistent symptoms in the presence of comorbid diagnoses should be attributed to unresolved brain injury, to the tremendous stress response of PTSD, or if both factors contribute to symptomatology (Halbaurer et al., 2009). It is strongly suggested throughout the literature that PPCS are positively correlated with persistent PTSD symptoms, however further research addressing causal relationships is indicated.

A study by Morissette et al. (2011) suggests that prolonged exposure to high intensity combat increases the risk for soldiers to experience persistent PTSD symptoms following combat acquired TBI. Veterans participating in this study describe ongoing physical symptoms and, in many cases, functional difficulties. Impairments in occupational and social situations are common, and are associated with overall life dissatisfaction. Work by Schneiderman et al. (2008) provides evidence that exposure to multiple mechanisms of injury (examples: blast exposure, motor vehicle crash, shrapnel, air transport) is significantly associated with increased risk of symptom persistence. This study suggests multiple injury mechanisms may be a marker for cases of repeated head injury and ongoing exposure to traumatic events associated with combat hazards.

Common Neurological and Biological Mechanisms

A number of parallels exist between the mechanisms believed to be associated with the symptoms of traumatic brain injury, and those related to the manifestation of PTSD (Kennedy & Moore, 2010; Pittman et al., 2012; Vasterling et al., 2009). In the expression of PTSD, the critical brain regions involve the prefrontal cortex, hippocampus, and amygdala. It is suggested that all of these regions are involved in the development, expression, and maintenance of PTSD symptoms (Chen & Huang, 2011; Kaplan, Vasterling, & Vedak, 2010; Schneiderman et al., 2008). Similarly, the neurological structures that are involved in the symptoms of TBI include the hippocampus, amygdala, prefrontal cortex, medial temporal regions, and corpus callosum. The functional interconnectedness of these regions makes them particularly vulnerable to the stress of biomechanical

impact, increasing susceptibility to deformation and destruction during impact (Kaplan, Vasterling, & Vedak, 2010; Vasterling et al., 2012).

In addition to structural alterations, there is growing evidence showing changes related to neurotrophic factors occur within the brain regions common to PTSD and TBI. It is hypothesized that structural damage associated with TBI interferes with production of neurotrophins, resulting in delayed brain tissue healing, and prolonged PTSD symptoms. Neurotrophins play important roles in cell growth, survival, differentiation, cell restructuring, and cell death. Normal structural plasticity occurring through synaptic genesis, dendritic remodeling, and neurogenesis is altered in response to increased amino acid and glucocorticoid release. This chemical response to physical and psychological stress suppresses neurogenesis, produces dendritic retraction, and exacerbates ischemic damage (Chen & Huang, 2011; Kaplan, Vasterling, & Vedak, 2010; Schneiderman et al., 2008).

Neuroimaging Studies. Numerous functional imaging studies are used to determine the involvement of specific brain regions in symptoms of TBI and PTSD. Neuroimaging techniques are not required to make a diagnosis of PTSD, and are not routinely conducted. However, imaging studies are being used with increasing frequency to identify damaged regions in an effort to better understand this disorder. These regions include: the amygdala, the hippocampus, the orbitofrontal cortex, and the dorsolateral and medial prefrontal cortices. Over-activity of the amygdala is an integral finding in most cases of PTSD, and is associated with stress-induced neuronal remodeling (dendritic growth) in this region. Even episodes of brief, severe stress may trigger a surge of cortisol that launches a complex chemical reaction, resulting in enhanced neuronal response and growth within the amygdala. This increase in amygdala activity is positively correlated with PTSD specific symptoms of enhanced fear and anxiety responses, and while often triggered by a single stressful event, will have a chronic, persistent effect.

Conversely, the hippocampal and cortical regions demonstrate notable under-activity following exposure to extreme, chronic stress. Neurons in these areas show significant atrophy following exposure to intense stressors and the subsequent release of cortisol. This overload of cortisol, which enhances neuronal growth in the amygdala, damages cells within the hippocampus and cortical regions. Hippocampal cell responses to high levels of cortisol include: altered chemical reactions, decreased dendritic connections, and cell death. These changes in hippocampal neurons ultimately result in diminished

responsiveness. Expressions of fear and anxiety by the limbic system are regulated by input from these regions, and appropriate control of these negative emotions is lost when the hippocampus and cortices fail to respond appropriately to stress (Chen & Huang, 2011; Kaplan et al., 2010; Pittman et al., 2012; Schneiderman et al., 2008).

Magnetic resonance imaging (MRI) based techniques such as functional MRI (fMRI), diffusional tensor imaging (DTI), and positron emission tomography (PET) scanning have been used extensively to study the mechanisms of neurobehavioral complaints associated with traumatic brain injury. Studies using these techniques suggest that brain regions most vulnerable to the impact and biomechanical forces associated with TBI include the orbitofrontal cortex, the dorsolateral prefrontal cortex, the temporal pole, the hippocampus, and tracts connecting the amygdala and the medial prefrontal cortex. Imaging of these areas show high rates of structural and functional abnormalities, particularly in the orbitofrontal cortex, which may account for the prevalence of executive deficits, and contribute to the emotional and behavioral dysregulation associated with TBI (Chen & Huang, 2011; Pittman et al., 2012).

Neuropsychological dysfunction. A complex combination of psychological and previously discussed physical factors is presumed to be involved in the evolution of PPCS and PTSD. The neurological insult incurred during TBI, and the subsequent impact on cognition and affect, can diminish the individual's abilities to engage in problem solving, and to regulate appropriate emotional responses, following exposure to trauma. This may lead to an increased incidence of stress symptoms, and development of additional psychological disorders.

The role of cognitive and emotional information processing in the beginning of TBI and PTSD symptom development is an important one. Psychological and biomechanical trauma exposures have both been linked to impaired information processing. The experience of TBI is positively correlated with acute and persistent cognitive effects, and complaints of behavioral symptoms. Reported areas of impaired cognition include: working and short-term memory; information processing speed; attention and concentration; emotional lability (frequent and extreme changes in emotional mood); and executive functioning. While the correlation between TBI and development of PTSD is clear in these studies, there is limited evidence throughout the extensive data of neuropsychological impairment in individuals who have been diagnosed with PTSD only. Note that in the cases of PTSD diagnosis, without comorbidity, the finding of negative TBI screening came as a result of soldier self-report surveys and was not clinically confirmed. (Brenner

et al., 2010; Carlson et al., 2010; Shandera-Ochsner et al., 2013; Vasterling, Verfaellie, & Sullivan, 2009).

Assessment

The biological and psychological assessment of soldiers who present for evaluation following deployment to combat theatres can be challenging. The idea that a veteran who is injured may be suffering from not just a single injury, but from a complicated interaction between two (or more) injuries, is one that is gaining increased attention and popularity during the course of recent wars in Iraq and Afghanistan. Any individual reporting risk factors for, and symptoms associated with, both PTSD and TBI is experiencing a bio-psychological event that is unique to their situation and experience. The best assessment methods are consistently found to be those that focus on a multimodal and holistic approach, incorporating interview and self-assessment inventory techniques (Bush, 2010; Vasterling et al., 2012), as well as additional sources of information relevant to reported traumas (e.g., medical record documentation, military reports, witness reports, reports from family or friends). There are a large number of screening tools that are being developed for use in assessing TBI and PTSD, producing varying degrees of validity and reliability between assessment tools. For the purpose of this paper we will not be referring to any specific forms or interview techniques, but instead focus on general assessment considerations.

The most common clinical presentation in the VA health care setting is a veteran with a history of one or more possible TBIs, and emotional distress. Assessment for these individuals must include a comprehensive evaluation of symptomatology, assessment of the traumatic event (or events) that may have precipitated the symptoms, and assessment of current psychosocial functioning. A complete history is essential to determining TBI and PTSD comorbidity and should be obtained as the first step when a soldier presents for treatment following deployment. Interview techniques may be structured to fit the individual and should remain flexible; to reduce clinician influence on responses, open-ended questions and spontaneous descriptions of events are the preferred method of assessment. However, some individuals may respond better to direct questions and prompts.

Following history taking, assessment efforts should be directed towards the emotional state of the soldier, cognitive functioning, and physical complaints. The assessment of emotional functioning to identify the presence and influence of any psychosocial stressors, or mental health diagnoses, is necessary to determine the veteran's current level of functioning and quality of life. Identification of functional impairment, and severity of emotional symptoms, is particularly valuable in

appropriately guiding treatment options following assessment. During this portion of the assessment, it is critical that the soldier be evaluated for suicidal ideation. While not all veterans experience severe emotional distress or suicidal thoughts, it is important to note that soldiers with a diagnosis of PTSD with TBI have a much higher risk for suicide than those with no TBI diagnosis (Bush, 2010; Capehart & Bass, 2012; Shandera-Ochsner et al., 2013).

The role of cognitive functioning is closely related to the impact of emotional states. Individuals who are experiencing cognitive deficits in the areas of memory, concentration, executive functioning, and attention are shown to have decreased life satisfaction, and increased incidence of mental health disturbances. The importance of adequate cognitive functioning should not be overlooked. Assessment of cognitive ability should be approached with flexibility; an individualized selection of cognitive testing has been shown to be most valuable, with emphasis placed on the veteran's presenting problem (e.g., academic measures should be emphasized to guide a veteran who is seeking to continue their education; more comprehensive measures should be utilized with an individual who is having difficulties making appropriate life-choices)(Bush, 2010).

Pain and headaches are common complaints of veterans returning from OIF/OEF deployments. A thorough assessment will include an evaluation of pain, and methods of obtaining pain information should, again, be personalized to the individual. Interview techniques asking the veteran to describe his pain in detail are effective for some, while others do best with a pain inventory checklist to guide their description and discussion of pain responses. Evaluation of pain should not be diagnosis focused, but instead focus on minimizing interference of normal functioning by pain symptoms.

Included in the assessment of physical complaints is the evaluation of sleep. Sources cited by Bush (2010) suggest that sleep is commonly disrupted in veterans diagnosed with TBI, PTSD, or both, with sleep disturbance reported in up to 84% of these individuals. 40% of those with reported sleep disturbances specify insomnia as their greatest concern. Sleep disturbance has been identified as a critical concern; insomnia may greatly exacerbate the symptoms of TBI, as well as increase the incidence of post-traumatic headache in cases of PTSD.

Attempts to use assessment tools to determine which symptoms are attributable to PTSD, and which to TBI, in cases of comorbidity is not a valuable use of resources and will not provide a direction of best care for the veteran who presents with comorbidity. Given the degree of symptom overlap and neurological

commonalities, the best use of testing instruments is to effectively identify problem areas that require intervention, regardless of cause.

The focus of all evaluation efforts, beyond diagnosis, is to assess the returning veteran's goals for treatment, and re-integration with their families and communities. Abilities to adapt to academic, vocational, and social environments are critical to the ultimate success of re-integration; adequate assessment provides the opportunity to identify physical, cognitive, and emotional injuries that may require accommodations to facilitate that success.

Treatment Paradigms

When TBI and PTSD occur separately, they are traditionally treated within different health care contexts. Care for the individual with PTSD is most often provided by mental health specialists (e.g., psychologists, psychiatrists, psychiatric social workers) within mental health contexts. Some mental health establishments, including the VA Healthcare system, offer specialized PTSD programs for veterans. Care of TBI is typically the responsibility of rehabilitation specialists (e.g., physiatrists, physical therapists, occupational therapists), neurologists, neuropsychologists, and neuropsychiatrists. As the instances of PTSD and TBI comorbidity increase, however, treatment modalities are merging, and care is becoming multidisciplinary.

Multidisciplinary treatment teams, consisting of neurology services, mental health practitioners, rehabilitation specialists, and related ancillary services (e.g., nursing, vocational counselors), work together to create integrated treatment options. Although integrated approaches may ultimately prove to be the best methods for meeting the needs of soldiers presenting with complex and interacting injuries, managing comorbid PTSD and TBI continues to be a challenge. As yet, there is no clear guidance on how to simultaneously manage these two conditions, although consistent general guidelines appear in the literature.

Psychotherapy. The VA and DOD recommend three specific psychotherapy modalities to treat individuals diagnosed with PTSD. Two of these modalities show encouraging results when used in the presence of comorbid TBI: cognitive processing therapy, and prolonged exposure therapy.

Simply put, cognitive processing therapy (CPT) is a technique developed to help returning veterans identify how they think about the traumatic event(s) they experienced, recognize maladaptive assumptions, and adopt new ways to think about, and cope with, their trauma experiences. CPT is correlated with a significant reduction in PTSD severity for veterans with mild,

moderate, and severe TBI, as well as a reduction in generalized anxiety (Capehart & Bass, 2012; Kennedy & Moore, 2010).

Prolonged exposure therapy (PE) is a cognitive behavioral therapy technique characterized by re-experiencing the traumatic event through repeatedly remembering the event, and engaging with reminders of the event, as opposed to actively avoiding the reminders. It is specifically intended to help persons with PTSD psychologically process traumatic events, and reduce trauma induced psychological disturbances. In addition, PE is associated with improvement of symptoms in 80% of persons treated with this technique (Moore & Penk, 2011). Recent trials of PE in combat veterans with comorbid PTSD and TBI with cognitive deficits suggest that PE may be associated with a decrease in negative cognitive assumptions, making it clinically significant in this population (Capehart & Bass, 2012; Wolf, Strom, Kehle, & Eftekhari, 2012).

Pharmacotherapy. The VA and DOD have recommended specific antidepressant medication classes as first-line pharmacological treatment choices for individuals diagnosed with PTSD. Similarly, these antidepressant medications are known to be useful for treating mood and anxiety disorders that are diagnosed after TBI, as well as for treating PPCS headache pain.

Conversely, antianxiety medications in the benzodiazepine class are correlated with problematic responses in both TBI and PTSD. In cases of PTSD, benzodiazepines are associated with an aggravated fear response, difficulty processing and incorporating psychotherapeutic methods and strategies, and pose a risk for substance dependence upon the prescribed benzodiazepine. In TBI, benzodiazepines are associated with worsening PPCS symptoms of dizziness and mental confusion. (Capehart & Bass, 2012; Pittman et al., 2012; Thomas & Harris, 2012).

Medical complications of TBI in the veteran with PTSD. The multidisciplinary treatment team approach is particularly important for optimal management of TBI symptoms in the presence of comorbid PTSD. Symptoms of chronic pain, endocrine deficiencies, and sleep disorders may all occur in the combat veteran with both PTSD and TBI, and must be managed as a collaborative effort within the treatment team.

Chronic pain associated with PPCS can adversely affect emotions and cognitions, and in OIF/OEF veterans diagnosed with PTSD, the relationship between pain and emotional distress is pronounced. Treatment for pain in PPCS in the presence of PTSD is complex for the caregiver because the two conditions can be mutually reinforcing,

and the choice of appropriate pain medication is limited (Capehart & Bass, 2012), with varying responses to medication administration.

As previously noted, sleep disturbances are associated with both PTSD and TBI. In the case of PTSD, sleep complaints are primarily initial insomnia from hyperarousal and anxiety, and middle insomnia/sleep maintenance due to nightmares. TBI, however, is associated with sleep disorders that may have developed as a result of damage to sleep centers in the brain; sleep apnea, periodic limb movements, or rapid eye movement behavior disorder are common diagnoses following TBI. In cases of TBI where a sleep disorder has been diagnosed, these conditions can be treated medically. In cases of TBI and PTSD where there is no physical disorder found, treatment modalities include good sleep hygiene (e.g., dark room, quiet environment, bedtime routine), CPT for causes of insomnia, and possibly medication that has been effective for curbing nightmares in PTSD.

While not directly related to PTSD, endocrine disorders that develop following TBI are common, with hypopituitarism being the most prevalent (Capehart & Bush, 2012). However, side effects of TBI induced endocrine dysfunction include symptoms that can exacerbate PTSD symptoms. For example, hypothyroidism has been associated with depressive symptoms, and gonadotropin dysfunction has been linked to erectile dysfunction. Treatment of the underlying endocrine imbalances can work to alleviate PTSD symptom exacerbation that is related to these side effects.

Cognitive rehabilitation. Cognitive rehabilitation is the term for therapy intended to improve functioning in the areas of: attention; vision and visuospatial functioning; language and communication skills; memory; and executive function. Cognitive difficulties in a veteran with both TBI and PTSD are best treated with cognitive rehabilitation. The VA and DOD recommend physicians managing these cases ensure that medication regimens are appropriate and review all prescription and non-prescription medications that the veteran is taking. Careful attention should be paid to medications that will further aggravate cognitive functioning or lead to sedation, as these side effects can further impair the individual's ability to resume their pre-deployment level of functioning; these medications should be eliminated whenever it is possible. There are no clear recommendations for medication to improve TBI associated memory impairment, but stimulant use has been associated with improved attention; care should be used, however, as stimulant use can significantly increase anxiety in cases of comorbid PTSD.

Although there are obviously disorder-specific components that are fundamental to TBI and PTSD treatments when addressed independently, there is no evidence suggesting that TBI diminishes treatment response to PTSD interventions, or that PTSD adversely affects the effectiveness of TBI interventions. Therefore, veterans diagnosed with both PTSD and TBI should be managed with an individualized treatment approach that addresses the symptoms that are troublesome to the soldier as an individual, without consideration of cause. And regardless of cause, treatment of comorbid PTSD and TBI symptoms should emphasize: education; positive expectations for treatment and outcome; enhancement of coping skills; and success of therapy in alleviating emotional symptoms. Managing the symptomatic responses of each disorder, rather than the diagnosis itself, is key to successful treatment.

Discussion

The wars in Iraq and Afghanistan led to a surge of research directed at the diagnoses of both PTSD and TBI. Due to the increased survivability of warfare exposure, PTSD and TBI comorbidity occur with adequate frequency to present a significant challenge to the health care systems that provide care to combat veterans. Despite this frequency of comorbid presentation, there is still much to learn regarding the mechanisms of comorbidity, and the eventual clinical management of these diagnoses.

Research strongly suggests there are neural and psychosocial factors that influence the course and development of PTSD, and recovery from TBI. A clear neurophysiological basis is understood for TBI, however unresolved neuropathological features, subsequent neural insults (such as repeated blast exposures), psychosocial factors, symptom attributions, expectations for recovery, and contextual factors (e.g., family, work, or financial stressors) may all influence the recovery from TBI. The development and course of PTSD is also determined by factors other than exposure to a single psychologically traumatic event. Neural factors (such as brain and neurocognitive integrity), coping strategies, social support, concurrent physical injury (including TBI), and exposure to subsequent or multiple stressors all contribute to the development of PTSD. Even when considered individually, there are multiple factors that contribute to the recovery from brain injury and psychological trauma. When they are considered as a comorbid occurrence, the factors that determine impairment from PTSD and TBI are compounded.

There seems to be a bidirectional relationship between TBI and PTSD; each likely influence recovery from the other, although it does not seem that the relationship between the severity of each is directly

correlated. For example, research suggests PTSD is unlikely to develop from a TBI event that causes amnesia for the event; this may imply an individual's inability to encode the traumatic memory, and lends the question: are more severe TBIs less likely than milder TBIs to be associated with PTSD? The literature reviewed for this paper does not specifically address this question, leaving it open to be answered by further research.

In order to progress in our understanding of PTSD and TBI, as well as how to care for soldiers who describe a comorbid presentation, it seems there are several areas to investigate further. Recognizing the neurophysiological and psychosocial mechanisms that underlie both TBI and PTSD is a critical area to direct further research. Additional research that examines whether TBI and PTSD moderate treatment modalities directed toward one or the other is an additional critical area.

After reviewing the research, structuring the care delivery system for veterans with PTSD and TBI is an area that seems to be in need of further study, development, and improvement. While it is suggested that comprehensive assessment and care models are being implemented in VA Healthcare facilities, these integrated models are not wide spread, and more support for the needs of these complex presentations is needed. There continues to be unanswered questions about how specific interventions might work in patients with comorbid PTSD and TBI, and how to best structure the delivery of services; using an integrated model, it will be essential to determine which contexts (e.g., hospitals, outpatient clinics, mental health facilities) might be the most appropriate to deliver care, and how best to sequence the various components of care. It is important to develop a method of introducing each individual to a system of care that prevents interventions from becoming fragmented; a method that immediately considers the use of an interdisciplinary team that includes both TBI and PTSD experts.

As a result of the OIF/OEF conflicts, the surge of interest and research activity into the comorbid presentation of PTSD and TBI is beginning to shed new light on both conditions and how they may interact with each other. A comprehensive perspective that focuses on the various mechanisms that contribute to the symptoms of each disorder has developed. This perspective replaces previous views that conceptualized each disorder as a function of a single process (e.g., neurological, cognitive, emotional). A consistent theme emerging throughout the research is the need to identify and manage individual reactions that occur within the context of psychological trauma and head injury, rather than simply labeling these responses as either PTSD or TBI. Previous reliance on diagnostic labels may have led to mistakenly attributing

symptoms to a specific process, but through research we are learning that managing these responses with strategies that promote a sense of support and recovery are most successful. The recent cascade of research activity into PTSD and TBI is likely to continue, and we can look forward to further insights about the risks, mechanisms, and treatments pertaining to each of these challenging disorders and their complex comorbidity.

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PREDICTING REACTIONS TO DEPRESSION IN OTHERS: MENTAL HEALTH STIGMA AND SOCIAL DISTANCE

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Abstract - Being diagnosed with a mental illness is quite common in the United States (Pratt & Brody, 2014), and the diagnosis itself can be challenging. When those same people experience stigma or social distance for simply having their mental illnesses, the pressure and embarrassment can seem unbearable (Corrigan, 2007). This study explored what circumstances increase or decrease the amount of mental health stigma and social distance participants place on a fictional character suffering from depression. After manipulating (1) origin of depression [biological versus psychological], (2) controllability of depression, and (3) target sex in a vignette, results showed that participant sex, target sex, and personal experience with mental health are predictors of social distance from mentally ill individuals. Surprisingly, mental health stigma was not affected by any of the independent variables. Results shed light on the circumstances in which social distance against mentally ill individuals increases and decreases. This information can aid clinicians in creating effective treatment plans for clients.

Key words: Mental health, stigma, social distance, depression

Mental illness is a prevalent problem in the United States. The Centers for Disease Control and Prevention estimate that one in four American adults have a mental illness (Pratt & Brody, 2014). Those mental illnesses range in the given diagnoses (e.g., depression, schizophrenia, or intellectual disabilities), severity (e.g., mild, moderate, or severe), prognosis (e.g., temporary or lifelong), and treatment (e.g., psychotherapy, medication, or a combination). The purpose of the current study was to understand two more dimensions of mental illness: stigma and social distance. Specifically, the current study investigated stigma and social distance against depression based on the origin of the depression (whether it was psychologically or biologically caused), the perceived controllability of the depression, target sex, participant sex, and the participants' personal experience with mental health.

