Individual Differences in Eyewitness Memory:
The Role of Anxiety, Depression, and Personality
in Memory for Emotional Events

by

Carmelina Barone

B.A. (Hons.), Simon Fraser University, 2007

Thesis Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Arts

in the

Department of Psychology

Faculty of Arts and Social Sciences

© Carmelina Barone 2012

SIMON FRASER UNIVERSITY

Summer 2012

Approval

Name: **Carmelina Barone**

Degree: **Master of Arts (Discipline)**

Title of Thesis: ***Individual Differences in Eyewitness Memory: The Role of Anxiety, Depression, and Personality in Memory for Emotional Events***

Examining Committee:

                    Chair: Robert McMahon, Professor, Department of Psychology

J. Don Read
Senior Supervisor
Professor and Department Chair, Department of Psychology

Jodi L. Viljoen
Supervisor
Associate Professor, Department of Psychology

Elina Birmingham
External Examiner
Assistant Professor, Department of Education
Simon Fraser University

Date Defended/Approved: August 17, 2012

Partial Copyright Licence

SFU

Ethics Statement

SFU

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

    a. human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

    b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University;

or has conducted the research

    c. as a co-investigator, collaborator or research assistant in a research project approved in advance,

or

    d. as a member of a course approved in advance for minimal risk human research, by the Office of Research Ethics.

A copy of the approval letter has been filed at the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

update Spring 2010

Abstract

The ability of witnesses of a criminal event to accurately recall what they have seen may be affected by various factors. This study explored whether individual differences such as anxiety, depression, and the Big Five personality traits were associated with memory accuracy for witnessed events. Participants were 211 undergraduates who watched videos varying in emotional valence (negative or neutral), completed measures of anxiety (STAI), depression (BDI-II), and personality traits (BFI) and then were asked to recall details from the videos. Results indicated that some individual differences variables, such as anxiety, conscientiousness, and neuroticism do have an association with memory accuracy. Research examining individual differences' association with memory accuracy may provide useful information to judges, juries, and investigators who are attempting to decide whether or not an eyewitness is credible.

Keywords: Eyewitness memory; individual differences; anxiety; depression; personality traits

Acknowledgements

There have been a number of people who have been instrumental along the path to completing this thesis. First and foremost, thank you to my supervisor Dr. Don Read for his guidance throughout this endeavor, for providing invaluable feedback on drafts of my thesis, and for first piquing my interest in this area of research in an undergraduate class. I would also like to thank Dr. Jodi Viljoen for the very helpful suggestions she provided during my proposal defence of this project.

Thanks also to the SFU undergraduates who participated in this research, and to my research assistant Sunny Chow who was so helpful in assisting me with various aspects of this project. This study was supported by a SSHRC Joseph-Armand Bombardier CGS Master's Scholarship.

To my parents, thank you for all your love and support, and for always telling me to go after my dreams. Thank you to my lab mate Carroll Boydell for your encouragement and for the many laughs we shared along the way. I would also like to thank all my friends for helping me forget about school and focus on fun when I needed it the most. Finally, to my loving husband Mike, thank you for believing in me always, and for keeping me grounded with the knowledge that you will always be there for me. I could not have done it without all the many nights that you cooked us tasty treats and made me laugh while I was up late working.

Table of Contents

List of Tables

List of Figures

INTRODUCTION

An eyewitness account of an event often provides the key element of evidence available to judges and juries to determine how events transpired during the commission of a crime. Accurate accounts can lead to accurate decisions by triers of fact, while inaccurate accounts can lead to erroneous conclusions. As a result, inaccurate conclusions may lead to imprisonment of innocent suspects, or to not guilty decisions when the suspect did in fact, commit the crime. Research has examined levels of accuracy of eyewitness identifications as well as levels of accuracy of eyewitness memory for details of criminal events (e.g., Pezdek, Blandon-Gitlin, 2005; Dysart & Lindsay; Brewer, Caon, Todd & Weber, 2006; Lindsay, Read, & Sharma, 1998; Naka, Itsukushima, & Itoh, 1996). Research in these areas has tended to focus on what are known as system variables, that is, those variables that are under the control of the criminal justice system (Wells, 1978). Such variables include how lineups are constructed, the length of time between a crime and testimony of the witness, or feedback given to a witness after identification of a suspect. Other research has examined what are known as estimator variables, that is, those variables that are not under the control of the criminal justice system and that cannot be manipulated in criminal cases. Variables such as the presence of a weapon during the crime, how much stress an individual experiences when witnessing the crime, and other characteristics of the eyewitness can be considered estimator variables. These variables can be considered estimator variables because they may affect witness

1

accuracy, but are not under the control of the criminal justice system. Research that has been conducted on estimator variables has primarily focused on research investigating the cross-race effect (Bothwell, Brigham, & Malpass, 1989; Meissner, Brigham, & Butz, 2005), the weapon focus effect (Steblay, 1992; Loftus, Loftus, & Messo, 1987), confidence of eyewitnesses (Sporer, Read, Cutler, 1995; Bothwell, Deffenbacher, & Brigham, 1987), and the length of exposure to a perpetrator (Bornstein, Deffenbacher, Penrod, & McGorty, 2012; Memon, Hope, & Bull, 2003).

There has, however, been a dearth of research examining estimator variables such as individual differences and their relationship to accuracy of eyewitnesses. This lack of research is problematic because certain personality features or the presence of a psychological disorder may contribute differentially to the ability of witnesses to recall accurately what they have seen. Unfortunately, most research has not explored how individual differences may be associated with witness accuracy, a deficit that may lead to the assumption that people who witness a crime should be considered to be similar, and that the results found by this research can be generalized to most people. Individual characteristics of witnesses may certainly be related to how well one can remember events.   For example, it is possible that trait anxiety and symptoms of depression may produce difficulties in the recall of certain witnessed events.

The prevalence of anxiety and depression is high in the general population, with a 2002 Statistics Canada report stating that approximately 4.7% of people had an anxiety disorder in the past 12 months and approximately 4.5% had major depressive disorder in the same time period. Because of the high prevalence rates of these disorders, it stands to reason that many eyewitnesses may be suffering from either anxiety or depression when they witness a criminal event. Furthermore, individuals with

2

mental health concerns may be more likely to be victimized and rates of both violent and

non-violent crimes are higher among those with severe mental illness than the general

population (Teplin, McClelland, Abram, & Weiner, 2005). Because individuals with

mental health symptoms are more likely to be a victim of crime, and by extension, an

eyewitness to crime, it is important to examine the association of mental health

symptoms and memory for eyewitnessed events. In addition, because anxiety and

depression are often comorbid (Sanderson, Beck, & Beck, 1990), not only may

eyewitnesses have one of these conditions, but they could have both. The current study

examined a number of individual differences variables (anxiety, depression, and the Big

Five personality traits) in eyewitnesses to determine whether any are associated with the

ability to accurately recall events.

Memory for emotional events

According to Easterbrook (1959), increased arousal leads to a narrowing of

attention. Therefore, viewing events that are emotional in nature, which may result in

increased arousal, could lead to a lower ability to recall accurate details than when

viewing neutral events. In fact, research on memory for events that are high in

perceived emotionality typically finds that memory for details that are central to

understanding an event is enhanced, while accuracy of memory for more peripheral

details is decreased (Burke, Heuer, & Reisburg, 1992; Christianson & Loftus, 1991).

Other research, however, has found that arousal induced thematically rather than

visually, that is, arousal that is induced through an individual's emotional involvement

with the event shows the predicted increase in recall of information central to the

experience but not necessarily a reduction in recall of peripheral details (Laney, Heuer,

& Reisberg, 2004). Hulse, Allen, Memon, and Read (2007) conducted a study that replicated the results of Laney et al. (2004). Therefore, memory for emotional events may be enhanced for details central to an event, but not necessarily diminished for details in the periphery depending on how arousal is induced.

Emotionality of an event has also been examined as a factor that may increase susceptibility to incorporation of inaccurate details, or false memories, into accounts of witnessed scenes. Porter, Spencer, and Birt (2003) exposed participants to positive, negative, or neutral photographed scenes and misleading questions. The photographed scenes were taken from the International Affective Picture System which contains a large number of emotionally evocative photos, and the photos chosen for the study were required to include a visible background and people. During the recall portion of the study, participants who viewed negative scenes showed an increased likelihood of recalling false details (80%) when compared to the positive and neutral groups (40% for both groups). Porter et al. (2003) speculated that these findings may have occurred because those who viewed a negative scene may have focused on the most distressing, (i.e. central detail) rather than the peripheral details, increasing the likelihood they would incorporate misleading peripheral information. Those who viewed a positive scene may have been more likely to take in the entire scene and not simply the central details, leading to an increased ability to distinguish accurate from misleading information. In contrast, a study by Forgas, Laham, & Vargas (2005) found that individuals who viewed a neutral or positive scene were more likely to incorporate misleading details into their recall than those who viewed a negative event. This finding can be explained by the idea that being in a neutral or positive mood signals that you are in a favourable environment which may require less effortful processing of encoded information, while

being in a negative mood calls for more vigilant and thorough processing (Schwarz, 1990). Furthermore, while in a positive mood, individuals may be less likely to be critical of new information and may simply incorporate it into existing schemas through an assimilation approach (Bless, 2000). The tendency to be less critical of information while in a positive mood is in contrast to a negative mood where there is a more critical approach to incorporating information into memory (Bless, 2000). Thus, it does appear that the emotional valence of the encoded event is important to the subsequent recall of the memory, with positive, neutral, and negative valences showing differential recall accuracy. The current study will incorporate both neutral and negatively valenced materials to differentiate between recall of emotional versus non-emotional stimuli. Next we will turn to variables that may moderate or mediate the relationship between emotionality of the event and memory accuracy.