Mental Health Stigma

Along with the prevalence of mental illness comes mental health stigma. Stigma is defined as people losing

their social status because other people have associated them as behaviorally and personally sick, menacing, abnormal, treacherous, or disgusting (Link & Phelan, 2001). The negative effects of stigma in general are well documented and have been established in a variety of contexts, such as criminals, the homeless, and people of varying races (Heatherton, Kleck, Hebl, & Hull, 2000; Jussim, Palumbo, Chatman, Madon, & Smith, 2000).

Another example of pervasive social stigma is mental health stigma, or stigma directed toward people who receive services in the mental health field or have been diagnosed with a mental illness. The negative effects of stigma against the mentally ill are well documented (Corrigan, 2007). Generally, medical professionals give mentally ill individuals a diagnostic label as a means of efficiency in terms of treatment plans, medical interventions, and disorder-compatible therapies. Unfortunately, mentally ill individuals report that the label makes them feel more stigmatized because they feel as if they have been reduced to a single, stereotyped diagnosis

rather than being an individual person with unique symptomology and experiences that differentiate them from others with the same diagnosis (Corrigan, 2007).

More specifically, some research (Anderson, Jeon, Blenner, Wiener, & Hope, 2015) has found that the stigma associated with mental illness varies depending on the presenting disorder (e.g., social anxiety, depression, schizophrenia, or mental illness in general). Other research (Jorm & Griffiths, 2008; Prévile, et al., 2015) has found that viewing mental illness as a sign of personal weakness may play in to the stigma surrounding mental illness. Finally, some people blame media for negative mental health stigmas (Wahl, 1999) because the negative images of mental illnesses portrayed in mass media (e.g., mental illness is associated with dangerousness, crime, violence) persist more than positive images (not all mentally ill individuals are violent criminals; Sieff, 2003). For example, almost 80% of consumers report seeing and/or hearing negative or demeaning comments about mental illness in the media (Wahl, 1999).

Whatever the origins of mental health stigma, negative judgments about individuals with mental illnesses have an impact on the targets. According to Patrick Corrigan (2007):

Stigma can significantly undermine the quality of life of people with mental illness. The social opprobrium that results from stigma can rob people labeled mentally ill of a variety of work, housing, and other life opportunities commonly enjoyed by adults in the United States. It can also prevent some people who might otherwise benefit from clinical services from pursuing treatment in an effort to avoid the label. (p. 31)

Additional research (Wahl, 1999) found that 70% mentally ill individuals reported being treated as incompetent when others knew about their mental illness. The same study found that over 25% reported being told by others to “lower their expectations in life” (p. 470) by settling for jobs well below their education, training, or experience level. Finally, 60% reported feeling avoided or deliberately ignored by others.

Rightfully so, many people with mental illnesses say they avoid telling people about their illness because they do not want to be negatively judged (Prévile et al., 2015; Wahl, 1999). Although family members and close friends tend to be supportive of mental illness disclosures (Wahl, 1999), research supports that telling people about mental illnesses has negative ramifications, legitimizing the concerns of diagnosed individuals. Examples include being seen as unpredictable or abnormal (Prévile et al., 2015); being discriminated against on housing, employment, insurance, or volunteer applications (Wahl, 1999); and being accused of not having a real medical illness (Prévile et al., 2015).

Social Distance

Social distance is defined as “the degrees of sympathetic understanding that exist between persons”

(Bogardus, 1933, p. 270). Research (Phelan, Bromet, & Link, 1998) found the more publically visible a mental illness is to others, the more likely people are to use greater social distance out of fear of being stigmatized by association with the ill individual. People are more likely to opt for greater social distance from another when that person’s mental illness is perceived as rare or uncommon, dangerous, and something that person is personally responsible for having (e.g., it is their fault that they have this disorder; Feldman & Crandall, 2007).

In regard to gender, men who are less familiar or have no experience with mental illness are more likely than women to opt for greater social distance between themselves and those with a mental illness (Anderson et al., 2015). On the other hand, women are both more likely to help and less likely to avoid people who are mentally ill (Corrigan & Watson, 2007). Both mental health stigma judgments in general and the specific form of stigma displayed through social distance were explored in this study.

Depression

While stigma and social distance against mental illness in general are areas of social concern, they may affect some people more than others. Depression is one of the most common mental illnesses in the United States; according to the Centers for Disease Control and Prevention, 7.6% of people in the United States, at any given time, are suffering from depression (Pratt & Brody, 2014). Depression is even more common among college students; just over 11% of college students report feeling severe or very severe levels of depression (Beiter et al., 2015).

Factors that play into elevated levels of depression in college students are the pressure to perform well academically, pressure to succeed in college, pressure for plans after graduation, and the financial burden of college. Further, students in college who are most likely to experience elevated levels of depression are those who live off-campus, upperclassmen, and transfer students (Beiter et al., 2015). Based on this research, depression was the diagnosis of choice for the present research.

Predictors of Mental Health Stigma & Social Distance

This study explored a variety of constructs predicted to be associated with greater levels of stigma and social distance toward individuals diagnosed with depression. It was hypothesized that stigma and social distance might increase or decrease based on the following factors: (1) origin of the depression [biological versus psychological], (2) perceived controllability of the origins of the disorder, (3) target sex, (4) participant sex, and (5) participants’ personal experience with depression. Each variable is briefly reviewed below.

Biological versus psychological depression. Depression is caused by any single or

combination of the following factors: biology, genetics, chemicals/hormones, society, psychology, and the environment (Abrahamson, Hornyak, & Rehm, 2010). Although commonly associated with suicidal thoughts and ideation, depression can serve as an indicator that a person's life is out of balance physically, emotionally, and/or mentally (Abrahamson et al., 2010). In spite of the range of causes, disabilities labeled as "mental" disorders, such as depression, drug addiction, or psychosis, are viewed as more controllable (discussed below) over time compared to physical/biological disabilities, such as cancer, AIDS, paraplegia, or blindness (Corrigan et al., 2000; Schwarzer & Weiner, 1991; Weiner, Perry, & Magnusson, 1988).

Based on the research above, Hypothesis 1 of the current study was: When asked to read a vignette about a fictional person, participants who read about someone with psychologically-driven depression will report (a) higher levels of mental health stigma and (b) greater social distance, compared to participants who read about someone with biologically-driven depression.

Perceived controllability. Perceived controllability is the idea that "people are responsible for their own life outcomes and can, through effort, change their life prospects" (Blaine & Williams, 2004, p. 79). People can use perceived controllable attributes to justify their negative feelings toward any disadvantaged group (Blaine & Williams, 2004; Crandall & Martinez, 1996). For example, perceived controllability is commonly used in research on stigma against obese individuals (King, Shapiro, Hebl, Singletary, & Turner, 2006). People feel more justified and comfortable in their negative judgments against obese people when they believe obesity is controllable, rather than if it is driven by uncontrollable factors such as genetics.

As mentioned before, many people in the general population believe that people with disorders, such as schizophrenia and major depression, are in control of their mental illness and are therefore at fault for the symptoms they experience (Corrigan et al., 1999; 2000; 2003; Weiner, 1995). Specifically, college students discriminate more toward mental illnesses over physical illnesses, and they discriminate more against those mental illnesses that are seen as more controllable (e.g., cocaine addiction) over ones that seem uncontrollable (e.g., schizophrenia; Corrigan et al., 2000).

Based on the above research, Hypothesis 2 was: Compared to participants who read a vignette about non-controllable depression, participants who read about controllable depression will report (a) higher levels of mental health stigma and (b) greater social distance.

Participant and target sex. At every age group, women are more likely than men to suffer from depression (Pratt & Brody, 2014). This may be because women are typically characterized as willing to ask for help, caring about their health, and expressing their emotions (Courtenay, 2010). Compared to men, women are less

likely to stigmatize mentally ill individuals (Corrigan & Watson, 2007; Farina, 1981; Pederson & Vogel, 2007). As mentioned before, some men view mental illness as a personal weakness (Jorm & Griffiths, 2008; Prévile et al., 2015). Thus, they feel ashamed, as if they have failed when they admit to having problems with their mental health (Good, Thomson, & Brathwaite, 2005; Pattyn, Verhaeghe, & Bracke, 2015) or visit mental health professionals (Addis & Mahalik, 2003). Part of this feeling could be explained by the fact that society expects men to be in control of their emotions, to appear independent and strong, and to rely only on themselves (Galdas, Cheater, & Marshall, 2005).

In regard to treatment for mental health problems, men are more likely to attempt taking care of their mental health issues by themselves (Jorm & Griffiths, 2006), and both men and women are likely to recommend that men use self-care for their mental health issues (Pattyn et al., 2015). One study (Pattyn et al., 2015) found that male participants did not see the benefit to psychotherapy for either male or female clients, but female participants would recommend medication treatment for male clients and psychotherapy for female clients.

Based on the above research, Hypothesis 3 was: Regardless of experimental condition, (a) men are more likely than women to recommend biological treatment to a person suffering from depression, and (b) women are more likely than men to recommend psychological treatment. Additionally, Hypothesis 4 was: Regardless of participant sex, (a) participants are more likely to recommend psychological treatment (compared to biological treatment) for female targets, and (b) participants are more likely to recommend biological treatment (compared to psychological treatment) for male targets.

Personal experience with mental illness. Finally, familiarity with a mentally ill individual is negatively correlated with mental health stigma (Anderson et al., 2015; Penn et al., 1994). Familiarity comes in the form of current or past mental health treatment for the participant, current or past mental health treatment for a family member of the participant or having a parent or sibling work in the mental health field (e.g., therapist/counselor, psychologist, psychiatrist, social worker). This finding was documented regarding treatment of individuals with schizophrenia (Penn et al., 1994), major depression, social anxiety, and mental illness in general (Anderson et al., 2015).

People who have experience with mental health are less likely to believe negative images about mental health that are portrayed in the media (Hoffner, Fujioka, Cohen, & Atwell Seate, 2015). The same study found that people with mental health experience are less likely to say negative things about mental health on the internet after the issue of mental health has been brought up in the news. Other research (Tzouvara & Papadopoulos, 2014) found that people in certain cultures who have experience with mental health are especially less likely to stigmatize the

mentally ill. In essence, personal experience seems to increase empathy for others with mental illness and understanding of the challenges associated with diagnosis.

Based on the above research, Hypothesis 5 was: Level of personal experience with mental health will be negatively correlated with (a) mental health stigma and (b) social distance from a target individual diagnosed with depression.

Method

Participants

This study included 258 participants from a Midwestern community between the ages of 18 to 70. A summary of all demographic information is available in Table 1. As seen in the table, participants were 75 men (29.07%) and 183 women (70.93%); ethnicity was 84.67% White/Caucasian, 5.36% African American, 3.45% Hispanic/Latino, 2.30% Asian American, and 4.22% mixed or other. Participants were solicited through university bulletins, class announcements, and announcements made on public social media sites. University students received extra credit from their professors; participants recruited from other areas (e.g., social media) were simply thanked for their participation.

Table 1: Demographic Information

	%	<i>M</i>	<i>SD</i>
Sex of Participant			
Male	29.07	--	--
Female	70.93	--	--
Age	--	27.92	13.08
Race/Ethnicity			
Caucasian/White	84.67	--	--
African American	5.36	--	--
Hispanic/Latino	3.45	--	--
Asian	2.30	--	--
Mixed	0.77	--	--
Other	3.45	--	--
Education			
HS but no diploma	0.38	--	--
HS diploma or GED	29.01	--	--
Some college but no degree	25.19	--	--
Associates degree	8.40	--	--
Bachelor's degree	29.39	--	--
Master's degree	6.49	--	--
Doctoral degree	1.15	--	--

Predictor Variable: Prior Mental Health Experience

Participants completed a questionnaire about their current or previous experience with mental health (see Appendix 1). Questions were created by the authors and addressed two main topics: participant receiving mental health services and participant's family receiving

mental health services. Questions addressing the participants' and their families' experiences with mental health gave the participants eight options of mental health treatment; four of the treatments were psychologically based, and four were biologically based. Examples include, "Join a support group (talking with other people in a similar situation in order to cope with the symptoms)" and, "Medication (taking a pill that will reduce the negative symptoms, e.g., anti-depressants)." A ninth option was available for those participants who did not receive mental health services. Participants selected all options that were applicable to their own and their family's experience with mental health treatment. If a participant selected anything besides "Did not receive mental health services," that participant was credited as having experience with mental health. Alphas were not calculated for these measures as individuals may have experienced some types of treatment without the expectation of receiving any other or an additional form.

Participants also took the Patient Health Questionnaire – 9 (Kroenke, Spitzer, & Williams, 2001) to determine if they had experienced symptoms of depression in the last two weeks. The scale includes 10 questions on a 4-point Likert scale from 0 (*Not at all*) to 3 (*Nearly every day*); questions address how often symptoms occur in the participants' lives (e.g., "Feeling down, depressed, or hopeless" and, "Trouble falling or staying asleep, or sleeping too much"). Scores are averaged to form a composite; the possible range of the scores is from 0 to 3, with higher numbers indicating more depression. The mean of this sample was 0.58 ($SD = 0.50$), and internal consistency of items was good, $\alpha = .82$.

Independent Variables

Origins and controllability. Participants were randomly assigned to read one of four vignettes about a 20-year-old college student named Alex (see Appendix 2 for full vignettes); the authors created the vignettes. The vignettes are all the same in that Alex exhibits symptoms of and is diagnosed with depression; the symptoms are consistent with the DSM-V criteria for the diagnosis of major depressive disorder (American Psychiatric Association, 2013). The vignettes vary on two dimensions: the origin of the depression and the controllability of the depression.

The psychologically controllable vignette involved Alex choosing to not meet new people at college. The psychologically non-controllable vignette involved Alex being held hostage in a school shooting in which she saw her professor and teaching assistant being killed. The biologically controllable vignette involved Alex willingly taking an unknown drug; that drug had a negative biological effect, leading to depression. The biologically

non-controllable vignette involved Alex's hypothalamus not working properly and emitting large amounts of cortisol, leading to depression.

After reading the vignette randomly assigned to them, participants took a memory test as a manipulation check. The memory test consisted of two questions, one asking about the controllability of Alex's depression ("how much would you indicate that Alex's depression was caused by something in her control versus out of her control") and one asking about the origin of Alex's depression ("how much would you indicate that Alex's depression was caused by psychological factors versus biological factors"). Both items used a 6-point semantic differential that ranged from 1 (*Completely Psychology; Completely Uncontrollable*) to 6 (*Completely Biological; Completely Controllable*).

Target sex. For the first 146 participants, the target sex in the Alex vignette was female. After 146 participants completed the survey, the target sex was changed from female to male; this change allowed for Hypothesis 4 to be assessed. This final dimension resulted in an overall 2 X 2 X 2 factorial design.

Dependent Variables

Mental health stigma. Participants completed the Perceived Social Stigma of those with Mental Illnesses (STIG) Scale (Prévile et al., 2015). The scale contained seven items such as, "Most people believe that mental health problems are not a true medical problem" and, "Most people believe that people with a mental health problem are abnormal." Responses range from 1 (Strongly Disagree) to 5 (Strongly Agree). Possible scores are added composites and thus ranged from 7 to 35, with higher scores indicating higher mental health stigma. The mean for this sample was 19.66 ($SD = 5.20$), and internal consistency was good, $\alpha = .80$.

Social distance. Participants completed the Modified Social Distance Scale (Anderson et al., 2015; originally adapted from Feldman & Crandall, 2007) while thinking about Alex from the vignette. The scale contained seven items such as, "I would like this person to be a close personal friend" and, "This is the kind of person that I tend to avoid." Responses range from 1 (Strongly Agree) to 7 (Strongly Disagree); after one item is reverse-coded, responses are summed. Possible scores thus ranged from 7 to 49, with higher scores indicating greater social distance. The mean for this sample was 29.32 ($SD = 7.96$), and internal consistency was high, $\alpha = .89$.

Treatment recommendations. Finally, participants indicated how much they would recommend eight treatment methods for Alex's depression (see Appendix 3). Four of the treatments were biological (nutrition, biofeedback, medication, and electrical brain

stimulation), and four of the treatments were psychological (join a support group, meditation, psychotherapy, and hospitalization). Each item was described in more detail to eliminate ambiguity. Responses range from 1 (Completely Ineffective) to 8 (Completely Effective). Scores for the biological treatments and psychological treatments were averaged separately for possible scores that ranged from 1 to 8 for each category. Higher scores indicate higher recommendations for either type of treatment. The mean for the psychological treatment sample was 5.41 ($SD = 1.07$), and for biological treatment sample was 5.10 ($SD = 1.09$). Again, alpha levels were not calculated as participants could have recommended a single treatment option.

Procedure

All participants in the study accessed the survey through the PsychData.com interface. Participants recruited from university classes were given the URL in a classroom setting where they could write their name down on a separate piece of paper (to preserve their anonymity) to receive extra credit. Participants recruited from social media (e.g., Facebook) were simply given the URL to complete the survey on their own time. The first screen of the survey provided consent information and required participants to click "yes" before proceeding. All participants were given unlimited amount of time to complete the questionnaire. Order of materials was: demographics, experience with mental health, PHQ-9, vignette (randomly assigned to condition), STIG scale, Modified Social Distance scale as applied to Alex, and treatment recommendations applied to Alex. Following the conclusion of the questionnaire, participants were shown a screen thanking them for their time and telling them the general nature of the study. This study was approved by the hosting institution's Internal Review Board for ethics.

Results

Manipulation Check

Before the hypotheses were tested, a manipulation check was conducted to test whether participants understood the vignettes and the experimental manipulation. Participants accurately perceived the school shooting and having no friends in college vignettes as leading to psychologically-based depression ($n = 129$, $M = 2.05$, $SD = 0.74$) and the malfunctioning hypothalamus and chemical reaction vignettes as leading to biologically-based depression ($n = 133$, $M = 3.71$, $SD = 1.54$); this difference was significant, $t(94) = -11.17$, $p < .001$. Additionally, participants accurately perceived the school shooting and malfunctioning hypothalamus as leading to

uncontrollable depression ($n = 123$, $M = 2.20$, $SD = 1.14$) and not having friends and choosing to take an unknown drug as leading to controllable depression ($n = 139$, $M = 3.95$, $SD = 1.30$); this difference was also significant, $t(94) = 11.45$, $p < .001$.

Hypothesis 1 and 2

The first hypothesis stated participants would report higher levels of mental health stigma and social distance when reading a vignette about psychologically-based depression versus when reading about biologically-based depression. An ANOVA revealed no significant difference in mental health stigma based on the origin of depression [$F(3, 261) = 0.86$, $p = .353$]. However, a statistically significant difference in social distance based on the origin of depression was found, $F(3, 257) = 5.49$, $p = .020$. Surprisingly, this result was opposite of what was hypothesized; see Table 2 for all relevant means and standard deviations. Therefore, Hypothesis 1 was not supported.

The second hypothesis stated participants would report higher levels of mental health stigma and social distance when reading a vignette about controllable depression versus non-controllable depression. An ANOVA revealed no significant difference in mental health stigma based on the controllability of depression [$F(3, 261) = 0.53$, $p = .469$]. However, significance based on the controllability of depression was found, $F(3, 257) = 69.21$, $p < .001$, for social distance in the hypothesized direction; see Table 2 for all relevant means and standard deviations. Therefore, Hypothesis 2 was partially supported.

Table 2: Means and Standard Deviations for Hypotheses 1 and 2

Origin of Depression	Mental Health Stigma	Social Distance
Biological	19.94 (5.27)	30.38 (7.97)
Psychological	19.37 (5.14)	28.24 (7.84)
Controllability of Depression	Mental Health Stigma	Social Distance
Controllable	19.88 (4.92)	32.76 (7.38)
Non-Controllable	19.41 (5.52)	25.43 (6.73)

Note. The first number in each cell is the mean; the number in parentheses is the standard deviation.

The ANOVAs also tested the interactions of the two independent variables (origin and controllability of the depression) on the two dependent variables (mental health stigma and social distance) separately. The interaction for mental health stigma was not significant, $F(3, 261) = 0.81$, $p = .369$, nor was the interaction for social distance, $F(3, 257) = 0.17$, $p = .678$.

Hypothesis 3

The first part of the third hypothesis was that men would be more likely than women to recommend biological treatment. A t-test revealed that, surprisingly, men ($M = 4.87$, $SD = 1.04$) were less likely than women ($M = 5.19$, $SD = 1.09$) to recommend biological treatment to a fictional character suffering from depression. Although this difference was significant [$t(249) = 2.19$, $p = .030$], it was in the opposite than hypothesized direction. Therefore, Hypothesis 3A was not supported.

The second part of the third hypothesis was that women would be more likely than men to recommend psychological treatment. A t-test revealed that women ($M = 5.52$, $SD = 1.15$) were more likely than men ($M = 5.19$, $SD = 0.82$) to recommend psychological treatment to a fictional character suffering from depression. This result was significant [$t(249) = 2.57$, $p = .011$] and in the correct direction. Therefore, Hypothesis 3B was supported. In short, women were more likely than men to recommend either form of treatment.

Hypothesis 4

The first part of the fourth hypothesis stated that participants would be more likely to recommend psychological treatment (compared to biological treatment) for female targets. A repeated-measures ANOVA revealed that as expected, a female target ($n = 132$) was more likely to be recommended psychological treatment ($M = 5.43$, $SD = 1.06$) over biological treatment ($M = 5.13$, $SD = 1.08$); that finding was statistically significant, $F(1,124) = 13.00$, $p < .001$. Therefore, Hypothesis 4A was supported.

The second part of the fourth hypothesis stated that participants would be more likely to recommend biological treatment (compared to psychological treatment) for male targets. Surprisingly, a repeated-measures ANOVA revealed that a male target ($n = 129$) was also more likely to be recommended psychological treatment ($M = 5.40$, $SD = 1.09$) over biological treatment ($M = 5.07$, $SD = 1.09$). Although this finding was statistically significant [$F(1,124) = 12.91$, $p < .001$], it was in the opposite than hypothesized direction. Therefore, Hypothesis 4B was not supported. In short, participants preferred to recommend psychological treatment over biological treatment regardless of target sex.

Hypothesis 5

The fifth hypothesis suggested that personal experience with mental health would be negatively correlated with (a) mental health stigma and (b) social distance. Participants were given scores for their own experience with (1) psychological and (2) biological treatment and their family's experience with (3) psychological and (4) biological treatment. From these

values, scores for (5) all self experience and (6) total experience with mental health (including both self and family) were created.

Those six mental health experience scores, along with participants' depression screening scores, were somewhat correlated with social distance (see Table 3). Mental health stigma was very slightly negatively associated with all mental health experiences (family and self), but none of the relationships were statistically significant. Supporting the hypothesis, social distance was negatively correlated with personal mental health experience. Five out of seven of these relationships were statistically significant, including one's own experience. The only predictors that were not statistically significant were family mental health experience. Therefore, Hypothesis 5 was partially supported.

Table 3: *Correlations Between Mental Health Stigma, Social Distance, and Various Levels of Experience with Mental Health*

	Mental Health Stigma	Social Distance
Self – Psychological	-0.03 (.594)	-0.27 (<.001)
Self – Biological	-0.09 (.152)	-0.31 (<.001)
Family – Psychological	-0.05 (.390)	-0.05 (.394)
Family – Biological	-0.06 (.330)	-0.10 (.102)
Self – All MH	-0.06 (.299)	-0.32 (<.001)
All MH Experience	-0.07 (.228)	-0.22 (<.001)
Depression	-0.03 (.606)	-0.22 (<.001)

Note. *Ns* range from 258 to 262 due to occasional missing data. The number in the parentheses is the *p* value. Statistically significant results are bolded.

Additional Analyses

Target sex. An analysis was run to explore whether target sex influenced the amount of mental health stigma and social distance participants felt toward the fictional character. A t-test revealed that male targets elicited more mental health stigma ($n = 129$, $M = 20.29$, $SD = 4.93$) than female targets ($n = 133$, $M = 19.05$, $SD = 5.40$); this finding approached significance, $t(260) = 1.95$, $p = .051$. Social distance revealed similar results. Male targets elicited more social distance ($M = 30.24$, $SD = 7.79$)

than female targets ($M = 28.45$, $SD = 8.05$); this finding approached statistical significance, $t(256) = 1.81$, $p = .071$.

Treatment experience and recommendations. Finally, an analysis explored any potential relationships between participants' experience with mental health, family experience with mental health, and the willingness to recommend treatment. Correlations revealed that a participant's own experience with mental health and their family's experience with mental health were not related to greater or less willingness to recommend treatment to a fictional person suffering from depression. The only two relationships that approached statistical significance were a participant receiving biological treatment and recommending either biological treatment ($r = 0.12$, $p = .053$) or any treatment ($r = 0.10$, $p = .096$). See Table 4 for all coefficients.

Table 4: *Correlations Between Experience with Mental Health and Treatment Recommendations*

	Recommend Psychological	Recommend Biological	Recommend Any
Self – Psych	-0.02 (.749)	0.01 (.827)	-0.00 (.951)
Self – Bio	0.07 (.288)	0.12 (.053)	0.10 (.096)
Family – Psych	0.02 (.800)	0.04 (.490)	0.03 (.599)
Family – Bio	-0.02 (.762)	0.07 (.259)	0.03 (.657)

Note. *Ns* range from 255 to 262 due to occasional missing data. The number in the parentheses is the *p* value.

Discussion

Several hypotheses were supported by the results, especially regarding social distance. Overall, it is important to note that none of the hypotheses involving the use of the mental health stigma scale produced significant results; thus, none of the hypotheses can be fully supported. The participants could be less inclined to place stigma on others, or they could have thought depression did not warrant mental health stigma as much as other mental illnesses (e.g., schizophrenia). Either way, the use of this scale should be considered one limitation of this study. Future research should look into developing a more nuanced scale that addresses mental health stigma. Additionally, future research should test mental health stigma as it applies to differing levels of depression and other mental illnesses (e.g., schizophrenia or bipolar disorder).

Although the mental health stigma scale did not produce significant results, the present study found many significant results regarding social distance. Additionally, many results regarding participant sex, target sex, and treatment recommendations were significant. The results

from Hypothesis 1 were opposite than expected in that the researchers found that participants place more social distance on targets with biological depression than on targets with psychological depression. This result goes against past research (Corrigan et al., 2000; Schwarzer & Weiner, 1991; Weiner et al., 1988), which found that psychological disorders are more likely to lead to social distance, compared to biological disorders. Because of the contradictory findings, more research must be done to understand the nuances of this finding.

Feldman and Crandall (2007) note that people opt for greater social distance from mentally ill individuals when their mental illness is perceived as rare (uncommon) and/or dangerous. It is possible that participants in the present study viewed targets taking unknown drugs and having malfunctioning hypothalamuses as rare and/or dangerous, but experiencing a school shooting or choosing not to make friends at college as more common and/or less dangerous. If this circumstance were the case, the results of the present study would be less dependent on the origin of depression and more dependent on prevalence and seriousness of depression. Future research should address similar hypotheses for different mental illnesses (e.g., anxiety disorders, other mood disorders) to see if the results from this study regarding origin serve as a harbinger for an upcoming trend or a single occurrence of the present study.

Hypothesis 2 was supported in that depression that was identified as controllable elicited more social distance than non-controllable depression. These results replicate previous research (Corrigan et al., 1999; 2000; 2003; Weiner, 1995). Results such as these indicate a direction for lowering the amount of social distance mentally ill individuals experience. For example, prefacing a mental illness with the uncontrollable aspects of the illness, when applicable, can reduce social distance applied by others. Mental health clinicians can also use these results to better their clients' treatment; for example, when noticing that a client's disorder is relatively controllable, therapists can spend a counseling session teaching clients about the feelings others may have toward the illness and ways of coping with those feelings.

For Hypothesis 3, finding that women were more likely than men to recommend both psychological and biological treatment was partially expected based on previous research. Consistent with the present study, one research team (Pattyn et al., 2015) found that women were more likely than men to recommend psychological treatment. The same study found that men saw little to no benefit to psychological treatment of mental illnesses; it was from this finding that the present authors hypothesized men would recommend biological treatment

more. Although the current study did not support men recommending biological treatment more than women, the results were consistent with other studies. For example, research (Galdas et al., 2005; Jorm & Griffiths, 2006) found that men were more likely than women to self-medicate mental illnesses. Because participants in the present study had the option of saying a recommended treatment would not be helpful to the target, it is entirely possible that men in the study were recommending that the target try self-medicating. Future research should look into ways of getting men to shy away from self-medicating illnesses and instead recommend more official forms of treatment to people suffering from mental illness.

The results for Hypothesis 4 revealed that psychological treatment is recommended more often than biological treatment to both male and female targets; this result was hypothesized for female targets but not for male targets. Psychological treatment could have been recommended more to both male and female targets because of the current societal view on biological treatment. As current research stands, many people in society are concerned with the amount of medication being dispersed to solve "problems" no one knew they had (e.g., restless legs syndrome, menopause; Diller, 1999; Greenfeld, 2013; Häfner, 1985). Along with this concern, some researchers (Pilowsky, 1993; Smith, 2012) suggest that the American public is shifting away from the use of medication to treat all problems, including mental illness, in favor of more natural, non-invasive treatment methods, such as psychotherapy. Future research should continue to test this trend toward psychological treatment in American society.

For Hypothesis 5 (on experience with mental illness), again only the relationships involving social distance were significant; these results comply with previous research (Anderson et al., 2015; Penn et al., 1994). The only results regarding social distance that were not significant regarded family experience with psychological treatment and family experience with biological treatment. It is possible that participants had family members had who received mental health services, but the participants were not particularly close with this family member (e.g., a step-sibling the participant only sees at holidays). If this were the case, the participants would may not experience as much empathy toward those with mental illnesses as they would if they had direct, personal experience with mental illness. Future research should look into ways of getting participants more exposure to the challenges faced by people with mental illness, in hopes that more exposure will further reduce prevalence of mental health stigma and social distance due to increased empathy or understanding.

Positives and Limitations

The present study is beneficial to the scientific community because, to the authors' knowledge, it is the first study to incorporate both social distance and mental health stigma as dependent variables measuring the effects of target sex, origin of depression, and controllability of depression. The results from this study can serve as a leaping point for future research on the topic. The difference in patterns of results for stigma versus social distance indicate that these two concepts are different from each other in important ways and are distinct phenomena. Additionally, by analyzing only one mental illness (depression), the present study was able to research many facets of that single illness in depth as opposed to only skimming the surface of many mental illnesses.

This study was not without its limitations. For example, some research (Crandall & Martinez, 1996; Corrigan & Watson, 2007; Tzouvara & Papadopoulos, 2014) found that participants' race, ethnic, or simple geographic location are potential predictors of mental health stigma levels. Unfortunately, the present study did not have enough participants identifying as African American, Asian American, or Hispanic to run these analyses. An additional limitation was the location of the study. With a large number of participants being students from a small, private Midwestern university, the results of the present study may not be generalizable to the general public. For example, participants from more progressive areas, such as San Francisco or Washington, D.C., may be more accepting of mental illness than participants from extremely conservative areas, such as Mesa or Oklahoma City (Forbes, 2016). Therefore, the method used in the present study should be continued in additional locations and with a wide variety of populations. Finally, although it was beneficial to only address one mental illness in depth, the hypotheses from the present study should be applied to other mental illnesses to discover if mental health stigma and social distance increases or decreases with certain disorders.

Future Research

Although it was outside of the scope of the present study, there is an important phenomenon amongst people with mental illness: self-stigma. Self-stigma involves mentally ill people embracing the idea that they are mentally ill, incompetent, and weak; self-stigma can result in feelings of shame, embarrassment, diminished self-esteem, and feelings of dependency (Corrigan, 2007; Rüscher et al., 2009). Similarly, many researchers (Corrigan, Watson, & Miller, 2006; Phelan et al., 1998; Sanden, Bos, Stutterheim, Pryor, & Kok, 2015) are acknowledging the prevalence of mental health stigma by association. In this case, family members will be stigmatized for simply being related to someone who is mentally ill; this stigma can be so bad that some family members will hide the mentally ill family member from

others when the symptoms of the illness are less than positive. Future research on mental health stigma should address the prevalence and experience of both types of stigma in order to get a truly comprehensive view of the impact of social pressures on the mentally ill.

Conclusions

In summary, the present study found that although measuring mental health stigma did not produce any significant results, levels of social distance were influenced by origin of depression, controllability of depression, and experience with mental illness. Additionally, target sex and participant sex both influenced treatment recommendations to a fictional individual suffering from depression. Although mental health stigma may not be as prevalent as other types of stigma (such as age, race, or sex), it is still worthy of attention and correction, including a focus on specific types of stigma such as social distance. Researchers should continue to study stigma and social distance because studies shed light on the topic; that attention then leads to more people becoming educated about mental illnesses. The more educated people are on the topic, the less likely they are to stigmatize and distance themselves from the mentally ill.

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Appendix 1

Experience with Mental Health Services

Have **you** received or are currently receiving services in the mental health field? If so, please **select** the services that you are receiving or received in the past. If you have not received mental health services, please **select**, “**Did not** receive mental health services”

- 1. **Join a support group** (talking with other people in a similar situation in order to cope with the symptoms)
- 2. **Nutrition** (eating foods that will stabilize your mood and keep your energy levels up during the day, e.g., bread instead of candy)
- 3. **Biofeedback** (teaching the person how to control heart rate, blood pressure, respirations, muscle tension, and other physiological processes in stressful situations in order to reduce negative symptoms)
- 4. **Meditation** (using deep breathing exercises, progressive relaxation tactics, and yoga as a means of decreasing symptoms)
- 5. **Psychotherapy** (seeing a therapist or counselor on an individual and weekly basis to learn how to better manage the depression symptoms)
- 6. **Medication** (taking a pill that will reduce the negative symptoms, e.g., anti-depressants)
- 7. **Hospitalization** (staying in a hospital to receive more intense help/therapy for a shorter period of time)
- 8. **Electrical brain stimulation** (sending electricity to specific parts of the brain to improve the neurons' ability to function properly)
- 9. **Did not** receive mental health services

Note. Participants also saw the same list, with these instructions: “Has **anyone in your family** (e.g., parents, siblings, grandparents) received or is currently receiving services in the mental health field? If so, to the best of your knowledge, please **select** which mental health services they received. If you are unsure or know that no one in your family received mental health service, please **select**, ‘**Did not** receive mental health services.’”

Appendix 2

Fictional Vignettes [Female Condition]

Psychological – Controllable

Alex is a 20-year-old college student at a large, public, Midwest university. Alex recently transferred from a much smaller community college on the East coast, so she does not really know anyone at this new college. Although Alex has a roommate that she sees every day, Alex does not have any other friends because she does not want to get involved with activities or people on campus. For the past two months, Alex has been quite irritable with her roommate; Alex will blow up at her roommate for small things, such as leaving dirty clothes on the floor or staying up too late at night. When Alex is in the room, she is almost always sleeping. Sometimes her roommate has to remind her to wake and go to class in the morning. Alex stopped going to eat at the cafeteria; she only eats enough food to survive (which caused her to lose weight). Alex no longer enjoys doing things that she used to do (e.g., hanging out with her friends or working out). Even on weekends when her roommate invites her to hang out around campus, Alex refuses and says she is too tired to join. On the rare chance that Alex decides to go out with her roommate, Alex is less than enthusiastic during the outing; she is commonly found not interacting with anyone and having trouble following others' conversations. Because of Alex's choice to not have friends or go out and experience this new college, she has been diagnosed with major depressive disorder.

Psychological – Non-Controllable

Alex is a 20-year-old college student at a large, public, Midwest university. Alex just started her third year of college, but this year is much different from the years past. At the end of her last year, Alex was involved in a horrible incident on campus. Alex was sitting in class one day when an armed individual walked into her classroom upset with the professor. Upset about a failing grade, this person was a former student and was out for revenge. Immediately upon walking into the room, the armed individual shot and killed the professor and the teacher's assistant. Alex was unfortunately sitting near the front of the classroom, so she was forced to look at the dead bodies of her professor and teacher's assistant for the remainder of the two hours that she was held hostage. Eventually, Alex and the other forty students were released physically unharmed. Over the rest of the semester and the summer, Alex experienced extreme irritability every time a door around her opened. Alex no longer enjoyed doing things that she used to do (e.g., hanging out with her friends or working out), she only ate enough food to stay alive (which caused her to lose weight), and she spent most of her time sleeping. Now back at college, these behaviors have gotten worse; her friends will invite her out but she refuses and says she is too tired to join. On the rare chance that Alex decides to go out with her friends, Alex is less than enthusiastic during the outing; she is commonly found not interacting with anyone and having trouble following others' conversations. Because of Alex's uncontrollable experience with a school shooting, she has been diagnosed with major depressive disorder.

Biological – Controllable

Alex is a 20-year-old college student at a large, public, Midwest university. At the beginning of the semester Alex decided that she was going to try things this semester that she had never done before. While going out to parties with her friends, Alex started doing recreational drugs. She started out smoking cigarettes and marijuana, but she quickly escalated to ecstasy and ketamine. During one night out with her friends, Alex chose to take a new drug that she had never heard of before from someone she had just met. This drug was an unknown combination of chemicals that had an unexpected and lasting effect on Alex's emotions. In the weeks following Alex's experiment with this drug, she experienced extreme irritability with those people around her for seemingly small things (e.g., not telling her they were going to go eat or coming over unexpectedly to hang out). Alex no longer enjoys doing things that she used to do (e.g., hanging out with her friends or working out), she only eats enough food to stay alive (which caused her to lose weight), and she spends most of her time sleeping. Alex's friends will invite her out but she refuses and says she is too tired to join. On the rare chance that Alex decides to go out with her friends, Alex is less than enthusiastic during the outing; she is commonly found not interacting with anyone and having trouble following others' conversations. Because of Alex's choice to experiment with an unknown drug, she has been diagnosed with major depressive disorder.

Biological – Non-Controllable

Alex is a 20-year-old college student at a large, public, Midwest university. While starting her third year of college, Alex experienced extreme irritability with those people around her for seemingly small things (e.g., her friends not telling her they were going to go eat or coming over unexpectedly to hang out). Alex no longer enjoys doing things that she used to do (e.g., hanging out with her friends or working out), she only eats enough food to stay alive (which caused her to lose weight), and she spends most of her time sleeping. Alex's friends will invite her out but she refuses and says she is too tired to join. On the rare chance that Alex decides to go out with her friends, Alex is less than enthusiastic during the outing; she is commonly found not interacting with anyone and having trouble following others' conversations. Alex was confused why she was experiencing these feelings because her schedule was no more stressful than normal and she had not changed her diet recently. Alex's annual physical and blood work revealed that her cortisol levels were incredibly high. Her doctor explained that cortisol is a hormone in her body that, in excessive amounts, can lead to depression. The doctor also explained that her cortisol levels were high because her hypothalamus was not functioning properly as a result of a genetic disorder. Because Alex's hypothalamus was uncontrollably releasing large amounts of cortisol, she has been diagnosed with major depressive disorder.

Appendix 3

Recommendations for Treatment

Please indicate to what degree you believe the following treatments would be effective treating Alex's depression. Please use the following scale:

Completely Ineffective	Very Ineffective	Moderately Ineffective	Slightly Ineffective	Slight Effective	Moderately Effective	Very Effective	Completely Effective
1	2	3	4	5	6	7	8

- _____ 1. **Join a support group** (talking with other people in a similar situation in order to cope with the symptoms)
- _____ 2. **Nutrition** (eating foods that will stabilize your mood and keep your energy levels up during the day, e.g., bread instead of candy)
- _____ 3. **Biofeedback** (teaching the person how to control heart rate, blood pressure, respirations, muscle tension, and other physiological processes in stressful situations in order to reduce negative symptoms)
- _____ 4. **Meditation** (using deep breathing exercises, progressive relaxation tactics, and yoga as a means of decreasing symptoms)
- _____ 5. **Psychotherapy** (seeing a therapist or counselor on an individual and weekly basis to learn how to better manage the depression symptoms)
- _____ 6. **Medication** (taking a pill that will reduce the negative symptoms, e.g., anti-depressants)
- _____ 7. **Hospitalization** (staying in a hospital to receive more intense help/therapy for a shorter period of time)
- _____ 8. **Electrical brain stimulation** (sending electricity to specific parts of the brain to improve the neurons' ability to function properly)

MENTAL ARITHMETIC PROCESSES: TESTING THE INDEPENDENCE OF ENCODING AND CALCULATION

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Abstract - Previous work has shown that the cognitive processes involved in mental arithmetic can be decomposed into three stages: encoding, calculation, and production. Models of mental arithmetic hypothesize varying degrees of independence between these processes of encoding and calculation. In the present study, we tested whether encoding and calculation are independent by having participants complete an addition verification task. We manipulated problem size (small, large) as well as problem format, having participants verify equations presented either as Arabic digits (e.g., “ $3 + 7 = 10$ ”) or using words (e.g., “three + seven = ten”). In addition, we collected trial-by-trial strategy reports. Though we found main effects of both problem size and format on response times, we found no interaction between the two factors, supporting the hypothesis that encoding and calculation function independently. However, strategy reports indicated that manipulating format caused a shift from retrieval-based strategies to procedural strategies, particularly on large problems. We discuss these results in light of two competing models of mental arithmetic.

Keywords: mental arithmetic, encoding, calculation, strategy reports

Mental arithmetic is a daily skill that involves several cognitive processes. For example, consider the period of time at the end of a meal when it is time to calculate a tip. Calculating a gratuity (e.g., 20%) requires first looking at the lunch total and encoding the total into a mental representation. The gratuity is then calculated through some manipulation of previously learned mathematical facts (possibly including practiced procedures or direct memory retrieval), culminating in the production of an amount that is then written on the receipt. Though most researchers agree on framing mental arithmetic in terms of encoding, calculation, and retrieval (Campbell & Clark, 1988; Dehaene, 1992; McCloskey, 1992), there is considerable debate regarding the independence of these processes. The purpose of the present study was to investigate the interaction between encoding and calculation in mental arithmetic.

To study encoding and calculation, we relied upon two specific empirical effects found throughout the literature. First, a common signature of the calculation process is the problem size effect, which is the finding that

response times and errors increase as problem operands grow in magnitude (Ashcraft, 1992; Campbell, Parker, & Doetzel, 2004; Groen & Parkman, 1972). For example, the simple addition problem $1+1$ is typically solved more quickly and accurately than $8+9$. One early explanation for the problem size effect was Groen and Parkman’s (1972) “min” (minimum addend) model, in which the larger operand of a simple arithmetic problem (9) is fixed in the mind and the smaller operand (8) is added in increments of one until the total (17) is reached. Thus, the increase in RT from the problem $1+1$ is attributed to an increase the number of increments calculated by the thinker. Such “min” counting is a prevalent operation employed by children, but adults are known to revert to this incremental technique only when direct retrieval fails (Groen & Parkman, 1972). Later accounts of the problem size effect included the network retrieval model (Ashcraft, 1987) and the network interference model (Campbell, 1987), both of which explained the problem size effect as due to the structure of arithmetic facts in long term memory. Further explanations of the problem size effect

have included roles for number fact acquisition and strategy selection. For example, smaller problems are encountered more frequently and may be less sensitive to interference during retrieval from long term memory (Campbell & Alberts, 2009). In addition, larger numbers are more likely to evoke procedural strategies (e.g., incremental counting) and are more error prone due the failing of retrieval activation (Campbell & Alberts, 2009; LeFevre, Sadesky, & Bisanz, 1997).

Though there are several competing explanations for the problem size effect, the increase in response times for larger problems is robust, and hence, the problem size effect is a reliable marker of mental arithmetic. Similarly, the encoding process in mental arithmetic is reflected by the format effect (Campbell, 1994; Dehaene & Cohen, 1995; Noël, Fias, & Brysbaert, 1997), where response times and errors increase when problems are presented in word problem format (Nine + three), as opposed to Arabic digits (9 + 3). The penalty associated with changes in surface format may be attributed to lack of familiarity of word problems (Schunn et al., 1997). However, it is not clear whether these format effects are localized to the encoding process alone, or whether changes in format directly affect the calculation process.

As such, the current research reveals a debate over how the processes of encoding and calculation interact. Models formed on the premise of no direct communication between encoding and calculation are called additive models (e.g., the Triple Code Model of Dehaene and Cohen, 1995), for they assert no interaction between encoding and calculation. That is, arithmetic codes exiting the encoding phase will not affect the manner in which the arithmetic problem is calculated. To be specific, such a model assumes that any differences in encoding (e.g., manipulating surface format, such as “4+5” versus “four + five”) would not directly affect calculation processes (Dehaene & Cohen, 1995).