Anxiety and memory

Anxiety is diagnosed by physical effects such as heart palpitations, sweating, and tremor, as well as its psychological effects such as a sense of fear, dread, or worry. Memory performance on implicit and explicit memory tasks has been shown to be reduced in anxious individuals, with the main causes of this performance loss being attributed to worrying which in turn interferes with attention (Eysenck & Calvo, 1992). More attention is thus paid to worrying, rather than the task at hand, resulting in decreased memory performance. Eysenck and Calvo (1992) also proposed a processing efficiency theory that states that worrying leads to reduced processing and storage capacity of the working memory. The anxious individual, however, attempts to stop the worrisome thoughts with the possible consequence of poor performance by

allocating further resources to task performance. Because there are only limited

resources that can be allocated to working memory, this compensatory strategy can only

increase performance to a certain degree. Thus, if the task becomes too difficult,

performance by anxious individuals will decrease to lower performance levels than those

who are non-anxious (MacLeod & Mathews, 2004).

Anxiety has been shown to cause a selective attention bias to threatening

information, whereby anxious individuals more readily attend to threatening information

in an environment while potentially ignoring more benign or positive environmental

information (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn,

2007; Mogg & Bradley, 1998). This attentional bias has been found across a number of

experimental tasks such as visual search tasks, modified Stroop tasks, the dot probe

task, and spatial cueing tasks (Cisler & Koster, 2010). If anxious individuals are

selectively attending to threatening information, it follows that they will primarily encode

this information to the detriment of other details and may show a tendency to have a

more difficult time recognizing or recalling information that is inconsistent with this bias.

For example, during a kidnapping, an anxious eyewitness may attend to the

perpetrator's weapon because it is very threatening and thus be able to give a good

description of it. This eyewitness, however, may not have encoded information about

the victim's appearance, resulting in an inability to recount these details to police

because attention was primarily focused on the threatening information. A meta-

analysis completed by Mitte (2008) examining memory bias of threatening information in

anxiety found that while there may be an attentional bias towards threatening information

there is no memory bias in implicit memory tasks or recognition memory. Thus, anxious

people do pay more attention to threatening details, but this does not translate into an

increased ability to retrieve such threatening information on implicit tasks. There was, however, a memory bias for explicit recall tasks. Those who were highly anxious were more accurate at recalling threatening information and less accurate when recalling positive information. Furthermore, only trait anxiety and not state anxiety was related to a memory bias for threatening information in recall tasks.

State anxiety, or anxiety that occurs because of current circumstances and is usually time-limited, has been examined in the context of eyewitness memory. Valentine and Mesout (2009) found in their real-world study of eyewitness identification that high state anxiety resulted in fewer correct descriptions and identifications of a target, as well as a greater number of incorrectly recalled descriptors.

In another study Dobson and Markham (1992) examined those high or low in test (trait) anxiety as measured by the Test Anxiety Scale. The Test Anxiety Scale is a trait measure of anxiety and a high score indicates that one experiences discomfort in testing situations. The experimenters also induced either high state anxiety (via evaluative threat) or low state anxiety (no threat instructions) in participants at encoding and/or retrieval. Thus, the design involved 4 separate conditions (i.e., receiving evaluative threat instructions only at encoding, only at retrieval, at both encoding and retrieval, or not receiving any evaluative threat instructions), and participants were also split into high and low trait anxiety groups. Participants viewed a purse-snatching event depicted on slides.

Results of the study included a main effect of trait anxiety whereby the high trait anxiety group (those who scored above 23 on the Test Anxiety Scale) were not able to provide as many correct answers as the low trait anxiety group on multiple choice

questions testing recognition of details of the event. There was also a main effect of retrieval condition on performance, whereby receiving evaluative threat instructions at retrieval improved performance for both the high and low trait anxiety groups. There were no interaction effects found. Despite the lack of interaction effects, planned comparisons revealed that high trait anxiety participants who were also in the high state anxiety group at both encoding and retrieval (i.e., those who received evaluative threat instructions) showed poorer recognition performance than low trait anxiety participants, but this difference was not found in conditions where high state anxiety was only induced at either encoding or retrieval or in the control condition with no threat instructions. When examining only the low trait anxiety group, the presence of high state anxiety instructions at both encoding and retrieval improved performance in comparison to the control condition where no state anxiety was induced. Thus, the presence of state anxiety boosted recognition memory in those low in trait anxiety. In contrast, those already high in trait anxiety did not demonstrate a difference in their performance when high state anxiety instructions were given versus when they received no such instructions in the control condition. Therefore, inducing state anxiety did not further impair their memory. Taken together, results of this study indicate that state anxiety induced at retrieval improves performance of both low and high trait anxiety participants, but those who were low on trait anxiety performed better than high trait anxiety participants when state anxiety was induced at both encoding and retrieval.