One example of an additive model is Dehaene and Cohen’s (1995) Triple Code Model. This model accounts for numerical processing through three separate code systems: the auditory verbal word frame, analog magnitude representation, and visual Arabic number form. Each code subsystem is responsible for a different number processing task. The auditory verbal word frame mediates written and spoken input and output, while the visual Arabic number form handles digital input and output as well as multi-digit operations. Finally, the analog magnitude representation is recruited in core number operations of estimation, magnitude comparison, and potentially subitizing (Campbell & Epp, 2005, p. 347). Critically, the Triple Code Model predicts that response time costs due to surface format manipulations can be

attributed to the efficiency of transcoding the visual stimuli into their appropriate internal codes. As calculation would take place entirely within the visual Arabic number form, there would be no downstream effect of format on the actual calculation process.

A second class of models is characterized by an interaction between the encoding and calculation processes. That is, the processes involved in calculation directly depend upon the format in which stimuli are encoded (Campbell & Alberts, 2009; Campbell, Parker, & Doetzel, 2004). To illustrate, think back to the lunch bill example presented earlier. If the bill was illustrated in Roman numerals rather than the typical Arabic digit format, one would expect that the time to calculate the tip would increase. What is not clear is whether the source of this increase is due to the efficiency of encoding the Roman numerals into a mental representation consisting of Arabic digits (e.g., the Triple Code Model), or whether the process of encoding the Roman numerals fundamentally affects the processes involved in calculation. Campbell and Epp (2005) present such an interactive approach with their Encoding Complex model. They argue that problem operands automatically trigger a network of associations and operations related to the problem encoded. Like the Triple Code Model, it views number processing as dependent upon representational codes (e.g., visual, verbal, magnitude). However, successful number processing depends on the strength of the relationships between representational codes, termed skilled processing (Campbell & Epp, 2005). Presentation of problems in an unfamiliar format would result in greater response times and errors because participants are unable to “maximize activation of relevant information and minimize activation of irrelevant information” (Campbell & Epp, 2005, p. 350). That is, the manipulation of format would directly affect the calculation process.

Evidence for an interactive model of mental arithmetic came from Campbell and Fugelsang (2001), who required participants to record their strategy choice after completing simple arithmetic problems. Participants were presented single-digit addition problems in a true/false verification task with equations displayed in either Arabic digit format (“6 + 3 = 8”) or word format (“six + three = eight”). Campbell and Fugelsang (2001) found that the problem size effect was larger for word problems than for digit problems. This format x size interaction indicated that the response time costs associated with the word format were carried into the calculation stage, thus supporting an interactive model of mental arithmetic. Further, Campbell and Fugelsang found that the most commonly reported strategy was direct retrieval from long term memory. However, participants reported using

procedural strategies more often than retrieval when solving word format problems, especially when the problem operands were large. That is, format had a direct effect on the types of strategies used in calculation, which further supports the interactive model.

The purpose of our study was to perform a replication of Campbell and Fugelsang (2001) with a different population. The participants in Campbell and Fugelsang (2001) were psychology students at a Canadian university. Though Campbell and Fugelsang did not report educational backgrounds of their participants, Campbell (personal communication) has reported that many participants in his lab are educated in China, which may lead to differences in performance on mental arithmetic (Campbell & Xue, 2001). We performed our replication on a sample of participants from Texas. Based on the past literature, we expected to replicate both the effects of problem size (small problems should be solved faster than large problems) and problem format (digit problems should be solved faster than word problems). The critical test concerns whether format (digit, word) interacts with problem size (small, large) on response times. If there is an interaction, the results would lend support for the interactive model of mental arithmetic (Campbell & Epp, 2005). If there is no such interaction, the results instead support an additive model of mental arithmetic (Dehaene & Cohen, 1995), calling the results in Campbell and Fugelsang (2001) into question.

Method

Participants

Twenty-three undergraduate students (18 female, mean age = 25.2 years, age range 19 to 60) participated in this experiment in exchange for partial course credit in their psychology courses. Within this sample, 16 self-identified their ethnicity as White, two self-identified as Black, and five as Hispanic. The experiment was reviewed and approved by the institutional review board at Tarleton State University.

Design and Stimuli

Each participant completed 288 trials consisting of four blocks of 72 single-digit addition verification problems. On even numbered trials, questions were presented as word problems in lower case English (“five + seven = twelve”). On odd numbered trials, questions were presented in Arabic digit format (“5 + 7 = 12”). Problems were composed of addends ranging from 2 to 9, resulting in a set of 36 problems ranging between $2 + 2 = 4$ and $9 + 9 = 18$ (note that commuted pairs such as $2 + 6$ and $6 + 2$ were counted as one problem). In each block, each of the 36 problems was presented once in digit format and once in word format. Problem size was defined as either small

(product of operands less than or equal to 25) or large (product of operands greater than 25). Within each set of 36 problems, 18 were presented as true equations (e.g., “ $2 + 4 = 6$ ”) and 18 were presented as false equations (e.g., “ $2 + 4 = 7$ ”). Across all four blocks, each addition problem was tested in each format twice in a true equation and twice with a different false answer. False answers were generated pseudo-randomly to be within ± 4 of the correct answer and never corresponded to either the difference or the product of the operands. Within each set of false answers, each of the numbers 4 to 18 (i.e. the range of true answers) occurred at least once but no more than four times.

All equations appeared as white characters against a black background, displayed in 36 point Lucida Grande font. For all equations the two operands were separated by a single space on either side of the + sign (e.g. three + eight = eleven). The answer to be verified appeared simultaneously with the problem operands. Following each verification trial, participants were asked to indicate the strategy they used by selecting one of five strategy descriptions (originally presented in Campbell and Fugelsang, 2001): “RECOGNITION = you thought the equation was true because it seemed familiar or looked right, or false because it seemed unfamiliar or looked wrong; REMEMBER & COMPARE = you remember the correct answer and then compared it to the presented answer; CALCULATE & COMPARE = you calculated to get the correct answer and then compared it to the presented answer; ODD/EVEN RULES = you used odd/even rules to deduce that the equation was false; OTHER = you used some other calculation strategy (e.g. subtraction) or are uncertain.”

Procedure

Even numbered participants selected “true” responses by pressing the right button of a response box, and odd numbered participants selected “true” responses by pressing the left button. Each participant was instructed to respond quickly but accurately.

Prior to the first block, each participant completed 12 practice trials in alternating word and digit format using the operand 0 or 1 paired with 0 to 9. At the beginning of each trial, a fixation point appeared at the center of the screen. When ready to begin, participants initiated the presentation of the equation with a button press. The fixation dot flashed for 1 second and was then replaced with an equation. The timer began with the presentation of this equation and ended with the participant’s manual response (a button press indicating true or false). All response times were accurate to ± 1 ms. After each response, feedback was given; a green C for correct or red E for error flashed on the screen for 300ms. On the

subsequent screen, the prompt “Strategy Choices” appeared with the cues Recognition, Remember & Compare, Calculation, Odd/Even Rules, or Other aligned vertically below. The experimenter recorded the strategy choice on each trial with a press of a keyboard button, clearing the screen and prompting the fixation point for the next trial.

Results

Participants completed a total of 6,624 experimental trials. Of these, we removed 423 trials that contained an error response (6.4%). From the remaining correct trials, we removed an additional 118 trials (1.9%) for which response time (RT) exceed 3 standard deviations from the mean RT over all trials ($M = 1708$ ms, $SD = 1056$ ms). All RT analyses were performed on the remaining 6,083 trials.

Response time analysis

We submitted correct RTs to a 2 (Problem Size: small, large) x 2 (Format: digit, word) x 2 (Truth Value: true, false) repeated measures analysis of variance. Results can be seen in Figure 1. As expected, there was a significant main effect of Problem Size, $F(1, 22) = 72.3, p < 0.001, \eta_p^2 = 0.77$. RTs for large problems ($M = 1819$ ms) were longer than for small problems ($M = 1453$ ms). Also, there was significant main effect of Format, $F(1, 22) = 327.8, p < 0.001, \eta_p^2 = 0.94$, with word problems ($M = 1880$ ms) taking longer to verify than digit problems ($M = 1392$ ms). Finally, there was a significant main effect for Truth Value, $F(1, 22) = 35.1, p < 0.001, \eta_p^2 = 0.61$, with false problems ($M = 1742$ ms) taking longer to verify than true problems ($M = 1530$ ms). There was a small, but statistically significant interaction between Problem Size and Truth Value, $F(1, 22) = 4.6, p = 0.04, \eta_p^2 = 0.17$. As can be seen in Figure 1, the problem size effect, operationalized as the difference between RT for large problems and small problems, was slightly smaller for false problems (mean difference = 333 ms) than for true problems (mean difference = 400 ms). Critically, there was no interaction between Problem Size and Format, $F(1, 22) = 0.03, p = 0.86, \eta_p^2 < 0.01$, lending support for an additive model of mental arithmetic (Dehaene & Cohen, 1995) over an interactive model (Campbell & Epp, 2005). No other terms in the ANOVA model were significant (all F -values less than 0.5).

Strategy Reports

Similar to Campbell and Fugelsang (2001), we calculated the mean percentage use of three prevalent strategies, Calculate & Compare, Recognition, and Remember & Compare, which is presented in Table 1. Notice that Recognition was used on most trials, but this strategy shifted to Calculate & Compare for large word

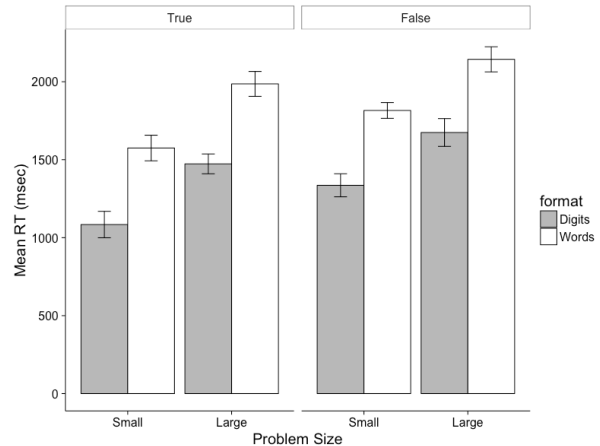


Figure 1. Mean RT as a function of problem size (small, large), format (digits, words), and truth value (true, false). Error bars represent within-subject 95% confidence intervals as recommended by Morey (2008).

Table 1

Percentage reported use of strategies as a function of truth, format, and problem size

	Format	True problems		False problems	
		Small	Large	Small	Large
Recognition	Digits	54.4	55.5	52.1	54.2
	Words	43.7	27.4	41.1	29.1
Remember and compare	Digits	24.4	21.4	23.0	21.8
	Words	31.3	27.2	23.7	22.9
Calculate and compare	Digits	20.4	22.1	24.2	22.7
	Words	24.2	43.5	34.0	47.5

problems. Whereas the RT analysis above did not bear out a Problem Size x Format interaction, the strategy reports do seem to indicate that format and problem size interact with regard to the types of strategies used.

Discussion

The purpose of the present study was to perform a replication of Campbell and Fugelsang (2001) and test the independence of encoding and calculation. We did this by having participants perform an arithmetic verification task and give trial-by-trial strategy reports. We tested 23 participants who verified whether addition equations were true or false in multiple conditions derived from manipulating problem format (Arabic digits or word problems) and problem size (small or large).

Given that the effects of problem size and format are strong in the literature (Ashcraft, 1992; Campbell, 1994; Campbell, Parker, & Doetzel, 2004; Dehaene & Cohen, 1995; Groen & Parkman, 1972; Noël, Fias, &

Brysbaert, 1997), we expected to find significant main effects of both. This expectation was confirmed. We found a large main effect of problem size; response times increased when problem operands increased in magnitude. We also found a large main effect of surface format; response times for equations in word format were larger than response times for equations in Arabic digit format.

The critical test for independence of encoding and calculation came from testing the interaction between the factors of problem size and format. Recall that an additive model (e.g., Dehaene & Cohen, 1995) is based on the premise of no direct communication between encoding and calculation processes. That is, codes acquired in the encoding phase do not affect the manner in which calculation occurs. For example, Dehaene and Cohen's (1995) Triple Code model would predict that the verbal auditory word frame subsystem would encode stimuli in word format (e.g., "six + nine = fifteen") and transform them into the appropriate internal code for calculation, which would be the visual Arabic form. Subsequently, this visual Arabic number form would account for calculation independently of the initial form of the stimulus. Thus, the effect of problem size (a calculation effect) would be the same regardless of initial format, which would imply that there is no interaction between problem size and format.

Alternatively, an interactive model (e.g., Campbell & Epp, 2005) would predict a direct influence of encoding on calculation. For example, Campbell and Epp's (2005) Encoding Complex Model would predict that the presented problems would activate a rich network of associations, including activations of both correct and incorrect answers which are all used in the calculation process. Presenting problems in an unfamiliar format (such as word format) would lessen the activation strength of the correct answer and potentially increase activation strength of incorrect answers, thus exacerbating the effect of problem size on RT. That is, encoding factors would directly affect the calculation process, implying that there would be an interaction between problem size and format.

Critically, we did not find a statistically significant interaction between format and problem size on RT. This finding is in opposition to that of Campbell and Fugelsang (2001). Rather, our results support an additive model of arithmetic processing. However, our participant strategy reports mirror those from Campbell and Fugelsang (2001). Like Campbell and Fugelsang's (2001) participants, our participants utilized the recognition strategy most often to solve equations, but showed a shift from recognition to procedural strategies when encountering large word problems. This strategy shift suggests that manipulations in the presentation format of

equations may alter the strategy used to complete the equations. That is, format manipulations seem to have downstream effects on the calculation process, which is the signature of an interactive model of arithmetic processing.

Thus, the results of our study are mixed. Response time patterns indicate support for an additive model of arithmetic processing, whereas strategy reports support an interactive model. However, some limitations to this study demand that the results be interpreted tentatively. With a relatively small sample size, we may not have had sufficient power to detect the interaction of problem size and format on response times. However, the expected effects of problem size and format were sufficiently robust, and the extremely small F -ratio ($F = 0.03$) on the problem size x format interaction makes reduced power an unlikely culprit. The nature of the verification task should be interpreted in context as well. Unlike a production task in which the answer is provided by the participant, a choice is made about a potential answer provided on each trial. This could affect the RT because the participant could rely on recognizing the answer provided rather than reaching the answer independently. That is, the verification task may not truly reflect calculation processes in the same way as a production task.

Given these contradictory findings, which result should we believe? Strategy reports are known to be questionable indicators of mental processes (Cooney & Ladd, 1992; Russo, Johnson, & Stephens, 1988). Response time patterns have long been the gold standard in cognition research, and as such, they should be interpreted accordingly. The absence of an interaction between problem size and format gives us a fair amount evidence in support of an additive model of mental arithmetic (e.g., Dehaene & Cohen, 1995). Future work could investigate the nature of strategy reports in mental arithmetic using free response setting rather than the forced choice setup we used.

In summary, we found support for an additive model of mental arithmetic performance, as predicted by Dehaene and Cohen (1995). Our results indicate that the stages of encoding and calculation in mental arithmetic are functionally independent. This result helps to further specify the cognitive mechanisms behind mental arithmetic and further clarify how adults go about the daily task of doing mental calculations.

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DO PEOPLE REMEMBER THE JUDGMENTS THEY MAKE?

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Abstract - In the choice blindness paradigm, participants view two images of faces and select the one they consider to be more attractive. The experimenter then hands the participants the image they selected and asks them to describe their reasons for selecting it. In some trials, the experimenter uses a simple magic trick to switch the images, and yet most participants describe their reasons for selecting the image. In a recent extension of the choice blindness paradigm, participants are asked to rate images on a scale of 1 to 10, then later asked to describe the reasons for their ratings. Some of the ratings are switched, and yet most participants describe their ratings. Here we investigated factors influencing why participants notice the switch. In Experiment 1 half of the participants were warned that their ratings might be switched. Results supported our hypothesis that more of the warned than non-warned participants would have at least one hit (correctly noticing a switch that is present) and one false alarm (incorrectly noticing a switch that is not present). From the fact that all participants in Experiment 1 who had a false alarm also had a hit, we hypothesized that a warning plus a hit is necessary for a false alarm. Results from Experiment 2, in which all participants were warned but only half had their ratings switched, did not support our hypothesis. In Experiments 1 and 2 we noticed that female participants seemed more engaged in the task than male participants, and hypothesized that female participants are more interested than male participants in images of female faces that were used in Experiments 1 and 2. In Experiment 3 we gathered male faces, so half of the participants could view same-sex images and half could view opposite-sex images. Results supported the opposite of our hypothesis because female participants noticed more switches for images of male faces than female faces, and the manipulation had no effect on male participants.

Roommates can clash when one becomes annoyed with the other. For example, maybe you left the milk out of the refrigerator and your roommate wonders why. If your roommate asked you why you left the milk out, but you don't remember the reason, what would you say? Would you admit that you don't remember?

Common sense suggests that when people fail to remember the reasoning behind their actions, they would simply admit they forgot. However, the results from the choice blindness paradigm show that people justify the reasons for their choices, even when they had not actually made them. In the original choice blindness study (Johansson, Hall, Sikstrom, & Olsson, 2005), experimenters showed participants two images of women's faces and asked them to indicate which was more attractive. The experimenter then handed the selected

image to participants and asked them to describe the reasons why they chose her. In some trials, the researcher used a simple magic trick to switch the images so the participants unknowingly received the image they had deemed as less attractive. To carry out the magic trick, the experimenter held two pictures in each hand: the picture the participant could see and a second picture hidden behind it. The hidden picture was the same as the visible picture in the other hand, so when the experimenter placed both pictures face down on the table, the pictures that had been invisible were now on top of the pictures the participant had seen. Thus, when the experimenter slid a picture across the table, it was actually the picture that had been visible in the other hand. The previously visible picture remained on the table hidden underneath the experimenter's arm, so when the experimenter pulled her

hand back she slid this picture along with her arm until it dropped into her lap. Instead of objecting, most participants simply gave plausible-sounding reasons. Obviously, participants cannot possibly “remember” selections they had not actually made. Because participants justify decisions not actually made, the experimenters argued that people sometimes fabricate the reasons for their actions.

Sagana, Sauerland, and Merckelbach (2014) extended on the work of Johansson et al. (2005) by looking at whether participants would justify not only decisions (e.g., which of these two is preferable?), but also judgments (e.g., rate this image on a scale of 1 to 10). The participants were asked to view images of women’s faces and rate how sympathetic the women appeared (1 being not sympathetic at all and 10 being extremely sympathetic). After rating all the images, the experimenter told participants they would be asked to justify their ratings, and warned them that some ratings could be changed. The experimenter then showed participants each image, told them what their rating had been, and asked them to describe why they had given that rating. For some trials, the experimenter switched the participants’ rating. Ratings between 1 and 5 were raised by 3 points, and ratings between 6 and 10 were lowered by 3 points. Even with a warning, more than half of the participants justified a switched rating, indicating that they failed to notice the switch.

If participants in Sagana et al. (2014) had not been warned, would even fewer have noticed a switch? Although participants are often suspicious when participating in psychology experiments (Orne & Scheibe, 1964), we believe the participants who noticed a switched rating did so due to the warning rather than any preexisting suspicion. To test this, in Experiment 1 we warned half of the participants that their ratings might be switched, and did not warn the other half. We hypothesized that more of the warned than non-warned participants would notice when their ratings were actually switched. Also, we hypothesized that the warned participants would be oversensitive and therefore expect their ratings to be switched even when they are not. In other words, we hypothesized that more of the warned participants would have at least one hit and one false alarm than the non-warned participants.

Experiment 1: Warned Versus Non-warned

Method

Participants. After receiving permission from the University of Central Arkansas (UCA) Institutional Review Board to carry out all three experiments, a total of 22 undergraduate students (16 female) participated in Experiment 1 for course credit. In all three experiments participants were treated in accordance with the ethical guidelines of the American Psychological Association (2010). Each participant in Experiment 1 was randomly assigned to one of the two conditions: warned or non-warned.

Materials. In an email interchange, we requested and obtained 15 black and white images of female faces used in Johansson et al. (2005). The images were 6 cm wide by 8 cm tall. A personality questionnaire was used as a distraction task between the study phase and the test phase. Participants’ ratings and verbal indications they had noticed switches were recorded on a datasheet created in Microsoft Word.

Procedure. In the study phase, all 15 pictures were shown one at a time for 2 seconds. After showing each image, the experimenter placed it facedown and asked, “How would you rate the happiness of this woman on a scale of 1 to 10, with 1 being not happy at all and 10 being extremely happy?” Between the study and test phase, the participants completed a personality questionnaire with 25 items that took 3 to 5 minutes to prevent them from mentally rehearsing their replies from the study phase. After completing the questionnaire, participants in the warned group (but not the non-warned group) were told that some of their original ratings may have been changed.

In the test phase, each picture was shown again one at a time for 2 seconds, then placed facedown. Participants were told their original rating and asked to explain why they gave that rating. However, in trials four, eight, and twelve (out of fifteen trials) the experimenter switched the ratings; ratings that had been between 1 and 5 were raised by 3 points, and ratings that had been between 6 and 10 were lowered by 3 points. If participants verbally indicated they noticed a switch, the experimenter recorded this.

Results

In the warned condition, 9 participants out of 11 had at least one hit, compared to just 2 participants out of 11 in the non-warned condition. The results of a chi-squared analysis, $\chi^2(1, N = 22) = 8.91, p = 0.0028$, supported our hypothesis that more of the warned than

non-warned participants would have at least one hit. As for false alarms, 5 participants out of 11 in the warned condition had at least one, whereas none had any false alarms in the non-warned condition. The results of a chi-squared analysis, $\chi^2(1, N = 22) = 6.47, p = 0.011$, supported our hypothesis that more of the warned than non-warned participants would have at least one false alarm.

Discussion

While examining the data we noticed that every participant who had at least one false alarm also had at least one hit. This suggests that participants who noticed a switch may have become oversensitive, leading to a false alarm, whereas participants who never noticed a switch had no incentive to become oversensitive. If so, then perhaps the warning itself was not sufficient to cause false alarms, and instead the warning plus the detection of a switch were necessary to cause a false alarm. Would warned participants have made any false alarms if none of their ratings had been switched? To answer this question, in Experiment 2 all participants were warned that their ratings could have been switched, but for only half of participants were their ratings actually switched. We hypothesized that more participants in the switched group than in the non-switched group would have at least one false alarm. We have no hypothesis about the effect of our manipulation on hits because only participants in the switched group could have any hits.

Experiment 2: Switched Versus Non-Switched

Method

Participants. A total of 22 UCA undergraduate students (17 female) participated, none of whom had participated in Experiment 1. Each participant was assigned to one of two conditions: switched or non-switched.