Trait anxiety, or anxiety that is an underlying personality feature and is more stable over time, has been examined less frequently as a possible source of differences in recall of events for eyewitnesses. An eyewitness identification study completed by Bothwell, Brigham, and Pigott (1987) that examined introversion/extraversion and

neuroticism/stability found that neurotic individuals were less accurate in their ability to identify faces when they were in the high manipulated arousal group rather than the low or moderate groups. In contrast, stables or those considered not neurotic, became increasingly accurate as level of manipulated arousal increased.   This finding is similar to the results of the Dobson and Markham (1992) study that found that higher manipulated arousal in low trait anxious persons resulted in increased performance. Level of extraversion, however, was not found to be related to accuracy of facial identification.   Level of confidence in the participant's identification was also examined, and it was found that overall confidence decreased as level of manipulated arousal increased. Neurotic individuals showed lower confidence than those who were not considered neurotic, and those who were more extraverted showed higher confidence in their identification decision. When the relationship between accuracy of identification decisions was compared to confidence ratings in that decision, it was found that introverts had a higher confidence and accuracy correlation than did extraverts and neurotics showed a higher correlation than stables.

Another study examining trait anxiety completed by Nolan and Markham (1998) examined witness memory in individuals selected as either high or low in test anxiety. Participants watched a video clip of a crime and were asked cued recall questions one week later about the crime and rated their confidence in their answers. There were no differences in accuracy between the low and high test anxiety groups. The correlation between accuracy of recalled details and confidence was higher for those in the high test anxiety ($r = .60$) than the low test anxiety group ($r = .28$). Nolan and Markham (1998) speculated that the higher accuracy-confidence correlation for those who were more highly anxious may have occurred because anxious individuals may be more self-aware

and may, as a result, have more insight into their performance. Those in the high test anxiety group rated their confidence lower, on average, than those in the low anxiety group. Similarly, when they were rated by observers, the observers also rated high-anxious individuals as less confident. Further, Valentine and Mesout (2009) also investigated trait anxiety but found no relation to accuracy of identifications made by witnesses. Thus, when giving testimony, people who appear highly anxious may be seen as less credible than their less anxious counterparts, but that does not mean that they are necessarily likely to be any less accurate.

In contrast, research by Siegel and Loftus (1978) that examined the role of life stress and anxiety in recall of an eyewitness event indicated that performance on a multiple choice recall test of a slide sequence depicting a theft was correlated with the participant's anxiety level and level of preoccupation with task-irrelevant thoughts, but not with their life stress. Life stress was measured using the Life Experiences Survey which asks participants to report events they have experienced in the past year, rate how desirable or undesirable the event was, and how much it had an effect on their life. Level of preoccupation was measured using the self-preoccupation scale that consists of questions regarding how much their minds wandered during the previous task, and items regarding performance fears. Participants who reported more anxiety and preoccupation were less accurate in their recall of the theft that they had viewed. Thus, research has been equivocal when anxiety is examined as a possible variable affecting memory recall of eyewitnesses, with several studies reporting an association while others do not. Studies that manipulated arousal in addition to measuring trait anxiety completed by Bothwell et al. (1987) and Dobson and Markham (1992) found that in those with low trait anxiety, increased state anxiety actually increased their memory performance. Valentine

and Mesout's (2009) study, on the other hand, found that increasing state anxiety was associated with decreased eyewitness identification performance and that trait anxiety was not associated with memory accuracy. Other examinations of trait anxiety such as that conducted by Siegal and Loftus (1978) found that anxiety was negatively correlated with accuracy while Nolan and Markham (1998) found no such relationship. The current study will attempt to further elucidate the relationship between trait anxiety and recall. Trait anxiety may cause a narrowing of attention due to processing resources being taken up by a focus on anxious thoughts or bodily sensations and may, as a result, allow less information to be encoded by anxious individuals. Furthermore, anxiety may affect ability during retrieval to access previously encoded information in addition to ability to encode information.

Depression and memory

People with depression have symptoms of low mood, loss of interest in most activities, feelings of worthlessness, and indecisiveness (American Psychiatric Association, 2000). There has been a considerable amount of research conducted examining the effects of depressed mood and major depressive episode on memory. What has not been completed, however, is research examining the effects of depression on memory for criminal events. Studies employing neuropsychological testing have examined depression's effect on memory and have found conflicting results. Some studies show impairment in memory recall and recognition in depressed individuals (Austin, Ross, Murray, & O'Carroll 1992; Porter, Gallagher, Thompson, & Young, 2003), while a meta-analysis completed by McDermott and Ebmeier (2009) found that

depression predicted poorer episodic but not semantic memory using neuropsychological assessments.

Other research has shown that those who are depressed tend to show an increase in overgeneral memories and reduced specificity of recalled content (Goddard, Dritschel, & Burton, 1996; Kuyken &, Brewin, 1995; Kuyken & Dalgleish, 1995; Williams and Broadbent, 1986). This tendency towards overgeneral memory may be explained by the propensity of depressed people to ruminate, or to go over negative experiences in one's mind over and over again. At first thought, it may seem that repeatedly focusing on an experience may increase one's memory for an event, however, rumination tends to take the form of self-reflection on symptoms of distress and on consequences and reasons for the distress (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). This is in contrast to rehearsal that would be beneficial for remembering events. In fact, Sutherland and Bryant (2007) found that when highly depressed and low depressed participants completed either a rumination or distraction task prior to autobiographical memory recall, highly depressed participants showed overgeneral recall of memories in the rumination but not the distraction group. The low depression participants did not show any overgeneral memory after either the distraction or rumination tasks. Furthermore, the highly depressed participants were more likely to show overgeneral memories after the rumination task if the rumination was negatively, as opposed to positively, framed during the experimental manipulation. Overgeneral memory has also been shown to be predictive of severity of depression (Brittlebank et al., 1993; Peeters, Wessel, Merckelbach, & Boon-Vermeeren, 2002). Those who demonstrate more depressive symptomatology tend to show less specificity in their memory when compared to those with less severe depression.

A study by Delduca, Jones, and Barnard (2009) examined specificity of autobiographical memory in hypomanic individuals, that is, individuals experiencing manic symptoms such as elevated mood, decreased need for sleep, engagement in risky activities but who did not experience significant impairment in functioning. In contrast to what is typically found in studies of depressed individuals, those identified as at high risk for developing bipolar disorder were found to recall specific memories during an autobiographical memory test, rather than overgeneral memories. This finding, however, was only evident when participants were asked to recall a memory using unpleasant cues, and not with other types of cues such as pleasant cues. The authors suggest that memory recall for unpleasant memories may be facilitated in individuals at risk for bipolar disorder by increasing the availability of negative memories for retrieval. Research in this area demonstrates that those who are depressed may show a tendency towards overgeneral memory while those on the opposite side of the mood spectrum who are hypomanic recall specific memories. This provides evidence that mood pathology may contribute to an individual's ability to accurately recall details of an event.

Reduction of overgeneral memory can occur when mindfulness is used as a therapy in depression (Williams, Teasdale, Seagal, & Soulsby (2000). Mindfulness is a process whereby a person focuses on their immediate experience, and continues to redirect their attention back to the present moment when their attention wanders. Williams et al. (2000) used either a mindfulness-based treatment approach or treatment as usual (control) with depressed patients, and found that those in the mindfulness group showed a reduction in overgeneral memories whereas control patients did not show any change in their memory specificity. Thus, mindfulness-based therapy may

serve as a way of avoiding the rumination that may be a mechanism by which overgeneral memory occurs.

Memory for mood-congruent information is typically better than memory for mood-incongruent information (Eich & Macaulay, 2000; Bower and Forgas, 2001). Therefore, if you are in a bad mood you are more likely to be more accurate at recalling details from a negative event than a neutral event. One explanation for this finding is that when a person is experiencing an affective state, a network of associated thoughts and constructs are activated, resulting in easier and faster access to these representations when a later memory task requires processing of a similar mood state (Eich & Forgas, 2003). Bower et al. (1981) found that there was a processing advantage for mood congruent information. Thus it may be the case that a depressed individual may show increased recall of emotional events that are negative and decreased recall for events that invoke positive experiences. Similarly, those who are not depressed may have an advantage in recalling more neutral experiences. This study explored the association between depressive symptomatology, emotionality of events, and memory accuracy.

Five-factor model of personality and memory

The five-factor model of personality has been conceptualized as representing the five major categories of personality traits. These five major traits are openness to experience, neuroticism, agreeableness, extroversion, and conscientiousness. The trait of neuroticism is described as including negative affect, difficulties in coping with emotional distress, irrational beliefs, and a tendency towards impulsive behaviour (MacCrae & Costa, 1987). Openness to experience refers to a person's tendency

14

towards being original, daring, having broad interests, and being imaginative (MacCrae & Costa, 1987). Regarding agreeableness, those who are low on this trait would be seen as antagonistic, mistrustful, callous, and uncooperative with others, while those high on agreeableness would display the opposite traits. Conscientiousness has been conceptualized as referring to a 'will to achieve' and to an individual who has self-control and is directed in his or her actions (MacCrae & Costa, 1987). An individual's propensity for being friendly, talkative, sociable, and fun-loving would fall under the trait of extraversion.