Materials and Procedure. The same materials were used in Experiment 2 as in Experiment 1. The procedure in Experiment 2 was a mirror-image of Experiment 1. In Experiment 1 ratings were switched for all participants but only half were warned; in Experiment 2 all participants were warned but ratings were switched for only half.

Results

In the switched condition, 5 participants out of 11 had at least one false alarm, and in the non-switched condition, 4 participants out of 11 had at least one false alarm. The results of a chi-squared analysis, $\chi^2(1, N = 22)$

$= 0.188, p = 0.66$, did not support our hypothesis that more participants in the switched condition than the non-switched condition would have at least one false alarm. Consequently, this supports our hypothesis for Experiment 1 that a warning is sufficient to make participants hypersensitive, leading to false alarms.

Discussion

While interacting with participants, we noticed that women and men reacted differently to rating faces and noticing changes. Female participants seemed to take the experiment more seriously than male participants, so women may have been more likely to notice switches because they were more engaged in the task. For example, when we asked the female participants “Why did you give her a 7?”, female participants gave us very detailed explanations such as “It was the way her eyes turned up and the way she smiled.” When we asked the men the same questions, men would say “I just thought she was happy.” Based on the results from a recent study, we thought the difference between male and female participants could be attributable to the fact that images of female faces are more familiar to female participants than to male participants.

Reis, Fallon, and Waite (2014) conducted a study in which participants viewed male-oriented (e.g., power tools) and female-oriented (e.g., makeup) images and were asked to determine if anything had been changed about the images. Participants were likelier to notice changes to the images associated with their own sex, meaning that male participants noticed more changes to male-oriented images than female-oriented images, and vice versa for female participants. Perhaps in our Experiments 1 and 2 male participants seemed to be less engaged than female participants because images of female faces are female-oriented. To investigate this possibility, in Experiment 3 we gathered images of male faces to supplement the images of female faces used in Experiments 1 and 2. In Experiment 3, participants viewed either same-sex or opposite-sex images. Extending the results from Reis et al. (2014) to our own paradigm, we hypothesized that participants would notice more switched ratings for same-sex images than opposite-sex images.

Experiment 3: Same Sex Versus Opposite Sex

Method

Participants. A total of 35 UCA undergraduate students (23 female) participated, none of whom had participated in the previous experiments. Each participant

was assigned to one of two conditions: same sex or opposite sex.

Materials and Procedure. The materials from the previous experiments were supplemented with 15 images of male faces downloaded from an online source providing materials for psychology experiments. Participants were shown 15 images of faces that were either the same sex or the opposite sex and asked to rate them on a scale of 1 to 10 for happiness. Following this, participants were given the same distractor task used in the previous experiments. After completing the questionnaire, participants were presented with the same images and their ratings, and asked to describe the reasons for giving that rating. Three of the ratings (trials four, eight, and twelve) had been increased or decreased by 3 points as in the previous experiments. If the participant verbally mentioned noticing a switch the experimenter took note of it.

Results

The results were submitted to two chi-squared analyses, one for female participants and one for male participants. For the female participants, 9 of 11 who viewed opposite-sex images noticed the switch whereas only 2 of 12 who viewed same-sex ratings noticed the switch, $\chi^2(1, N = 25) = 7.00, p = 0.0082$. For the male participants, 3 of 6 who viewed opposite-sex images and 3 of 6 who viewed same-sex images noticed the switch, $\chi^2(1, N = 12) = 0, p = 1$.

Discussion

While interacting with participants in Experiments 1 and 2 we observed that female participants seemed to be more engaged in the task than male participants. Based on prior research (Reis et al., 2014) we attributed the apparent difference between male and female participants to the possibility that images of female faces might be female-oriented, for which women are likelier to notice changes than men. As a result, we hypothesized that female participants would notice more switched ratings of female faces than male faces. Our results did not support our hypothesis but were nonetheless interesting as they support the opposite of our hypothesis. In fact, female participants were likelier to notice switched ratings of men's faces than women's faces, suggesting that women are more interested in images of men than images of women. Could it be that women pay closer attention to men because they are judging men's but not women's attractiveness? Chatterjee, Thomas, Smith, and Aguirre (2009) found that facial beauty can be

apprehended at a glance and can bias subsequent cognitive judgments. Although our participants were asked to rate happiness, a smile can also contribute to attractiveness, which may help participants remember their ratings.

We had developed our hypothesis that female participants would be likelier than male participants to notice switched ratings of female faces as a way to explain why female participants seemed more engaged in Experiments 1 and 2 than male participants. The fact that Experiment 3 did not support our hypothesis suggests either that our observation about the difference between male and female participants was mistaken, or there is another reason that female participants seemed more engaged. Experiment 3 provided some indirect evidence that women were more engaged in the experiment: (1) more women than men participated in the experiment, and (2) there was no difference between conditions for male participants. Perhaps women are simply more conscientious than men, which leads them to sign up for more experiments than men, and to pay more attention when participating in experiments.

General Discussion

Our study expanded on prior research in which choices (Johansson et al., 2005) or judgments (Sagana et al., 2014) are switched and participants are asked to justify both switched and non-switched responses. The willingness of participants to justify switched responses is typically taken as evidence that when asked to justify past behavior for which the reasons are forgotten, participants will concoct justifications on the fly. This project explored factors influencing the likelihood that participants would notice switches. The results from Experiment 1 supported our hypothesis that a warning would increase the likelihood of hits and false alarms. The fact that all participants in Experiment 1 with a false alarm also had a hit led us to hypothesize that a warning together with a hit was necessary to instigate a false alarm. The results from Experiment 2 did not support this hypothesis, which lends more support to our hypothesis that a warning is sufficient to cause a false alarm. In Experiments 1 and 2, we noticed that female participants seemed to be more engaged in the task than male participants, and based on prior research (Reis et al., 2014), we hypothesized that participants would pay more attention to same-sex images than opposite-sex images. The results from Experiment 3 supported the opposite of our hypothesis: Female participants were likelier to notice switched ratings for images of male faces than images of female faces. The

complete lack of a difference between conditions for male participants, combined with the typically higher numbers of female participants in our studies led us to conclude that women may simply be more conscientious than men.

Limitations

This highlights one of the limitations of our experiment: Our procedure was not sensitive enough to distinguish between unnoticed switches and apathy. That is, participants may refrain from mentioning they noticed a switch because they did not actually notice, or because they *did* actually notice but did not care enough to mention it. In the future we would like to devise a way to make this distinction in this type of task. Another limitation is that while we hypothesized that the observed difference between male and female participants was attributable to women being more conscientious than men, we could have but did not investigate this possibility. As the reader is aware, participants completed a personality questionnaire which could have provided insight into the relative conscientiousness of our male and female participants, but we neglected to record the sex of the participants on the questionnaire. The main reason for this oversight was that we thought of the conscientiousness explanation only after gathering our data. In a follow-up study, we can record the participants' sex on their personality questionnaire.

A third limitation of our study is the possibility that we did not include enough participants to reveal significant differences in Experiment 2. After all, the observed difference between conditions in Experiment 2 was consistent with our hypothesis that more participants in the switched condition (i.e., 5) would have at least one false alarm than in the non-switched condition (i.e., 4). However, this difference was small enough that it could easily have been the result of chance, and Experiment 1 revealed significant differences using the same sample size. The same could be said about the small sample size of male participants in Experiment 3. However, there was absolutely no effect of our manipulation for male participants (i.e., 3 of 6 in the same-sex condition and 3 of 6 in the opposite-sex condition noticed a switch), and no sample size would be sufficient to make a non-effect significant.

Looking to the future

In Experiments 1 and 2 we asked all participants to view images of women as a way to control our materials, and because we thought female participants would be more comfortable than male participants rating same-sex images. When designing our experiment we took a cue

from previous choice blindness experiments (Downs & Sobel, 2015; Johansson et al., 2005) by asking participants to rate the attractiveness of viewed images. Although in our experience (Downs & Sobel, 2015) female participants are perfectly willing to describe the reasons they selected one of two images as more attractive, in the initial stages of our experiment female participants seemed to be extremely uncomfortable describing their reasons for giving a numerical rating to an image. We hypothesized that when participants describe why they selected one of two images, they can always put a positive spin on their selection (e.g., I selected her because I liked her hair). For numerical ratings, particularly 7 or less, participants have a harder time describing the reasons for their ratings in a positive light (e.g., I gave her a 7 because her hair is a little messy), and they don't want to be malicious.

After observing discomfort in all of the first several female participants (probably because more women than men participated in our experiment, every one of the first several participants was a woman), we decided to stop asking participants to rate the attractiveness of viewed images. We wonder if Sagana et al. (2014) encountered the same problem, prompting them to ask their participants to rate how sympathetic the images appeared instead of their attractiveness. We discarded the data from the first five participants, and changed the task for subsequent participants to ratings of happiness instead of attractiveness. This raises questions that we did not have the opportunity to explore in this study. Were we correct in our observation that participants were uncomfortable describing the reasons for numerical ratings of attractiveness? Are participants more willing to rate happiness than attractiveness because they prefer to avoid being malicious? Why are participants better able to put a positive spin on selections than ratings? It seems clear that this paradigm will inspire plenty of future investigations.

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SOCIAL SUPPORT AND COGNITIVE FLEXIBILITY
LINKED TO RESILIENCE TO DEPRESSION

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Abstract - This study examined the relationships among cognitive factors, perceived social support, and depression symptoms in 251 undergraduate students. Previous research in this population has shown that cognitive inflexibility and negative world beliefs are associated with greater depression symptoms (Hokett & Reiland, 2015). We examined the additional influence of perceived social support on both cognitions and depression. Regression analyses revealed that cognitive variables were more strongly related to depression than perceived social support was. Additionally, cognitive variables partially mediated the relationship between perceived social support and depression symptoms. This study demonstrates that social support might have an important effect on both cognitions and depression.

Depression, which affects about 16% of Americans (Kessler et al., 2005), can engender debilitating symptoms that cause impaired daily functioning. Studies suggest that college students experiencing mental health issues, including depression symptoms, are more likely to demonstrate suicidal behaviors and academic impairments (Andrews & Wilding, 2004; Keyes et al., 2012). Considering that a relatively large percentage of the general population experiences depression, it is important to identify factors that contribute to the development and maintenance of depressive disorders.

Many theories of depression are centered upon cognitive factors. Beck's (1967) cognitive theory of depression posits that thoughts and perceptions are strong predictors of negative emotions. Beck (1970) describes a cognitive triad of depression, noting that negative beliefs about the world, the future, and oneself are typical of depressed individuals. In support of Beck's (1970) theory, researchers have found significant relationships between greater depression symptoms and more negative general perceptions of one's self, the world, and others (Hokett & Reiland, 2015; Maschi & Baer, 2012).

In addition to negative beliefs, cognitive inflexibility is another possible correlate of depression. Sarapas, Shankman, Harrow, and Goldberg (2012) found that lower cognitive flexibility was associated with more severe depression symptoms in individuals with depressive disorders. The researchers measured

cognitive flexibility with the Wisconsin Card Sorting Test (WCST; Grant & Berg, 1948) that requires individuals to adjust and adapt to random, unannounced changes in card sorting tasks. Ottowitz, Dougherty, and Savage (2002) also found that individuals with depression tend to perform worse in problem solving tasks compared to individuals without depression. Another form of cognitive flexibility may be the ability to tolerate some amount of uncertainty in decisions and life events. The Intolerance of Uncertainty Scale (IUS; Freeston, Rhéaume, Letarte, & Dugas, 1994) assesses beliefs about one's ability to cope with ambiguities and unknowns in life, and high scores have been associated with depression and rumination (de Jong-Meyer, Beck, & Riede, 2009; Liao & Wei, 2011). According to Nolen-Hoeksema's (1987, 1991) response styles theory of depression, individuals respond to stressful life events through rumination or distraction. Rumination is associated with more severe and longer-lasting symptoms (Nolen-Hoeksema, 1991), which is evidence that rigid thinking plays a role in depression. Cognitive flexibility seems to help individuals adapt to challenges.

In addition to beliefs and cognitive flexibility, social support may also relate to depression. Cohen and Wills (1985) argue that social support promotes wellbeing and acts as a protective factor in stressful situations. Social support may protect individuals from developing inflexible and negative thinking patterns that are related to depression. Multiple studies have found greater perceived social support to be related to fewer

depressive symptoms (Jenkins, Belanger, Connally, Boals, & Durón, 2013; Pengilly & Dowd, 2000; Raffaelli et al., 2012).

Although many studies have found associations between social support and depression, there is limited information about the mechanisms of this relationship. Cognitive flexibility could mediate the relationship between social support and depression. Greater social support could contribute to more positive, flexible thinking and more positive emotions. Dickinson, Potter, Hybels, McQuoid, and Steffens' (2011) longitudinal study found that older adults with less instrumental (i.e., tangible) social support experienced greater cognitive decline, specifically involving executive function, compared to those who reported higher levels of social support. Those with less social support may be particularly susceptible to more negative, inflexible thinking. Nolen-Hoeksema, Parker, and Larson (1994) theorize that social support might act as a distraction from rumination or other inflexible thinking patterns that contribute to depression. Support for the benefits of social support on thinking patterns can be found in Abela, Vanderbilt, and Rochon's (2004) study of 190 seventh grade students. The researchers found that the relationship between low social support and depression was partially explained by rumination, suggesting that weaker social support systems were associated with more rigid thought patterns.

Despite the large body of information regarding factors that relate to depression, there is limited information regarding the relationships among thinking styles, social support, and depression in college students. Most studies have focused on examining the effect of cognitive factors on depression (Hokett & Reiland, 2015; Maschi & Baer, 2012; Ottowitz et al., 2002; Sarapas et al., 2012) or social support on depression (Jenkins et al., 2013; Pengilly & Dowd, 2000; Raffaelli et al., 2012). Whereas there is an abundance of evidence that both cognitive factors and social support are related to depression, there is a lack of information about the relationship between social support and cognitions. Cognitive flexibility may be impacted by social factors that promote more positive beliefs and adaptive functioning.

This study will investigate the relationships among perceived social support, cognitive factors, and depression symptoms in college students. We hypothesize that greater cognitive flexibility, positive beliefs about the world, and perceived social support will be associated with fewer depression symptoms. We also hypothesize that cognitive factors (i.e. cognitive flexibility and positive beliefs) will mediate the

relationship between perceived social support and depression symptoms.

Method

Participants

The original student sample consisted of 251 college students. Sixteen participants were dropped for completing fewer than 80% of the survey items, resulting in a final sample size of 235. The ages ranged from 18 to 45 years, with a mean age of 20.41 ($SD = 2.73$). The sample was comprised of 79% ($n = 199$) women and 21% ($n = 52$) men. The participants were racially diverse; a majority (55%; $n = 138$) identified as White/Caucasian, 39% ($n = 98$) identified as Black/African-American, and 6% ($n = 15$) selected Other/Biracial.

Measures

Demographics Questionnaire (DQ). The DQ was created for this study in order to determine basic demographic information such as age, sex, and race. Participants also indicated their class standing, relationship status, and economic background.

Beck Depression Inventory (BDI). The BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is a self-report measure that assesses depression symptoms and severity. Each of the 21 items is rated from 0 to 3, where 0 indicates absence of the symptom and higher scores illustrate increasingly higher endorsement of the symptom. Sample items from the BDI include "I do not feel sad," representing "0" on the scale, and "I am so sad and unhappy that I can't stand it," representing "3." Studies have shown that the BDI is a valid assessment of depression symptoms. Convergent validity is evident in correlations as high as $r > .90$ between different versions of the BDI (Beck, Steer, & Brown, 1996; Lightfoot & Oliver, 1985) and acceptable correlations between BDI scores and clinician ratings of depression ($r = 0.62-0.66$; Foa, Riggs, Dancu, & Rothbaum, 1993). In the present study, the internal consistency was excellent (Cronbach's alpha = .92).

Intolerance of Uncertainty Scale (IUS). The IUS (Freeston et al., 1994) is a 27-item measure that is used to determine beliefs about one's ability to handle ambiguous situations. Sample items include "uncertainty makes life intolerable" and "it's unfair not having any guarantees in life." Each statement is rated using a Likert-type scale that ranges from 1 (not at all representative of the participant) to 5 (completely representative of the participant). The IUS has been found to have acceptable reliability, demonstrating good internal consistency (Cronbach's alpha = 0.88 - 0.94) and test-retest reliability over a 5-week interval ($r =$

0.78; Dugas, Freeston, & Ladouceur, 1997). The IUS in the present study demonstrated excellent reliability (Cronbach’s alpha = .93).

World Assumptions Scale (WAS). The WAS (Janoff-Bulman, 1989) assesses global perception of the world, other people, and one’s self. The WAS includes items such as “human nature is basically good.” This measure consists of 32 items that are each rated on a Likert-type scale from 1, “strongly disagree” to 6, “strongly agree.” The reliability in our study was acceptable (Cronbach’s alpha = .73).

Multidimensional Scale of Perceived Social Support (MSPSS). The MSPSS (Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item measure that assesses one’s perception of social support. It includes items such as “I get the emotional help and support I need from my family.” The response scale ranges from 1 to 7, where “1” represents “very strongly disagree” and “7” represents “very strongly agree.” The MSPSS demonstrates good internal consistency (Cronbach’s alpha = .88; Zimet et al., 1988). In our study, the internal consistency was excellent (Cronbach’s alpha = .93).

Procedure

This study was approved by a university Institutional Review Board. College students were invited to participate in the research study by email, and surveys were administered to college students through Qualtrics. Questionnaires were completed in an average time of 20 to 30 minutes.

Analyses were conducted using the SPSS (Statistical Package for Social Sciences 22) software. Data analyses were performed on responses from the 235 college students who completed at least 80% of items on each measure. Mean substitution replaced missing values. In addition to conducting descriptive analyses to determine means, standard deviations, ranges, and correlations between variables in our study, we also conducted a linear regression and mediation analyses to address the study’s hypotheses. We conducted a linear regression to address the first hypothesis that greater cognitive flexibility, positive beliefs, and perceived social support would be associated with fewer depression symptoms. We used Preacher and Hayes SPSS Indirect Bootstrapping Macro for Mediation to address our second hypothesis that cognitive variables (IU and WAS scores) would mediate the relationship between perceived social support and depression symptoms. This method is considered to be appropriate for determining mediation (Preacher & Hayes, 2008). The cognitive factors were assessed using the WAS (world assumptions) and the IUS (intolerance of

uncertainty), and social support was measured using the MSPSS. Depression was measured with the BDI.

Results

Descriptive Data for Cognitive and Social Variables and Depression Symptoms

Table 1 summarizes descriptive data for each measure and correlations between the BDI and other measures to satisfy assumptions of mediation. Participants reported generally high thresholds for uncertainty and generally more positive world beliefs. Higher scores on the IUS represent greater intolerance of uncertainty, and the mean item rating score was 2.67 on a scale of 1 to 5. Higher scores on the WAS represent more positive world beliefs, and the mean item rating score was 3.83 on a scale of 1 to 6. MSPSS scores also indicate that participants reported considerably high levels of social support. The mean item rating score was 5.75 on a scale of 1 to 7. Lastly, BDI scores suggest minimal depression; out of a possible score of 63, the average score was less than 11. The relatively broad ranges of scores on each instrument, however, provided enough variability to examine relationships among the variables.

Table 1
Summary of Descriptive Statistics and Correlations between Measures

	Mean (SD)	Range	Correlation with BDI score
IUS	72.17 (19.66)	27-122	.42**
WAS	122.59 (14.41)	78-155	-.47**
MSPSS	69.05 (13.30)	12-84	-.35**
BDI	10.42 (9.60)	0-44	n/a

**p < .01

Relationships among Cognitive Variables, Perceived Social Support, and Depression

As hypothesized, both perceived social support and cognitive variables significantly predicted depression symptoms and explained 35.8% of variation in BDI scores [$F(3, 234) = 42.95, p < .001, R^2 = .36$]. Depression symptoms were predicted by lower social

support scores, greater intolerance of uncertainty, and more negative world beliefs. Cognitive variables more strongly predicted depression symptoms than perceived social support did (see Table 2). Greater intolerance of uncertainty and more negative world assumptions were the strongest predictors of depression.

Table 2
Summary of Linear Regression Analysis for Social and Cognitive Factors Predicting Depression

Variable	B	SE B	β
MSPSS Total	-0.11	0.04	-.16**
WAS Total	-0.23	0.04	-.34***
IUS Total	0.17	0.03	.34***
R ²	.36		

p < .01 *p < .001

Consistent with our second hypothesis, IUS and WAS scores partially mediated the relationship between perceived social support and depression symptoms. A 95% bootstrap confidence interval (CI) was calculated for each mediation analysis, and statistical significance was indicated when the CIs did not include zero. Indirect bootstrapping results supported the hypothesis that intolerance of uncertainty and world beliefs might partially mediate the relationship between perceived social support and depression (see Table 3). WAS scores demonstrated stronger mediation compared to IUS scores in the relationship between perceived social support and depression symptoms (see Figures 1 and 2).

Discussion

Our results suggest that both cognitive factors and social support are significantly associated with depression symptoms. As hypothesized, greater intolerance of uncertainty, more negative world beliefs, and lower perceived social support were associated with greater depression symptoms in our sample of college students. Our results also supported our second hypothesis that cognitive variables might mediate the relationship between perceived social support and depression symptoms. These findings highlight the potential importance of both thinking

patterns and social support in promoting or hindering resilience. The relationships among social support, cognitions, and depression symptoms in our study suggest that social support might be a salient target for increasing resilience to depression as it might have both a direct path to improving mental health and also an indirect path through its potential impact on thinking patterns associated with resilience.

Our results are consistent with prior research with other types of samples that demonstrates a link between lower depression symptoms and cognitive flexibility (e.g., Palm & Follette, 2010; Sarapas et al., 2012), more negative world beliefs (e.g. Maschi & Baer, 2012), and greater social support (e.g. Chao, 2011; Prachakul, Grant, & Keltner, 2007; Raffaelli et al., 2012).

Table 3

Indirect Effects of Cognitive Flexibility (IUS Total and WAS Total) on Depression through Perceived Social Support

Mediator	Point Estimate	Standard Error	Lower CI ^b	Upper CI ^b
IUS	-.0374	.0216	-.0869	-.0030
WAS	-.1216	.0295	-.1855	-.0709

Note. Bias-corrected 95% confidence interval (CI); CIs that do not contain zero are considered significant

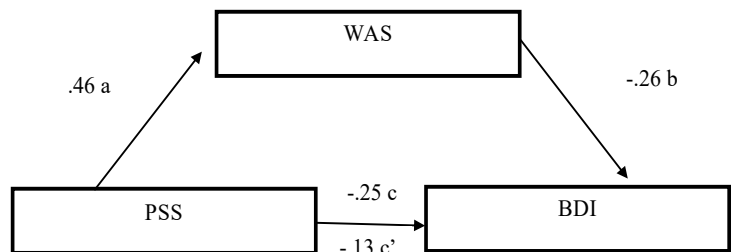


Figure 1. Path a demonstrates that greater perceived social support (PSS) predicts more positive world beliefs (WAS), and path b shows that more positive world beliefs (WAS) correspond to fewer depression symptoms (BDI). There was a direct effect of perceived social support on BDI scores (path c), but the WAS was a significant partial mediator between PSS and depression. The WAS accounted for about half of the direct effect between PSS scores and BDI scores (path c').