Eyewitnesses will differ in their personality traits just as they would differ on any other individual differences dimension. Thus, the question becomes whether these differences are linked with an individual's proficiency at accurately recalling event details. Memory research has examined this question to a degree, though not often in the eyewitness memory context.

 In a study examining personality traits and their association with objective tests of memory (i.e., recall of a story from the Logical Memory subtest of the Wechsler Memory Scale) and subjective memory tests (i.e., tests that demonstrate a participant's own belief of their memory ability), Pearman (2009) found that a higher openness score was associated with more accurate story recall. None of the other Big Five personality traits were associated with the objective memory test. In terms of an individual's own beliefs about his or her memory, Pearman (2009) found that neuroticism and conscientiousness was related to how frequently participants reported memory difficulties, with more frequent reported problems associated with higher neuroticism and fewer reported problems associated with higher conscientiousness scores. Participants'

ratings of their subjective memory, however, were not associated with their objective memory performance.

Unlike depression, in the context of eyewitness memory studies, the Big Five personality traits and suggestibility have been examined as possible predictors of memory performance. Liebman et al. (2002) had undergraduates listen to an audiotaped story and then engage in free recall of the event. Following free recall, participants answered 20 questions about the event, 5 of which were accurate reflections of the event and 15 of which reflected misleading information. Then participants were told they had made a number of errors and were asked to complete the questions a second time. Liebman et al. (2002) found that those who were higher on suggestibility as measured on the Gudjonsson Suggestibility Scale 2 were less able to recall the event accurately (accuracy based on first completion of questions), recalling more misinformation than those who were less suggestible. The Big Five personality traits were not associated with recall accuracy on this specific task. However, participants were also shown 21 pictures from a children's book with a corresponding narrative read out to them by the experimenter. Three weeks later participants were asked questions about the story, with 10 misleading questions introduced. One week later participants provided free recall of the story and were asked 20 questions about it, 10 of which included misinformation. Results indicated that those who scored higher on the openness to experience trait were more accurate in their recollection of the original event than those who had lower scores on this trait. Individuals who reported only misinformation were higher on the neuroticism dimension and low on openness to experience and agreeableness (Liebman et al., 2002). Liebman et al.'s (2002) study indicates that there may be some association between personality traits and memory

accuracy, though it primarily focused on whether participants reported misinformation rather than on their true recall of the event.

In a false memory study, Porter, Birt, Yuille, & Lehman (2000) found that participants who experienced a partial false memory scored higher on extraversion than those who experienced either a partial false memory or no false memory. Conscientiousness also showed a strong trend towards being higher in those who did not experience a false memory. Individual differences in personality traits were also examined in the interviewers who elicited the memories from participants. Interviewers who were more extraverted tended to elicit more false memories from participants than those who were more introverted. Thus, it seems there may be an interplay between more extraverted interviewers being able to elicit false memories from introverted participants possibly because they may be better able to build rapport and be more persuasive which could result in higher susceptibility to false memories in participants (Porter et al., 2000).

Another false memory study conducted by Zhu et al. (2010) examined the association between personality traits and false memory in a sample of Chinese college students. This study did not examine the Big Five personality traits specifically, but focused on other personality variables such as dissociative experiences, cooperativeness, and harm avoidance. Participants in this study were more likely to experience false memory if they scored high on cooperativeness, high on self-directedness, and low on harm avoidance. These three traits may map onto three of the Big Five personality traits: agreeableness, conscientiousness, and openness to experience. Those who are more cooperative would be likely to score high on agreeableness, having a low tendency to avoid harm may relate to being more open to

17

experiences, and being high on self-directedness would likely be associated with high conscientiousness scores.

Results of these studies indicate that certain personality traits may be linked to likelihood of recalling false memories, although some studies report conflicting results, with openness being found to correlate with improved accuracy by Pearman et al. (2000) and Liebman et al. (2000), but Zhu et al. (2010) found harm avoidance associated with increased likelihood of reporting false memories. It may be the case that harm avoidance only partially maps on to the construct of openness, resulting in these conflicting outcomes. Few research studies have examined the relationship between memory accuracy in an eyewitness context, rather than incorporation of false details, and personality traits, thus the current study will attempt to determine if such traits moderate the relationship between eyewitness accuracy of emotional and non-emotional events.

Divided attention and memory

Performing two tasks at the same time can lead to a degradation in performance for one or both of the concurrent tasks and to any subsequent memory performance (e.g., Baddeley, Lewis, Eldridge, & Thomson,1984; Craik, Govoni, Naveh-Benjamin, & Anderson, 1996; Naveh-Benjamin, Craik, Perretta, & Tonev, 2000). Reasons for this reduced performance can be attributed to decreased time available to process and encode information, or processing of information may be shallower as the result of engaging in two tasks at once (Naveh-Benjamin, Guez, & Marom, 2003). In eyewitness situations, divided attention can occur due to the presence of a weapon (i.e. the weapon focus effect) or due to other competing demands such as a witness attending to his or

her feelings regarding the criminal event or looking for help rather than focusing on other details of the crime (Lane, 2006).