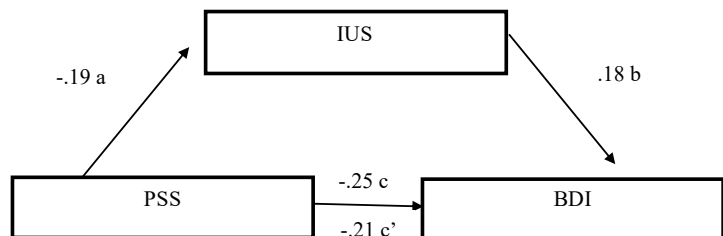


Figure 2. Greater perceived social support (PSS) predicts less intolerance of uncertainty (path a); intolerance of uncertainty predicts higher BDI scores (path b). There was a direct effect of PSS on BDI scores (path c), but there was also a significant indirect effect of PSS on BDI scores through IUS scores (path c'). The IUS was a significant partial mediator between PSS and depression.

We found stronger associations between cognitive factors and depression compared to social support and depression, perhaps due to the complex nature of social support. Support may have different effects on depression depending on the nature of the support. For example, instrumental social support is support that encourages problem-solving behaviors (Dickinson et al., 2011). However, simply talking with someone and venting about a problem could actually increase rumination and decrease problem-solving behaviors by encouraging the individual to continuously think about a stressful situation rather than search for ways to solve the problem (see Ross & Mirosky, 1989).

Cognitive factors were more strongly related to depression symptoms than social support was, but we found support for our second hypothesis that cognitive variables might mediate the relationship between perceived social support and depression symptoms. Our findings are consistent with studies that suggest that social support is associated with more adaptive coping strategies as opposed to rumination and inflexible thinking that are characteristic of depression (e.g., Abela et al., 2004; Nolen-Hoeksema et al., 1994; Prachakul et al., 2007). Our study adds to the body of research that suggests that social support might encourage more positive beliefs and cognitive flexibility that help individuals cope adaptively with stressors. It might be beneficial for clinicians to add a social support component to traditional cognitive-behavioral treatments for depressive disorders. Research involving ages across the lifespan has shown that social support is linked to resilience to depression (Abela et al., 2004; Chao, 2011; Pennigly & Dowd, 2000), and the present study demonstrates that cognitive approaches may actually benefit from encouraging social behavior.

Nonetheless, this study is limited by self-report data and its cross-sectional design. Because information was only obtained at one point in time, this study cannot determine causative relationships among variables. We cannot determine, therefore, whether cognitive and social factors cause depression. In fact, depression can influence thoughts (Lewinsohn, Steinmetz, Larson, & Franklin, 1981) and affect social relationships (Feinstein, Bhatia, Hershenberg, & Davila, 2012). Nevertheless, there is limited research evidence from longitudinal studies supporting the theory that inflexible thinking patterns at baseline are associated with greater depression symptoms in the future (e.g., Pearson et al., 2015; Rawl, Collishaw, Thapar, & Rice, 2013; Sarapas et al., 2012; Smets, Luyckx, Wessel, & Raes, 2012). Similarly, there are longitudinal studies that provide evidence that lower social support is a predictor of cognitive decline (Dickinson et al., 2011; Seeman,

Lusignolo, Albert, & Berkman, 2001; Zunzunegui, Alvarado, Del Ser, & Otero, 2003).

Future research should investigate the relationships among specific types of social support, cognitive factors, and depression in varying populations because these factors may have different impacts on different populations and are likely to change throughout life. Abela et al. (2004)'s study suggested age-related differences among these variables; they found different relationships among social support, rumination, and depression between children in the third grade and children in the seventh grade. Our sample was comprised of mostly young adults with healthy cognitive functioning, whereas older adults often endorse chronic mild, subclinical depression symptoms (Beekman et al., 2002), and they are more susceptible to cognitive decline (Ford, Flicker, Singh, Hirani, & Almeida, 2013) and reductions in some types of social support (Field & Minkler, 1988). Studies have linked cognitive decline in older adults to less instrumental (i.e. tangible) social support (Dickinson et al., 2011) and less social engagement (Seeman et al., 2001; Zunzunegui et al., 2003). Similarly, low social support has been linked to greater depression in older adults (e.g., Chao, 2011). In order to tailor therapy and instill resilience in people of varying ages, it is important to understand which factors are most significantly associated with depression and how those factors interact. Future research should build upon the findings of the current study to examine how social and cognitive factors are related to depression in older populations.

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THE EFFECTS THAT RACE HAS ON STUDENT PERCEPTIONS OF PROFESSORS' CREDIBILITY

EMILY PHIPPS & WIND GOODFRIEND

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Abstract - There are a low number of professors of color in the U.S. (Umbach, 2006), which may be due to a number of causes. It is important to study whether college student perceptions of professors are affected by race, to identify and understand whether race creates additional challenges for potential professors. To examine perceptions of professor credibility, 79 college students completed an online survey in which they were randomly assigned to read one of four professor vitae. The vitae were varied in two ways (independent variables): professor race (White or Hispanic) and academic experience (high or low credibility). The participants then completed various scales measuring perceived professor credibility. Results showed professor race did not affect students' perceptions of their competence, goodwill, trustworthiness, or overall impression (all four p values $> .08$). However, professors with a stronger academic background were perceived more credible overall ($p = .04$). Future research directions and implications for the association between the student perception of race and professor credibility are discussed.

Keywords: Race, professor credibility, student perceptions

It has come to the attention of some researchers that very few faculty members at undergraduate institutions are people of color (Anderson & Smith, 2005; Umbach, 2006). It is estimated that 14% of U.S. undergraduate faculty are people of color, while 28% of students are people of color (Umbach, 2006). Due to the increasing population of people of color in the U.S., a discrepancy between the racial diversity of college students and the racial diversity of college faculty may warrant further attention and concern. College prepares students for their futures both academically and socially, and exposure to diversity and to role models who are people of color may help all students, regardless of their own race or ethnicity.

One example of how diversity plays a role in higher learning comes from Umbach (2006) who stated, "Even after controlling for a number of individual and institutional characteristics, faculty of color were more likely to interact with students, to employ active learning and collaborative learning techniques, to create environments that increase diverse interactions, and to emphasize high-order thinking activities in the classroom" (p. 337). Even though it has been found that faculty of

color have a positive influence on students, one factor that may be preventing minority faculty members from succeeding in a university setting is poor student evaluations. The purpose of this study was to examine how faculty ethnicity and perceived credibility interact to influence student perceptions.

One definition of credibility (Nesler, Agunis, Quigley, & Tedeschi, 1993) was that it is made up of five components, including competency, character, sociability, composure, and extraversion. Nesler et al. (1993) also note that a source can be considered credible if the source is accurate, truthful, and follows through. Specifically relevant to teachers, another writer notes: "Competence refers to the teacher's perceived knowledge or expertise in a subject matter, trustworthiness the perceived goodness of the teacher (e.g., honesty), and caring the perceived goodness of the teacher (e.g., understanding and concern;" Zhang, 2009, p. 329).

Powers, Nitcavic, and Koerner (1990) found "that the dimensions of credibility may vary based on the source being evaluated and the type of individual doing the evaluation" (p. 228). Here they are referring to the idea that for credibility of faculty, it is important to remember

that it is typically students who are doing the evaluation. Further, Myers (2004) suggests that college professor credibility consists of three dimensions: competence, character, and caring. Competence includes how much knowledge an instructor is perceived to have, character focuses on the morality of the professor, and caring is how much interest an instructor is perceived to have about students' well-being.

Certainly, perceived credibility is an important dimension on which college and university faculty will be judged by both students and peers. If racism is present, however, faculty of color may already be disadvantaged if they fall into a stereotyped group perceived as less credible, educated, or intelligent. One study (Anderson & Smith, 2005) found that indeed, students have different expectations for professors of color compared to White professors. These researchers found that students believed White women professors were more capable than Latina professors, despite their teaching styles; this was true even among Latino students.

Specifically related to the college setting, Sosa and Sagas (2008) hypothesized that students perceive White male professors as being more capable of teaching classes compared to women or people of color. Interestingly, the study found that students believed a White professor was more capable than a professor of color even for classes focusing on race or gender issues. Not many studies currently in the field of psychology have specifically examined perceptions of Hispanic or Latino professors alone. However, the general or typical stereotype of Latinos is that they are lazy, aggressive, and ignorant (Anderson & Smith, 2005). The current study therefore focused on comparisons between White and Hispanic professors. Based on previous research, we hypothesized that participants would favor a White professor, compared to a Hispanic professor; specifically, the White professor would be perceived as having higher competence, goodwill, and trustworthiness. We also expected that perceptions of professors based on race would interact with the professors' experimentally manipulated general credibility.

In some cases, "reverse racism" might occur in which lowered expectations for people of color actually result in more positive judgments. For example, one study (Harber, 1998) found that when participants read essays supposedly written by African-Americans or by Whites, the essays written by African-Americans were judged in a more lenient manner than the essays written by White people. This shows how there was a positive bias when it came to judging a person of color's work. In this context, it is possible that professors of color may actually be judged more positively than their White counterparts, but only

due to lower expectations from the start. This kind of "reverse" racism is possible, but likely not common. Reid (2010) found that when students evaluated professors, professors of color were evaluated more harshly. In short, professors of color had to prove their intellectual competence, while White professors were rarely (if ever) challenged.

The role race plays in a person's identity affects the way they perceive race in general. Some people believe it is very significant to their identity while others believe it plays absolutely no role. For example, some people believe we are living in a post-racial era, or a time when race is acknowledged but is not perceived to be significant (Johnston, Pizzolato, & Kanny, 2015). Overall, Johnston et al. (2015) found that college students have become more open-minded to diversity. However, other studies have shown consistent prejudice (e.g., Carter, 1990), and race remains a topic frequently highlighted in national news (e.g. the "Black Lives Matter" campaign and controversy). Carter (1990) examined how the level of a White student's racial identity affects his or her attitudes toward other races, especially for male participants. Another study supported a gender difference in racial attitudes (Pope-Davis & Ottavi, 1992); here, women were found to be less racist than men. A potential explanation for the different viewpoint is that women face discrimination in a way men do not, so women are able to understand what it is like to be discriminated against (i.e. increased empathy toward oppressed groups). They are more racially aware and realize the impact certain attitudes have on ethnic minorities (see p. 296). We therefore hypothesized that among White participants, women would perceive a professor of color as more credible than male participants would.

Finally, perceptions of professor credibility may also depend on experience with diversity. One study that examined personal experience (Hall, Cabrera, & Milem, 2011) investigated how precollege factors and college factors played a role in whether or not a student will participate in engagement with diverse peers. It is possible that this type of previous exposure to diversity will also lead to students being more willing to take classes from a professor of color or to base judgments of credibility on actual credentials, rather than resort to racist stereotypes. Thus, we hypothesized that a positive correlation would exist between pre-college exposure to diversity and perceived credibility of a fictional Hispanic professor.

Method

Participants

This study included 79 college students from a Midwestern college between the ages of 18 and 26 ($M = 20.17$, $SD = 2.65$). Demographic data can be viewed in

Table 1. The table shows participants included 20 men and 59 women; ethnicity was 65.82% White/Caucasian, 18.99% Hispanic/Latino, 7.59% African-American, 3.80% Asian, and 3.80% other.

Table 1: *Demographic Information*

	%
Sex of Participant	
Male	25.32
Female	74.68
Year	
Freshman	21.52
Sophomore	17.72
Junior	30.38
Senior	30.38
Race/Ethnicity	
Caucasian/White	65.82
Hispanic/Latino	18.99
African American	7.59
Asian	3.80
Other	3.80

Predictor Variables

Diversity exposure. In order to measure the amount of exposure participants had to diversity, a modified version of the scale created by Locks, Hurtado, Bowman, and Oseguera was used (2008). The items of this scale measured the proportion of Whites in precollege environments, the precollege predisposition to participate in diversity activities in college, positive interactions with diverse peers in college, and a sense of belonging. This scale has 15 different items each with a 5-point Likert scale (anchors changed depending on the item). One example is, "Racial composition of high school" with anchors 1 (*All people of Color*) to 5 (*All White*). Items were summed to create a composite score. The original scale had some items with 4-point Likert scales and others with 5-point Likert scales; this version was modified so that all items 5-point scales in order to make a cohesive overall composite score. The possible range of scores was from 15 to 75 with higher scores indicating more exposure to diversity. The mean score of this sample was 61.12 ($SD = 8.41$). Internal consistency for this scale was good, $\alpha = .731$.

Social dominance orientation. For exploratory purposes (not related to a particular hypothesis), social dominance orientation was also measured (Pratto, Sidanius, Stallworth, & Malle, 1994). Social dominance orientation (SDO) is a personality construct relevant to one's preference for social hierarchies and power dynamics. This scale contained 16 different items (e.g., "If certain groups stayed in their place, we would have fewer problems" and, "We should

strive to make incomes as equal as possible" [reverse scored]). Participants responded to each item on a 7-point Likert scale (*very negative to very positive*), and items were summed to create a composite score. Thus, scores ranged from 16 to 112 with higher scores indicating more belief in social dominance (i.e. endorsement of some groups having more power than others in society). The mean score of this sample was 40.35 ($SD = 17.70$). Internal consistency for this scale was good, $\alpha = .925$.

Independent Variables: Race and Credibility of Professors

Participants were randomly assigned to read one of four fictional professors' vitae creating a 2 (race: Hispanic or White) X 2 (credibility: high or low) factorial design. For race, the name at the top of the vitae was either Santiago Garcia or Jacob Johnson; names were chosen based on an online search for most common names within each ethnicity. To manipulate credibility, the vitae differed in schooling, cumulative GPA, academic positions, awards, and number/type of publications. Examples of two (out of four) vitae can be seen in the Appendix.

Dependent Variables: Perceptions of Professors

To measure participants' perception of the credibility of the professor, participants completed the scale made by McCroskey & Teven (1999). This scale included 18 different items, with three dimensions of credibility that included "competence," "goodwill," and "trustworthiness." Each dimension is measured with six items and 7-point semantic differential scales (e.g., *Unintelligent to Intelligent*). All 18 items were summed to create a composite score for overall impressions; thus, the possible range was 18-126, with higher numbers meaning a more positive perception of the professor. The overall mean for this sample was 79.96 ($SD = 11.95$), and internal consistency was good, $\alpha = .810$.

The three subscales were also calculated separately for a more nuanced view of perceptions. Each had a possible total range of 6 to 42 (and higher numbers indicating perceptions of more of that trait in the professor). Competence had an overall mean of 28.65 ($SD = 6.68$), $\alpha = .765$. Goodwill had an overall mean of 24.81 ($SD = 4.00$), $\alpha = .631$. Trustworthiness had an overall mean of 26.51 ($SD = 4.60$), $\alpha = .633$.

Procedure

All participants went to a URL for the survey provided by the software company PsychData, which provided all survey materials online. Participants first completed a screen with consent information, then reported basic demographics. Next, they viewed one of the fictional professor c.v.s., then completed all measures described above (the order was: professor credibility scale,

SDO, diversity exposure, and prejudice toward Hispanics). Finally, participants were thanked for their participation. This study was approved by the hosting university’s IRB committee.

Results

To test most of the hypotheses, the data were analyzed with a series of 2 (professor race) X 2 (professor credibility) X 2 (participant sex) ANOVAs. The dependent variables for the ANOVAs were overall perceptions of the professors, as well as the more specific tests of competence, goodwill, and trustworthiness. Table 2 displays the *F*-values and *p*-values for each interaction and main effect.

Table 2: ANOVA Results for Effects of Professor Race, Professor Credibility, and Participant Sex on Perceptions of College Professors

Dependent Variables	<i>F</i>	<i>p</i>
Overall Credibility		
Professor Race	0.22	.640
Professor Credibility	4.36	.040
Participant Sex	1.31	.256
Race X Credibility	0.00	.971
Race X Sex	1.72	.193
Credibility X Sex	0.14	.701
Race X Sex X Credibility	0.01	.922
Competence		
Professor Race	0.93	.339
Professor Credibility	4.43	.039
Participant Sex	0.24	.627
Race X Credibility	0.53	.470
Race X Sex	2.77	.101
Credibility X Sex	1.31	.257
Race X Sex X Credibility	1.63	.206
Goodwill		
Professor Race	3.12	.082
Professor Credibility	0.28	.598
Participant Sex	0.09	.760
Race X Credibility	0.43	.512
Race X Sex	2.06	.156
Credibility X Sex	0.09	.768
Race X Sex X Credibility	1.06	.306
Trustworthiness		
Professor Race	2.98	.089
Professor Credibility	4.06	.048
Participant Sex	4.12	.046
Race X Credibility	2.94	.091
Race X Sex	0.04	.834
Credibility X Sex	0.12	.730
Race X Sex X Credibility	6.11	.016

Note: Results with *p*-values less than .05 are in bold and italicized. Degrees of freedom are (1, 71) for each test.

As seen in the table, for overall perceptions and for competence, the only significant finding was a main effect of professor credibility. Overall perceptions were higher for the high-credibility professor (*n* = 34, *M* = 84.26, *SD* = 10.74) compared to the low-credibility professor (*n* = 45,

Table 3: Means and Standard Deviations for Perceived Professor Trustworthiness, By Condition

Condition	<i>M</i>	<i>SD</i>	<i>n</i>
High Credibility			
Female Participants			
White Professor	29.55	4.99	11
Hispanic Professor	26.64	4.43	11
Male Participants			
White Professor	24.50	3.11	4
Hispanic Professor	27.38	2.92	8
Low Credibility			
Female Participants			
White Professor	26.44	4.74	18
Hispanic Professor	25.47	4.14	19
Male Participants			
White Professor	26.83	4.74	18
Hispanic Professor	19.00	7.07	2

M = 76.71, *SD* = 11.90), *F*(1, 71) = 4.36, *p* = .040. The same pattern was true for competence; the high-credibility professor was perceived as more competent (*n* = 34, *M* = 31.53, *SD* = 7.08) than the low-credibility professor (*n* = 45, *M* = 26.47, *SD* = 5.49), *F*(1, 71) = 4.43, *p* = .039. Surprisingly, no significant main effects or interactions were found for perceived goodwill of the professors.

When trustworthiness was used as a specific dependent variable, both the main effects of professor credibility [*F*(1, 71) = 4.06, *p* = .048] and participant sex [*F*(1, 71) = 4.12, *p* = .046] were significant as well. Table 3 shows the means, standard deviations, and sample size for perceived trustworthiness in each condition. Overall, the high-credibility professor was perceived as more trustworthy (*n* = 34, *M* = 27.50, *SD* = 4.35) than the low-credibility professor (*n* = 45, *M* = 25.76, *SD* = 4.70), *F*(1,71) = 4.06, *p* = .048. Also overall, female participants indicated more trust in the professors (*n* = 59, *M* = 26.75, *SD* = 4.65) than did male participants (*n* = 20, *M* = 25.80, *SD* = 4.50), *F*(1, 71) = 4.12, *p* = .046. While none of the two-way interactions were significant (all *ps* > .090), the three-way interaction for perceived trustworthiness was significant, *F*(1, 71) = 6.11, *p* = .016.

It was expected that pre-college exposure to diversity would be positively correlated with perceived credibility of Hispanic professors. For participants who read about a Hispanic professor (*n* = 39), correlations were run between level of diversity exposure and each of the four major DVs; none of these correlations were statistically significant (all *ps* > .70). Table 4 shows all correlations and *p*-values.

Table 4: Correlations Between Pre-College Exposure to Diversity and Perceptions of a Hispanic Professor

	<i>r</i>	<i>p</i>
Overall Credibility	-.03	.873
Competence	.01	.944
Goodwill	-.03	.843
Trustworthiness	-.06	.704

Note. Sample size in all cells is *n* = 39.

Finally, exploratory correlations were conducted between SDO scores and perceptions of the professors. The only significant correlation was between SDO and perceived competence of the White professor, $r(39) = -.35$, $p = .027$ (see Table 5). Surprisingly, no correlations were found between SDO and perceptions of the Hispanic professors (all $ps > .370$).

Table 5: *Correlations Between SDO and White Professor Credibility*

	<i>r</i>	<i>p</i>
Overall Credibility	-.27	.101
Competence	-.35	.027
Goodwill	-.13	.426
Trustworthiness	-.09	.607

Note: Those with higher SDO found the professor to be less competent.

Discussion

Most of the analyses did not support the hypotheses. When college students examined four different fictional professor c.v.s that varied on professor race and academic credentials, the only variable that reliably predicted perceptions of the professors was whether they appeared to have high or low credibility. This credibility was based on variables such as academic degree, number of publications, and prestige of institution. Credibility differences on vitae led to better perceptions of professors' competence, trustworthiness, and overall perceived credibility. The only specific variable where credibility did not have a significant impact was perceived goodwill. In addition, predictor variables such as pre-college exposure to diversity and the personality trait of social dominance orientation did not seem to have much of an effect on perceptions of the fictional professors in this study.

The general lack of findings for professor race (which was not significant for any of the dependent variables measuring perceptions of the professor) could potentially be explained by at least three factors. First, it is entirely possible that the sample of students in this study simply were not racist. Previous work has shown that racism in the U.S. has decreased over time, or at least become more subtle and implicit (Benokraitis & Feagin, 1986; Swim, Aikin, Wall, & Hunter, 1995). Johnston et al. (2015) found that around half of the college students they studied found race not to matter for various reasons and that college students today are generally open-minded about diversity. If this is the case, perhaps professors of color will find a friendlier environment as they move through student evaluations.

However, it is also possible that the findings did not reach significance for other reasons. One might be that the experimenter herself is Hispanic; participants may have changed their responses due to their ability to guess the goals and hypotheses of the study (and they did not want to appear racist to the experimenter). Another possibility is an artifact of the study materials. Perhaps students who examined the various c.v.s focused on the academic credentials and did not pay much attention to the names at the top, thus making professor race not particularly salient. Finally, the lack of significance may have been due to the very small statistical power in analyses due to sample size. A quick view of Table 3 shows that the size for various conditions ranged from a maximum of 19 (which is not impressive) to a minimum of two. With only two people in a particular condition, drawing any conclusions becomes problematic and potentially even irresponsible.