Lane (2006) conducted a study examining the effects of divided attention on eyewitness suggestibility and the incorporation of misleading post-event information in memory reports for the event. Participants watched a slide sequence depicting an event either with their full attention directed towards the slides or as they engaged in a divided attention task. The divided attention task consisted of listening to an audiotape and naming songs from the tape when asked, in addition to paying attention to the slides. After watching the slide sequence, participants were given a post-event questionnaire that contained some false details, and then were asked to complete a memory test for the slide sequence. Lane (2006) found that participants in the divided attention group were more likely to recall false misleading information than those in the full attention group. Consequently, divided attention during encoding of a witnessed event can lead to difficulties in accurately recalling what has been seen and can even lead to incorporation of false details into an account.

Dividing attention can lead to the reduction of processing resources available to be directed towards a task, similar to the way in which anxiety and rumination can affect processing. Thus, dividing attention can place a burden on resources available during encoding which may in turn interact with various individual differences variables to affect quality of memory accuracy. The current study will manipulate level of attention to a video, and it is predicted that divided attention will have the most deleterious effects on memory accuracy for the anxious participants because their processing resources may have already been depleted due to task-irrelevant worrying.

Coarse and fine-grained analysis

An important consideration of research that examines eyewitness memory is to distinguish between grain sizes of details reported. During a memory report, people may use a strategy of balancing the accuracy of their report with the informativeness of the details they are providing (Goldsmith, Koriat, & Weinberg-Eliezer, 2002). For example, suppose a perpetrator of a robbery weighs 225 pounds. When a witness is asked to describe the suspect, the witness could tell police the robber was between 190-250 pounds. This is a correct description; however, it is less informative than if the witness reported that the suspect was approximately 230 pounds. The former answer is accurate; however, the latter answer is more informative. Furthermore, when witnesses are asked to recount what they have seen at the scene of a crime, they often have personal control over how much detail they report. Coarse-grained details may be more frequently accurate, but fine-grained details are often more informative (Goldsmith et al., 2002). While an individual may be able to accurately report a coarse grained detail, a fine-grained detail pertaining to the same information could be reported inaccurately. In their studies examining grain size, Goldsmith et al. (2002) found that participants would choose to report fine-grained details only when they judged (through confidence ratings) that these answers were likely to be correct. Thus, it is important to incorporate grain size into studies of eyewitness memory because if this issue is not considered, what is seen as a difference in memory accuracy may simply be due to asking participants to report different levels of details of events (Weber & Brewer, 2008). The current study will incorporate both coarse-grained and fine-grained questions when assessing memory for events to ensure that this issue is adequately addressed.

Current study

Research investigating individual differences in memory for witnessed events can assist in developing criteria that will be useful in assessing credibility of witnesses. For example, are witnesses who are depressed or anxious more or less likely to be accurate when they relate details seen during commission of a crime? This information can be useful to triers of fact and investigators in their determination of how much weight to place on an eyewitness' account of events. Similarly, this information may provide a means of distinguishing between two or more conflicting witnesses who seem equally confident in their report of what occurred. Eyewitnesses may be testifying about events that are quite distressing crimes, such as a murder or sexual assault they witnessed, or crimes that are more neutral in emotionality, such as fraud. As a result, it is important to determine how memory is affected by different types of emotional events, rather than simply focusing on the stereotypical highly negative and distressing event. The research literature reviewed in this paper indicates that a number of individual differences variables may play a role in the ability of eyewitnesses to recall events. Namely, the current study will examine trait anxiety, depression, and the Big Five personality traits as variables that may affect memory recall of witnesses of criminal events. Additionally, emotionality of the target scene will be manipulated, accounting for negative and neutral events, and attention will be manipulated (full or divided). The *first research question* this study will address is whether emotional valence affects memory accuracy for witnessed events and if so, whether this effect changes over levels of the individual difference variables in participants. Also of interest is the *second research question* of whether manipulating the level of attention may have an effect on the relationship between the individual difference variables and memory accuracy. The *third research*

question of interest is whether level of anxiety, depression, and the Big Five personality traits in eyewitnesses are associated with differences in ability to accurately recall events. Last, *the fourth research* question will examine whether accuracy of eyewitnesses varies in identifying fine versus coarse-grained details of the events, and if this interacts with the individual difference variables.