The most interesting results came from the specific dependent variable of trustworthiness, where the main effect of credibility was maintained, but results also showed a main effect of participant sex and a three-way interaction. Based on previous research (e.g. Carter, 1990; Pope-Davis & Ottavi, 1992), it was believed that women in the study might have better perceptions of the Hispanic professors due to their ability to relate to someone from an historically oppressed social group. However, the means in Table 3 display this was not the case; women showed no affiliation toward the Hispanic professors (and if anything showed a slight preference to the White professors). Surprisingly, results for the men were more interesting. When viewing professors of low credibility, male participants preferred the White professor over the Hispanic one (supporting general previous findings that White professors are favored; Umbach, 2006). However, when viewing professors of high credibility, men believed that the Hispanic professor was more trustworthy. It is possible that the men recognized potential prejudiced barriers the fictional Hispanic professors might have had to overcome to achieve their impressive credentials; it is also possible that a "reverse racism" effect occurred (Harber, 1998) such that the men had lower expectations of Hispanics in general and thus were more or less surprised that a Hispanic man could achieve so well, giving their perceptions a boost.

Limitations and Future Research

In addition to the limitations mentioned above, other issues may have negatively affected this study. For example, the students were asked to view the professor c.v.s on a computer screen and then to move on to the survey questions; they could not go back to the c.v.s after progressing. It is possible that the students did not pay

attention to detail while examining the materials. Many college students are unfamiliar with the format of academic vitae and may have focused more on the sections or lists of publications than on the name at the top of the screen.

The title of the study was also "Professor Credibility," and this may have led the students to focus on that aspect of the materials in an attempt to be "good subjects."

Another limitation of this study was that a majority of the students had never been taught by a Hispanic professor, or a professor of color at all. There are few professors of color at the specific college where students were recruited, so it is possible that students who had been taught by a professor of color would have different perceptions of the professors' credibility. Finally, using professor vitae could be considered a limitation because no actual interactions occurred between the participants and the professor. The students were not able to physically see the professor teaching, which would have provided more information on which to base their judgments and would have made the professors' race more salient.

Future research could utilize different methods to address some of these limitations. Experimenters viewed by the participants could vary in race, and the title of the study could be something general such as "Evaluating Professors." Participants could view c.v.s but also watch a brief video of actors pretending to be professors; note, however, that this leads to additional confounding variables such as the professors' clothing or physical attractiveness. Finally, a larger sample size would be the best way to make this study stronger. The study relied on a computer program to randomly assign participants to each condition, which unfortunately led to some conditions being very small (especially conditions for male participants, of whom there were only 20 in the study). Recruiting more people would eventually lead to more even condition sizes across more trials of random assignment.

Conclusion

Faculty of color are underrepresented in the college education system, which is why students' perceptions of race is important (Anderson & Smith, 2005; Umbach, 2006). Even though in general this study found an optimistic lack of data to support racist views of professors, it does not mean race is irrelevant to students on a larger scale. There are various reasons why there are not many professors of color, including potential racism of students, colleagues, or university administrators, which means there needs to be continued research on this issue. However, this study does provide some initial evidence

that the future for professors of color may be viewed optimistically and that racism among college students may be decreasing.

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Appendix

White and High Credibility Professor Vitae

Jacob Johnson, Ph.D.

Current Address: Yale University
 Anthropology Department
 38 Hillhouse Avenue
 New Haven, CT 06511
 johnsonj@yale.edu

Telephone: (203) 432-9374 (Office Phone)

Employment History and Education

2010-present	Associate Professor of Anthropology, Yale University
2000-2010	Assistant Professor of Anthropology, Stanford University
1998-2000	Visiting Fellow, University of Leicester in England
1992-1998	Doctoral Candidate in Graduate Studies, Harvard University

Dissertation: "An ambivalent embrace: The cultural politics of Arabization and the knowledge economy in the Moroccan public school"

Cumulative graduate GPA: 4.0

Research Awards and Honors

- Grant, National Science Foundation (NSF2010-FRS382039382)
 Topic: "A Topography of Dignity: Gendered Politics and Transformative Symbols in Northern Ireland"

Teaching Awards and Experience

- **Yale Professor of Honor (2012)**
- Experience teaching twelve courses at undergraduate level; six courses at graduate level

Publications – Books

Johnson, J. (2011). *Guns, Germs, and Steel: The Fates of Human Societies*. Stanford, CA: Stanford University Press.

Johnson, J. (1999). *Arabic Anthropology in Morocco: Public Schools the Next Generation*. Cambridge, MA: Harvard University Press.

Publications – Book Chapters

Johnson, J., & Garriott, W. *A Body on Drugs: Methamphetamine and the Making of a New Criminal Type in the Rural United States*. In “Cultural Patterns of Crimes.”

Dan-Cohen, T., & Johnson, J. (2004). *Making life is easy: Novelty and uncertainty in synthetic biology*. In “Crossroads of Biology and Anthropology.”

Johnson, J., & Danforth, L. (2002). *The Anastenaria: A Study in Greek Ritual Therapy*. In “Rites and Rituals: How Anthropology Affects Today.”

Publications – Journal Articles

* Selected journal articles from the past five years; a full list is available upon request.

2015 Johnson, J. “An Ancient Natural Disaster.” *Expedition*, 12, 25-31.

2015 Johnson, J. “Edge Abrasion During Biface Manufacture.” *American Antiquity*, 38, 215-18.

2014 Johnson, J. “The Pillage of Prehistory.” *American Antiquity* 38 (3):317-20.

2012 Johnson, J. “Un Modelo de Tecnologia Mesoamericana de la Obsidiana Basada en Desechos de un Taller Preclasico en El Salvador.” *Estudios de Cultural Maya*, Vol. 9: 47-65. Reprinted in *America Indigena* 35 (4): 727-46 (1975), with minor modifications.

2011 Johnson, J. “A Reassessment of the Precolumbian Obsidian Industry of El Chayal, Guatemala.” *American Antiquity* 40: 98-103.

Hispanic and Low Credibility Professor Vitae

Santiago Garcia, M.S.

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 Employment History and Education

2008-present	Adjunct Instructor of Anthropology, Bay Mills Community College
2004-2008	Master's Degree Student, University of Phoenix <i>Thesis: "Anthropology and Condiments on Hot Dogs"</i> Cumulative graduate GPA: 3.1

 Publications – Journal Articles

2014 Johnson, J., & Garcia, S. "Hot Dogs vs. Hamburgers: Which is More 'American?'" *Journal of American Anthropology*, 19, 45-50.

2010 Garcia, S. "Condiments on Hot Dogs: Is Ketchup a Vegetable?" *Journal of American Anthropology*, 15, 76-77.

SOCIAL TECHNOLOGY AND VIDEO GAMES:
A COMPARISON OF RESPONSES FROM ADOLESCENTS AND THEIR PARENTS

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Abstract - As part of a larger study, 116 adolescents between 15 and 19 years old (69 females, 45 males, 2 gender unspecified; $M_{age} = 16.9$) and their parents (52 mothers and 32 fathers) were asked to (a) estimate the average amount of time each day the adolescents spend using five categories of social technology (i.e., Text/Instant Messaging, Talking on the Phone, Facebook, Twitter, and Picture/Video Messaging) and playing three categories of video games (i.e., Everyone 10 and Older, Teen, and Mature) and (b) rate the extent to which the parents monitor their adolescents' involvement in these activities. The adolescents reported spending more time Text/Instant Messaging than any other type of social technology, and they reported playing Mature video games more than any other category of video game. Despite the considerable amount of time the adolescents reported spending on the social technologies and playing video games, (1) the adolescents', mothers', and fathers' ratings of the parents' monitoring of the adolescents' involvement in these activities were generally quite low, and (2) the mothers and fathers rated themselves as monitoring their adolescents' involvement in these activities significantly more than did the adolescents. Potential explanations for the discrepancy between the parents' and adolescents' monitoring ratings are discussed as are directions for future research.

Keywords: social technology, video games, adolescents, parents

Both popular literature and empirical research have documented the increasing role of social media and video games in the lives of many adolescents in the United States (e.g., O'Keeffe & Clarke-Pearson, 2011; Olson et al., 2007). With the broad availability and appeal of laptops, tablets, and "smart" mobile phones, adolescents seemingly have constant access to social technology wherever they go. For example, a recent investigation by Rideout (2015) revealed that adolescents between 13 and 18 years of age spend, on average, almost 7 hours a day using some form of screen media, a large portion of which is spent on social media (especially for females; e.g., Weiser, 2000) and playing video games (especially for males; e.g., Greenberg,

Sherry, Lachlan, Lucas, & Holmstrom, 2010). Moreover, research indicates that adolescents spend more time using the internet and playing video games than any other age group (Holtz & Appel, 2011), leading one researcher (Clark, 2005) to label present-day adolescents the "constant contact" generation.

The impact of the extensive use of various social technologies and video games on adolescents' physical and psychological health has already generated considerable debate and concern (Brown & Witherspoon, 2002; Pujazon-Zazik & Park, 2010; Strasburger, Jordan, & Donnerstein, 2010; Villani, 2001). For example, although social media may play an important role in adolescents'

social relationships (Subrahmanyam & Greenfield, 2008) and identity development (Jensen, 2003), involvement with certain forms of media is associated with a host of negative social and emotional outcomes (e.g., physical aggression, withdrawal, and anxiety; Anderson et al., 2008; Holtz & Appel, 2011; Olson et al., 2009). In addition, adolescents' increased access to social technologies has created a new avenue for peer victimization. With more than 90% of adolescents using mobile phones, smartphones, laptops, and tablets daily for communication with peers (Lenhart, 2015), social victimization via cyberbullying is becoming an increasingly common and serious problem among adolescents (e.g., Hoff & Mitchell, 2009; Smith et al., 2008; Tokunaga, 2010).

Although recommendations have been made for parents to be actively involved in monitoring their adolescents' social media use (e.g., Mesch, 2009), most parents appear to be relatively unaware of their adolescents' experiences with social technology and video games (e.g., Weigle & Reid, 2014). For example, parents have been found to underestimate their adolescents' use of various social technologies (e.g., Rosen, Cheever, & Carrier, 2008) and the extent to which they play violent video games (e.g., Gentile, Nathanson, Rasmussen, Reimer, & Walsh, 2012). Furthermore, there appears to be a rather substantial disconnect between parents' and adolescents' reports of the extent to which parents are monitoring their adolescents' social technology and video game use. More specifically, parents' ratings of the extent to which they monitor their adolescents' use of social technologies (Brown & Bobkowski, 2011) and video games (Gentile et al., 2012) tend to exceed the ratings provided by their adolescents. Parents' apparent overestimation of the extent of their monitoring behavior may help to explain why they tend to be relatively unaware of their son's or daughter's experiences with social media, including cyberbullying (Cassidy, Brown, & Jackson, 2012). Given that extensive involvement with certain forms of social technologies and video games has been associated with both internalizing and externalizing symptoms in adolescents (Gentile, 2009; Hoff & Mitchell, 2009; Holtz & Appel, 2011), the degree of parental monitoring of such activities may play an important role in adolescents' social and emotional functioning.

The Present Study

Unlike prior studies that have tended to focus on one specific topic relevant to social media, the present study was designed to address the topics of social technology and video games in a single investigation. Given our interest in addressing the issue of parental monitoring, our examination of social technology and video games in a

single study allowed us to determine the extent to which the patterns of perceptions of a sample of adolescents and their parents are congruent across these two relatively distinct domains of social media.

The major goals of the present study were to assess: (1) the amount of time a sample of adolescents from northeast Kansas are involved with social technologies and video games, (2)

the adolescents' perceptions of the extent which their parents monitor their involvement with social technologies and video games, and (3) the extent to which the parents' judgments on these topics are congruent with their adolescents' experiences and perceptions. Furthermore, because prior research (e.g., Gentile, 2009; Lenhart, 2015; Rideout, 2015) has demonstrated that adolescent males and females tend to differ in the extent to which they use social technologies and play video games, gender differences were also examined in the present study.

Method

Participants

A total of 116 adolescents (69 females, 45 males, 2 gender unspecified) attending a public high school in northeast Kansas participated in the study. The adolescents were between 15 and 19 years old ($M_{age} = 16.9$ years) and the largest proportion of the adolescent sample identified themselves as Caucasian/White (44.0%), followed by African American/Black (22.4%), Hispanic/Latino (11.2%), and multi-ethnic (11.2%); the remaining 11.2% of adolescents identified themselves as either Asian/Pacific Islander, Native American, or Other. A majority of the mothers ($n = 52$) and fathers ($n = 32$) who participated in the study identified themselves as a biological parent (86.5% and 68.8%, respectively).¹

Materials and Procedure

As part of a larger study, adolescents with parental permission completed a "Social Technologies and Video Games Questionnaire" in their regular classroom at a day and time that was deemed convenient by their teacher. Mothers and fathers who were willing to participate in the study received a parent version of the questionnaire that closely parallels the adolescent version. In order to match an adolescent's questionnaire with his/her mother's and/or father's questionnaire, a unique code number was printed on each adolescent's questionnaire and the same code number was printed on the questionnaire(s) the adolescent delivered to his/her parent(s).

Adolescent Questionnaire.

In the Social Technologies section of the questionnaire, the adolescents were asked to estimate the average amount of time they spend each day using five

categories of social technology (i.e., Text/Instant Messaging, Talking on the Phone, Facebook, Twitter, and Picture/Video Messaging). For each of the five categories, the adolescents were asked to check one of 12 boxes (labeled 0 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, 6 hours, 7 hours, more than 7 hours) to indicate their estimate of the amount of time they spend, on average, each day using that technology. During data analysis, responses from 1 hour to 7 hours were converted to minutes, and a response of "more than 7 hours" was considered as 8 hours (480 minutes). In addition, the adolescents were asked to rate the extent to which they believe their parents monitor their use of each of the various categories of social technology. The adolescents made these ratings on a 5-point scale ranging from 1 (*they don't monitor at all*) to 5 (*they monitor completely*).

In the Video Games section of the questionnaire, the adolescents were initially provided with a description (and some examples) of video games rated as Everyone 10 and Older, Teen, and Mature. They were asked to estimate the average amount of time they spend each day playing these three categories of video games using the same 12-box response format they used in estimating the amount of time they spend on average each day using each of the various types of social technology. In addition, the adolescents were asked to rate the extent to which they believe their parents monitor their playing of video games. The adolescents made this rating on a 5-point scale ranging from 1 (*they don't monitor at all*) to 5 (*they monitor completely*).

Parent Questionnaire. As indicated earlier, the parents who volunteered to participate in the study were asked to complete a version of the questionnaire that closely parallels the adolescent questionnaire. In the packet the adolescents delivered to their parents, instructions were provided for completing both the Social Technologies and Video Games sections of the questionnaire and having their son or daughter return the completed questionnaire to his/her teacher in a sealed envelope.

Results

The main findings from the Social Technologies and Video Games sections of the adolescent and parent questionnaires are presented below. For each section, results from the adolescent sample are followed by results that compare the responses of the adolescents and their parents.

Social Technologies

A 2 (Gender of Adolescent) x 5 (Type of Social Technology) mixed analysis of variance (ANOVA), with Type of Social Technology as a repeated measure, was

conducted on the adolescents' estimates of the average amount of time each day they spend using the various social technologies. As presented in Table 1, the results yielded a significant main effect of Type of Social Technology, $F(4, 444) = 55.05, p < .001, \eta_p^2 = .33$, and post hoc comparisons revealed that the adolescents reported spending (1) more time Text/Instant Messaging than Picture/Video Messaging and (2) more time Picture/Video Messaging than on Twitter, Facebook, and Talking on the Phone (time estimates for the latter three social technologies did not differ from one another). This main effect was qualified by a significant interaction of Gender of Adolescent and Type of Social Technology, $F(4, 444) = 3.06, p < .05, \eta_p^2 = .03$ (see Table 1). Post hoc tests of this interaction revealed that the females reported spending more time Text/Instant Messaging and using Twitter than did the males; the females and males did not differ in the estimated amount of time they spend using the other three social technologies. Summing across the five categories of social technology, the females estimated that they spend approximately 563 minutes (i.e., about 9.4 hours) each day using the various social technologies, and the males estimated that they spend approximately 394 minutes (i.e., about 6.6 hours) each day using the various social technologies.

Table 1

Adolescents' Estimates of the Average Number of Minutes Each Day They Spend Using the Five Categories of Social Technology

	Text/Instant Messaging	Talking on Phone	Facebook	Twitter	Picture/Video Messaging
Males	185.33	40.67	44.00	40.67	83.33
Females	267.35	38.38	40.81	87.57	131.91
Total	234.69	39.29	42.08	68.89	112.57

To compare the responses of adolescents and their parents, separate 2 (Respondent: Adolescent vs. Mother [or Father]) x 2 (Gender of Adolescent) x 5 (Type of Social Technology) mixed ANOVAs, with Type of Social Technology as a repeated measure, were conducted on (1) the adolescents' and mothers' (fathers') estimates of the average amount of time each day the adolescents spend using each of the various categories of social technology and (2) the adolescents' and mothers' (fathers') ratings of the extent to which the adolescents' use of each of the various categories of social technology is monitored. The adolescents' and their mothers' estimates of the average amount of time each day the adolescents spend using each of the various categories of social technology did not differ; similarly, the adolescents' and their fathers' estimates did not differ. With regard to the monitoring ratings, however,

a significant main effect of Respondent was found for both the adolescent vs. mother comparison, $F(1, 95) = 11.48, p < .01, \eta_p^2 = .11$, and the adolescent vs. father comparison, $F(1, 59) = 10.31, p < .01, \eta_p^2 = .15$. Although the monitoring ratings were generally quite low (i.e., well below the midpoint on the 5-point scale), both the mothers and fathers rated themselves as monitoring their adolescents' use of the various categories of social technology significantly more than the adolescents rated their parents' monitoring of their use of the various categories of social technology ($M_s = 2.16$ and 1.53 , respectively, for mothers and their adolescents, $F[1, 95] = 11.48, p = .001, \eta_p^2 = .11$; $M_s = 1.96$ and 1.53 , respectively, for fathers and their adolescents, $F[1, 59] = 10.31, p < .01, \eta_p^2 = .015$).

Video Games

A 2 (Gender of Adolescent) x 3 (Type of Video Game) mixed ANOVA, with Type of Video Game as a repeated measure, conducted on the adolescents' estimates of the average amount of time they spend each day playing video games yielded a significant main effect of Type of Video Game, $F(2, 218) = 29.48, p < .001, \eta_p^2 = .21$. As presented in Table 2, post hoc tests of this main effect revealed that the adolescents reported spending (1) more time playing Mature than Teen video games and (2) more time playing Teen video games than those rated as appropriate for Everyone 10 and Older. This main effect was qualified by a significant interaction of Gender of Adolescent and Type of Video Game, $F(2, 218) = 22.33, p < .001, \eta_p^2 = .17$ (see Table 2). Post hoc tests of this interaction revealed that the males reported spending more time playing Mature and Teen video games than did the females²; the males and females did not differ in the estimated amount of time they spend playing video games rated as appropriate for Everyone 10 and Older. Summing across the three types of video games, the males estimated that they spend approximately 216 minutes (i.e., about 3.6 hours) each day playing video games, and the females estimated that they spend approximately 51 minutes each day playing video games.³

To compare the responses of adolescents and their parents, separate 2 (Respondent: Adolescent vs. Mother [or Father]) x 2 (Gender of Adolescent) x 3 (Type of Video Game) mixed ANOVAs, with Type of Video Game as a repeated measure, were conducted on the adolescents' and mothers' (fathers') estimates of the average amount of time each day the adolescents spend playing the different types of video games. In addition, separate 2 (Respondent: Adolescent vs. Mother [or Father]) x 2 (Gender of Adolescent) ANOVAs were conducted on the adolescents' and mothers' (fathers') ratings of the extent to which the adolescents' video game playing is monitored. With regard to the "estimate of time" ratings, post hoc analysis of the significant three-way interaction of Respondent, Gender, and Type of Video Game, $F(2, 190) = 9.29, p < .001, \eta_p^2 = .09$, revealed that mothers underestimated the average amount of time each day their sons spend playing Mature video games. Specifically, the mothers estimated that their sons play Mature video games 73.24 minutes (about 1.22 hours) per day and these 17 sons estimated that they play Mature video games 219.71 minutes (about 3.66 hours) per day, $t(32) = 3.15, p < .01$. Although the monitoring ratings were again quite low, both the mothers and fathers rated themselves as monitoring their adolescents' playing of video games significantly more than the adolescents rated their parents' monitoring of their video game playing ($M_s = 2.69$ and 1.58 , respectively, for mothers and their adolescents, $F[1, 97] = 24.05, p < .001, \eta_p^2 = .20$; $M_s = 2.68$ and 1.63 , respectively, for fathers and their adolescents, $F[1, 59] = 15.36, p < .001, \eta_p^2 = .21$).

Discussion

Social Technologies

Prior research indicates that adolescents, especially female adolescents, use social technologies primarily for interpersonal communication with their friends (Lenhart et al., 2008; O’Keeffe & Clarke-Pearson, 2011). Therefore, it is not surprising that adolescents in the current study reported spending the most time Text/Instant Messaging and Picture/Video Messaging, and females reported spending more time Text/Instant Messaging than did males. However, given that recent research failed to find a significant gender difference in adolescents’ use of Twitter (Lenhart, 2015), it is noteworthy that the females in the present study also reported spending more time on Twitter than did the males.

Given the relatively low monitoring ratings, parents were surprisingly accurate in estimating the amount of time each day their adolescent spends using the various categories of social technology. Nonetheless, the parents' ratings concerning the extent to which they monitor their adolescents' use of the various categories of

Table 2

Adolescents' Estimates of the Average Number of Minutes Each Day They Spend Playing the Various Types of Video Games

	Everyone 10 and Older	Teen	Mature
Males	18.21	57.50	140.36
Females	15.22	12.83	22.61
Total	16.35	29.73	67.16

social technology were significantly higher than the ratings provided by their adolescents. Although this finding is consistent with prior research (e.g., Gentile et al., 2012; Mesch, 2009), the reason for the discrepancy remains unclear. Given that the parents of children and young adolescents tend to monitor their offsprings' media exposure much more than parents of older adolescents (Eastin, Greenberg, & Hofschire, 2006; Hoffner & Buchanan, 2002; Warren, Gerke, & Kelly, 2002), the parents in the present study may have overestimated the degree to which they currently monitor their adolescents' use of social technology by basing their judgments on the extent of their monitoring when their adolescents were younger. Another possible explanation for the discrepancy is that parents' monitoring ratings may be artificially inflated because of social desirability concerns to be perceived as a "good parent" who keeps a watchful eye on his/her adolescent's use of social technology (e.g., Gentile et al., 2012). Furthermore, parents have been found to use a variety of techniques for monitoring their adolescents' use of interactive technology (Vaterlaus, Beckert, Tulane, & Bird, 2014), and parents and adolescents may have different ideas about what constitutes (appropriate and inappropriate) monitoring.

Video Games

The adolescents' estimates of the amount of time they spend playing the three categories of video games are comparable to the estimates reported in prior research (see Rideout, 2015; Rideout, Foehr, & Roberts, 2010). Furthermore, it is well-documented that video games depicting violence and sexually explicit materials are especially popular among male adolescents, who report spending considerably more time playing "mature" games than their female counterparts (Gentile, 2009; Lenhart, 2015).

As with the Social Technologies section of the questionnaire, the parents' ratings of the extent to which they monitor their adolescents' playing of videogames were quite low and, yet, significantly higher than the ratings provided by their adolescents. Although the parents were generally quite accurate in estimating the amount of time their adolescents spend playing video games, one apparent reflection of the relatively low level of parental monitoring was the finding that the mothers significantly underestimated the average amount of time each day their sons spend playing Mature video games. One possible explanation for why this pattern was found for mothers but not fathers in the present study may involve parental differences in the extent to which mothers and fathers participate in video game playing with their adolescents (especially with male adolescents). More specifically, research indicates that fathers report co-

playing video games with their sons more frequently than do mothers (Padilla-Walker, Coyne, & Fraser, 2012) and, in doing so, fathers may be especially aware of the amount and types of video games their adolescent sons play.

Limitations and Directions for Future Research⁴

Although the present study yielded numerous interesting findings relevant to the major goals outlined in the Introduction, there are some limitations to the study that provide direction for future research.

First, the sample size of this study was relatively small, especially for analyses examining the extent to which the adolescents' responses were congruent with their parents' responses. Although our sample was quite diverse, the relatively small sample size did not allow us to examine (1) potential racial-ethnic differences in adolescents' or parents' responses or (2) the degree of congruence between adolescents' and their parents' responses across the various racial-ethnic groups.

A second limitation to note is that the study relied exclusively on self-report measures from the adolescents and their parents, and the reliability or validity of the measures were not established. Rather than relying exclusively on, for example, adolescents' time estimates of their social technology and video game usage, future participants could be asked to keep a "daily log" of their relevant activities or respond to an electronic "event recorder" provided by the experimenter for a set period of time (e.g., several weeks) to achieve more reliable and valid time estimates. Similarly, parents could be asked to keep detailed records of their efforts (e.g., specific approaches, amount of time spent) to monitor their adolescent's use of social technology and video games.

Finally, we did not ask parents about the extent to which they perceive their adolescents' use of certain social technologies and video games as problematic and/or the point at which the parents begin to evaluate certain social media usage as excessive for their adolescents. Given that parents' judgments on these issues may be associated with their specific approaches to (and the amount of time they spend) monitoring their adolescents' use of social technologies and video games, future research should inquire about the parents' perceptions of these issues. Furthermore, given our interest in comparing the attitudes of adolescents and their parents, it would be important to determine the extent to which adolescents' and their parents' perceptions of problematic or excessive use of particular social technologies and video games are congruent.

Concluding Comments

Despite the considerable amount of time the adolescents in the present study reported spending using social technologies and playing video games, (1) the

adolescents', mothers', and fathers' ratings of the parents' monitoring of the adolescents' involvement in these activities were generally quite low, and (2) the mothers and fathers rated themselves as monitoring their adolescents' involvement in these activities significantly more than did the adolescents. Given that the extensive involvement with certain forms of social technologies and video games has been associated with both internalizing and externalizing symptoms in adolescents (Anderson et al., 2008; Gentile, 2009; Hoff & Mitchell, 2009; Holtz & Appel, 2011; Olson et al., 2009), future research needs to address the role of parents' monitoring of, and attitudes toward, such activities on young individuals' social and emotional development.

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Footnotes

- ¹For 27 of the adolescent participants, both the mother and father completed a parent questionnaire. For 25 of the adolescents, only the mother completed a questionnaire. For 5 of the adolescents, only the father completed a questionnaire. No parent had more than one adolescent take part in the study. Due to the relatively small sample size, no analyses were conducted to directly compare the responses of the 27 mothers and fathers who completed a parent questionnaire for the same son or daughter.
- ²Despite the gender difference in the self-reported amount of time spent playing Teen and, especially, Mature video games, the males' ratings of the extent to which their parents monitor their playing of video games ($M = 1.73$) did not differ significantly from the females' ratings ($M = 1.42$), $t(112) = 1.61$, $p = .11$.
- ³It should be noted that the adolescents' estimates of the total amount of time they spend playing video games each day and the total amount of time they spend using the various social technologies each day may not be totally independent of one another. For example, there are video games available on Facebook that some adolescents may choose to play.
- ⁴We would like to thank an anonymous reviewer for his/her recommendation that we add this section to the Discussion and for his/her thoughtful suggestions for issues to address in this section.

Special Features

Conducting Psychological Analysis: Dramatic

A DIABOLICAL AND DISORDERED PERSONALITY:
JOHN DOE IN “SEVEN”

CARLEE BROWN AND WIND GOODFRIEND

BUENA VISTA UNIVERSITY

Abstract - John Doe is arguably one of the most thrilling and interesting serial killers in all of film. This paper analyzes the personality of this mysterious and extreme figure of the movie *Seven* by examining symptoms he displays that are characteristic of several personality disorders, including paranoid personality disorder, histrionic personality disorder, antisocial personality disorder, and obsessive compulsive personality disorder.

Keywords: Personality disorders, serial killers, movie analysis

The movie *Seven* begins with rookie Detective Mills and veteran Detective Somerset investigating the murder of an obese man. Other murders with the same level of intensity and grotesqueness begin to appear. These murders represent the seven deadly sins, and sins and were committed by one man named John Doe (portrayed by Kevin Spacey), who is relentless in his quest to punish those who have sinned. Doe always seems to be one step ahead of the detectives and evades capture throughout the film. He eventually turns himself in to the authorities just for theatrical flair, and to complete his masterpiece of crime (Kopelson & Fincher, 1995).

The DSM-V (American Psychiatric Association, 2013) has three clusters for personality disorders. Cluster A is labeled as odd/eccentric. Doe exhibits several of the characteristics of one of the disorders within this cluster: paranoid personality disorder. Doe has a distrust of others. This is shown through the name he chose for himself, one widely used for anonymity. Doe is also a loner who does not confide in anyone, nor does he trust someone enough to help with his work (American Psychiatric Association, 2013; Kopelson & Fincher, 1995).

Another characteristic of a paranoid personality disorder is a sense of blamelessness—all fault is in others (American Psychiatric Association, 2013). Doe targets people who have been immersed into their sinful lives. He punishes them as an attempt to bring attention to their lives, and as an influence to try to change. But when Detective Mills tries to draw attention to the hypocrisy of it all, Doe ignores it completely, not recognizing his own faults. It is not until the very end of the movie when Doe finally admits his one vice or deadly sin: envy. Another characteristic of paranoid personality disorder is the belief in conspiracies. When asked if he felt like he was doing God’s work, Doe alluded to his thoughts: “The Lord works in mysterious ways” (American Psychiatric Association, 2013; Kopelson & Fincher, 1995).

The second cluster, or Cluster B, of personality disorders is labeled as dramatic and erratic. Within this cluster, Doe exhibits the characteristics of histrionic personality disorder, which include attention-seeking, the need to be at the center of attention, and being theatrical in language and gestures (American Psychiatric Association, 2013). If Doe is one thing, he is theatrical. He planned his murders

methodically and executed them as such. However, his plans were like nothing the detectives had seen before.

Gluttony, or overindulgence, was the first sin punished in the movie *Seven*. In order to punish gluttony, Doe found a man so obese, it was impossible for him to leave his home. Doe tied his arms and legs together, and together and made him eat until his stomach exploded. Doe made this man's cardinal sin the cause of his death. At the scene of the crime, Doe left a clue that stated a way for this man to change his ways: "Long is the way and hard, that out of Hell leads up to Light." In this note, Doe was referencing *Paradise Lost*. If the man wanted to change his ways of sin, the road would be long and hard, but would end in paradise. However, he did not make this choice, and continued to over-indulge himself. This was Doe's goal (Kopelson & Fincher, 1995).

The next murders by Doe continue to be extremely theatrical. The second murder targets the sin of greed and forces a corrupt defense attorney to pay for his sins with flesh. Here, Doe goes so far as to actually quote the theatrical production of *Merchant of Venice* by Shakespeare, stating, "One pound of flesh, no more no less. No cartilage, no bone, but only flesh. This task done, and he would go free." Next, Doe focuses on sloth and forces a drug user and dealer to choose drugs or life. Making sure to leave an impression on the detectives, Doe cuts off the man's hand and spells "Help Me" in fingerprints (Kopelson & Fincher, 1995). Only someone with a desire to surprise and mesmerize his crowd would be able to come up with something so heinous, but Doe was not finished (Kopelson & Fincher, 1995). The pattern of murders continues, each highlighting Doe's primary symptoms of need for attention and theatrical style, the foundational symptoms of histrionic personality disorder.

All of these murders were meticulous and exact. Doe found inspiration in literature and theatre, which showed in his over-the-top antics. These factors are what led to the conclusion of a possible histrionic personality disorder diagnosis. However, this could not be the only personality disorder at work in Doe for him to be able to commit these murders and feel no remorse for them. Doe also showed signs of antisocial personality disorder. He showed no remorse for his murdering, kidnapping, and psychological torture. He said it himself; "Don't ask me to pity those people. I don't mourn them anymore than I do the thousands that died at Sodom and Gomorrah." Another aspect of Doe indicative of antisocial personality disorder was how charming he was, when one disregards his terrible offenses. He was eloquent and intelligent. However, these are not the only personality disorders needed to commit a crime such as these. He needed to be able to be perfect in order to finish his work (American Psychiatric Association, 2013; Kopelson & Fincher, 1995).

Cluster C in the DSM-V is dedicated to personality disorders with the common characteristics of anxiety and fear. Doe exhibits most of the symptoms in obsessive compulsive personality disorder. These include: maintaining order, sense of perfectionism, inflexible moral and religious beliefs, and obsessions and fixations (American Psychiatric Association, 2013).

One of the signs towards Doe's obsessive compulsive personality is how he lived his life. Doe's apartment may have looked strewn about and scattered, but everything was where he intended it to be. He carefully and perfectly documented every day of his life and all of his interactions. He wrote 2,000 composite notebooks full of daily interactions, thoughts, and dreams. He had pictures for every victim and future victim. He wanted his masterpiece to be perfectly conducted and perfectly written. He left no fingerprints in the house, and he even had all of his clothes dry cleaned to get rid of DNA evidence. Everything in his apartment had a proper place, and he kept it that way. There was an order in his life. He also meticulously planned each murder, or as he believed, sermon (American Psychiatric Association, 2013; Kopelson & Fincher, 1995).

Another sign of Doe's obsessive-compulsive personality disorder was in his obsession with religion and morals (American Psychiatric Association, 2013). All of his crimes were done in the name of religion. His apartment was covered in religious décor. He had crosses above his bed, and in every room. He only read religious literature. He even had shrines dedicated to his crimes. He truly believed he was doing God's work. He was obsessed with the idea of religion and it showed in his actions, words, and thoughts (Kopelson & Fincher, 1995).

Doe was also completely inflexible when choosing and punishing his victims (American Psychiatric Association, 2013). He carefully stalked and monitored the city looking for the perfect sinner. This is seen in the multitude of photographs for each victim. However, Doe saw nothing of their lives except for what he wanted to see: sin. For the obese man, Doe did not take into consideration his environmental circumstances or his previous life. This man could have been self-medicating with food. Doe only saw his gluttony, and not the reasons behind it. So, Doe had to punish. He did this for the others, as well. Doe did not take into consideration the actual motive for the defense attorney; Doe assumed it was greed. The defense attorney may have had the mentality most defense attorneys have—the protection of rights against a power-hungry and obsessive criminal justice system is more important than securing a conviction. This is not necessarily greed, but rather the protection of the weak. However, Doe did not care he only saw the sin. This was a pattern for all Doe's victims. He could not empathize with

the drug abuser and his underlying causes of drug use. Finally, he could not even understand or forgive his own deadly sin: envy. Therefore, he made himself part of the scheme. This line of reasoning and this personality disorder is one of the only explanations for his rigid moral thinking (Kopelson & Fincher, 1995). John Doe is the perfect, although extreme, example of someone suffering from multiple personality disorders. His comorbidity is what makes him one of the greatest serial killers in film. However, comorbidity and personality disorders are serious problems; the majority of most people who have one disorder have at least one more disorder (American Psychiatric Association, 2013). Doe also exemplified the persona of someone with a personality disorder: He thought nothing was wrong with him. When Detective Mills accused Doe of being crazy, Doe responded with, "It's more comfortable for you to label me as insane" (Kopelson & Fincher, 1995). He completely denied the possibility of something being wrong – perhaps this is what ultimately led to his horrific chain of ironically sinful behaviors.

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IMPENETRABLE SUIT, SUSCEPTIBLE MIND: A PERSONALITY ANALYSIS OF IRON MAN

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Abstract - Iron Man is one of today's most popular superheroes. This paper analyzes the personality of the "man behind the mask:" Tony Stark. The analysis includes theories from Neo-Freudian psychologists Adler and Erikson, then briefly covers Type A Personality and ideas from the biological perspective of personality. Finally, Stark's symptoms for two personality disorders are reviewed.

Keywords: Dramatic analysis, Adler, Erikson, Type A, Personality Disorders

This paper analyzes Tony Stark's (a.k.a. Iron Man) personality using theories from Alfred Adler, Erik Erikson, Type A personality, the biological perspective, and personality disorders. Anthony Edward Stark (played in the recent movies by Robert Downey Jr.) is a self-proclaimed genius, billionaire, playboy and philanthropist (Iron Man, n.d.). Many of us know him as "the man in the suit," Tony Stark, and the Iron Man. While traveling in a Middle Eastern desert to test a newly designed Stark Industries weapon, the Humvee in which Stark was riding drove over a landmine. The explosion resulted in shrapnel entering Stark's chest which penetrated his heart. To stay alive, an electromagnetic device was inserted into Stark's chest which eventually was used to power Stark's iron suit; this led to the creation of the superhero Iron Man.

Stark is the only child of Howard and Maria Stark, the owners of a prominent U.S. company. According to Alfred Adler, birth order and parental influence both affect an individual's personality (Adler, 1958). Stark was the first and only child in his family, and potentially as a result he was subjected to excessive pampering. This pampering was especially pronounced because his parents were extremely successful in the business world. Adler stated that first-born children are more likely to go on to become criminals, alcoholics, and perverts (although he indicated that not every familial situation would fit the description).

Howard and Maria gave Tony everything he wanted (which would be considered pampering), but they never really spent time with Tony (which would be considered by Adler to be neglect). For example, several flashbacks show Tony as a child waiting for hours while his father focused on work. Adler claimed neglected individuals are uncomfortable with warm personal relationships later in life (Adler, 1958). We can see this effect in Stark's playboy nature and inability to commit to an adult romantic relationship. In several instances in the film series (before he becomes committed to girlfriend Pepper Potts), Stark engages in sexual behaviors after just a few minutes of knowing someone (all while holding a glass of whiskey).

Another personality theory constructed by Adler was what he called striving for superiority, a struggle which almost inevitably leads to an inferiority complex (Adler, 1964). Because of this implicit sense of inferiority, individuals tend to compete with themselves more than they do with others. In short, they suffer from a nagging sense of low confidence which can lead to overcompensation in superficially braggart behaviors. Certainly, Stark has the appearance of confidence, but he frequently experiences phases of self-doubt. A key to overcoming inferiority is what Adler called *Gemeinschaftsgefühl* which, translated, means social interest (Burger, 2011). Adler believed personal

satisfaction could only be achieved through selflessness and a sacrifice of personal glory for the greater good. The idea of a poorly adjusted individual sounds similar to how Stark lived his life and ran his arms business until his accident. As Stark ages, and has positive influences such as Pepper Potts and the other Avengers, his personality begins to change due to his increased interest in serving the larger community. An example of his evolved motivation can be seen in the climactic scene of "The Avengers" when Stark believes he is sacrificing himself to stop a nuclear weapon from destroying New York.

Erik Erikson was another Neo-Freudian theorist who suggested that personality is shaped by critical stages of development throughout the lifespan (Erikson, 1968). As a toddler, Stark experienced the crisis of Autonomy versus Shame and Doubt. An individual with autonomy will have confidence in themselves to navigate through life's challenges and will believe in their own decision-making abilities (i.e. not being reliant only on others). Stark has passed through this stage. This is evidenced by his drive for innovation as well as his drive to tackle any problem or villain that crosses his path. Through the series of Iron Man movies, Stark confronts a millionaire who used to be his mentor, a Russian terrorist with electric whips, and another genius techno-terrorist. In the film "Iron Man vs. Captain America: Civil War," he is even willing to battle a close friend when he feels that the larger community is threatened.

The next Eriksonian stage important to understanding Stark's personality is Intimacy versus Isolation, which occurs during young adulthood (Erikson, 1968). Passage through this stage requires an individual to develop intimacy and grow emotionally. People like Stark, who fail to develop intimacy during this stage, face what is called emotional isolation. Stark is a prime example of emotional isolation; he enters into superficial relationships which do not give the same satisfaction that a genuine relationship would. Individuals with emotional isolation also tend to avoid emotional commitment because they see a single person's lifestyle benefits (e.g., freedom, multiple sexual partners). Failure to move beyond these ideas can inhibit emotional growth (Burger, 2011). Throughout the series, Stark's girlfriend displays many instances of frustration with Stark when he neglects her or fails to remember important details. For example, he buys her strawberries even though she is allergic to them.

As an adult, Stark is currently in the crisis of Generativity versus Stagnation (Erikson, 1968). To successfully pass through this crisis one must develop a sense of generativity, or a concern for guiding the next generation, either by parenting or by working with groups of young people. A lack of generativity, also known as

stagnation, is a feeling of emptiness or questioning one's purpose in life. While Stark does not have children of his own, nor does he work with youths, one could argue that by being a worldwide icon, Stark, or Iron Man, has an influence on the next generation by being a superhero and serving as a role model. Another argument for why Stark has not experienced either generativity or stagnation is because he is just beginning this stage or because he is fixated in the previous crisis, preventing any further growth. As Stark continues to develop emotionally, one could see the crisis of Generativity versus Stagnation become more prevalent in Stark's life. An example of this crisis in Stark's personal journey is seen in his decision to rebuild the destroyed "Stark Tower" and re-christen it "Avengers Tower," symbolizing his commitment to a team mentality and something larger than himself. Another personality concept that accurately depicts Tony Stark is Type A personality, originally suggested by Friedman and Rosenman (1959). Individuals with a Type A personality are aggressive, competitive, achievement oriented, hostile, require a sense of control, and feel a sense of time urgency. Each of these traits describes Stark quite well. Stark often lashes out while working with others due to his aggression and constant need to maintain control. His condescending attitude is clear when he believes others' lack of intelligence or ability are holding him back.

Insight into the personality of Tony Stark can also come from the biological approach. By examining brain wave activity, physiological responsiveness, and hormones, differences in personality can be explained (Eysenck, 1982). For example, studies have established that introverts physiologically respond more to environmental stimuli, compared to extraverts (Eysenck & Eysenck, 1967). According to Hans Eysenck's theory, Stark would rate high in extraversion (a social gregarious nature and need for frequent stimulation) and neuroticism (anxiety or frequent emotional change). He would therefore be given the label of "choleric," which Eysenck described as impulsive, aggressive, and emotionally touchy – an accurate description of Stark. Stark's playboy behaviors may also be founded on biological predispositions. A reason for this promiscuity may be, from an evolutionary standpoint, that it is logical for a male to have sex with as many women as possible in order to increase the chances of offspring (Buss, 1995). Men have a lower parental influence, compared to women, and therefore are predicted to be more open to short-term sexual relationships. Stark, through his resistance to form meaningful relationships and his biological drive to pass along genes, has created a playboy persona who lives for one night stands.

Finally, the most salient aspect of Stark's personality is that he may meet criteria for diagnosis of

personality disorders (American Psychiatric Association, 2013). Because personality disorders are 85% comorbid, the prevalence for more than one personality disorder is high (Burger, 2011). Stark tends to underestimate the abilities of others; this is especially prevalent in his work with the Avengers. He frequently makes sarcastic comments about the intelligence of his teammates and condescending judgments of their abilities and life choices. He has an exaggerated sense of self which is clearly present for most, if not all, of his life. Along with an exaggerated sense of self, comes the tendency to overestimate his own abilities and accomplishments, as well as a preoccupation with being admired and a need to be the center of attention. This fits the criteria for narcissistic personality disorder (American Psychiatric Association, 2013).

Stark's narcissistic personality disorder affects his life in many ways. For example, shortly after returning home from an overseas visit, Stark discovers he was not invited to a company charity event. He still shows up, purely to be the center of attention. After battling enemy Obadiah Stane, Stark had a speech prepared which stated that Iron Man was just a body guard. Predictably, Stark went off script and pushed all the attention on himself by stating that he was Iron Man.

Stark may also meet the criteria for a diagnosis of histrionic personality disorder (American Psychiatric Association, 2013). Stark always feels the need to be the center of attention and feels unappreciated if anyone else receives attention; this is a problem for group efforts through the Avengers. His need is highlighted with his countless outlandish statements and the fact that he built a Stark Industries tower in the middle of New York City, so everyone would notice him and his business success. Another hallmark symptom of histrionic disorder is when people wear provocative and unusual clothing; certainly, the iron suit with a glowing heart falls under this criterion (American Psychiatric Association, 2013). When one suit becomes boring or too well known, he continues to create newer, more complicated, and more advanced suits to impress his audience and fans.

Tony Stark, through his biology, parental upbringing, and life choices, has been molded into a complex individual. Stark, the victim of neglectful and dismissive parents and an individual with potential personality disorders, is one of the most famous superheroes of our time. Would any role be better for Stark than a billionaire with incredible intellect and resources who doubles as a superhero? The spotlight is what Stark craves and intimate relationships are what he detests. As one of earth's mightiest Avengers, Stark is able to have both, living his lavish playboy lifestyle, while also maintaining the attention of the world.

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