Regarding the *first research question* examining the interaction of the individual difference variables with emotional valence of the video events, it is predicted that those who are experiencing more depressive symptoms will show increased recall of details from the negatively valenced video when compared to controls. This prediction is based on the congruency between the depressed mood and the negative event, which is consistent with literature examining mood congruency (e.g., Eich & Macauley, 2000; Bower & Forgas, 2001). However, non-significant results of mood congruency as a function of level of depressive symptoms could occur if those who have moderate to severe depressive symptoms show a decline in performance due to a lack of motivation in recalling video content. Thus, there may be a curvilinear relationship between depressive symptoms and accuracy. This curvilinear relationship may demonstrate that mildly depressed participants are more accurate than non-depressed participants at recalling the negative video, but those who are more severely depressed may demonstrate less accurate recall. Anxious individuals are also predicted to show increased recall of the negative scene because of the tendency for those who score high on anxiety to focus on details that signal threat in the environment, as found by Bar-Haim et al. (2007). If this prediction is not supported, it may indicate that the interference of worrying at encoding seen in anxious participants may override any additional boost in recall that this threat bias may provide. Furthermore, because

neuroticism is primarily a trait that encompasses negative affect and associated attributes, it is suggested that those who score high on neuroticism may be more likely to recall the negative emotionally valenced video more accurately than those who score lower on this trait. This prediction stems from the tendency for individuals to recall details consistent with their mood more accurately than those incongruent with their mood (Eich & Macaulay, 2000).

Predictions for the *second research question* examining how amount of attention paid to the videotaped events affects ability to recall information are as follows: Individuals in the divided attention group will perform less accurately across both the emotional and non-emotional videos due to a reduction in processing resources available to be allocated to encoding. In addition, those who are anxious will recall less accurate information under conditions of divided attention when compared to their non-anxious counterparts due to the potential for their worrying to interfere with their ability to encode information. This prediction would be in line with research by Siegel and Loftus (1978) indicating that witnesses who are preoccupied with task-irrelevant thoughts perform less accurately. Thus, anxious individuals tested in the divided attention condition are predicted to perform less accurately than anxious individuals in the full attention condition.

In terms of the *third research question* regarding whether levels of the individual differences variables (anxiety, depression, and Big Five personality traits) in eyewitnesses are associated with differences in ability to accurately recall events, we expect to find that anxious individuals will be more likely to have poorer memory for details seen in videotaped scenes than non-anxious controls. This prediction is consistent with findings reported by Eysenck and Calvo (1992) indicating that anxious

individuals experience a competition for resources needed for encoding versus those being directed toward task-irrelevant information such as worrying. Thus, worrying may consume cognitive resources that could otherwise be used for encoding information. This competition for resources can result in decreased performance on one or both tasks. An absence of significant results would demonstrate that anxiety level is not associated with eyewitness memory accuracy.

Those who are depressed are expected to perform at lower levels than non-depressed participants when total accuracy scores are examined due to the tendency to ruminate, or reflect on past distress or bad experiences. This tendency to ruminate may interfere with resources available for encoding. Depressed participants are also predicted to show a tendency towards overgeneral memory, which will be presented in the next section where grain size is discussed. Individuals who score high in both anxiousness and symptoms of depression are hypothesized to show the least accurate recall of the events. High levels of anxiety and depressive symptoms are predicted to show this pattern because, as previously mentioned, there may be a curvilinear relationship between these variables and accuracy. That is, moderate levels may boost accurate recall, while high levels may impair accuracy. Regarding the Big Five personality traits, based on findings by Liebman et al. (2000) and Pearman (2009), I predict that higher scores on the openness dimension on the BFI will be predictive of a higher degree of memory accuracy independent of other factors. I predict the openness trait will translate to greater accuracy because openness may be reflective of a tendency to encode the entire event rather than focusing on one small part of it. Furthermore, because having a high level of conscientiousness is associated with individuals who aim

for high achievement, it is predicted that those who are higher on the conscientiousness trait will perform better on both coarse and fine-grained details.

For the *fourth research question* of whether there are differences in accuracy rates for recalling coarse and fine-grained details, it is predicted that eyewitnesses will more accurately report coarse-grained details when compared to fine-grained details. This is consistent with research conducted by Weber and Brewer (2008) and Goldsmith et al. (2002). In addition, because the personality trait of neuroticism is associated with a tendency towards negative affect and difficulty coping with stress, it is predicted that neurotic individuals will perform less accurately on fine rather than coarse details, but only in the divided attention group. This is hypothesized to occur because dividing attention will disproportionately increase stress levels of those who are neurotic, who will then in turn have difficulty recalling fine-grained details. In line with the work by Goddard et al. (1996) and Kuyken and Brewin (1995), those who are depressed are predicted to recall fewer fine-grained details than their non-depressed counterparts, but to recall the same number of coarse-grained details due to the tendency for those with depression to show overgeneral memory. To test this hypothesis of an interaction between level of depression and type of memory performance the dependent variable will need to examine the differential accuracy of coarse and fine details (which will hereafter be referred to as difference scores), rather than the overall accuracy scores. A finding that depressed individuals do not show a tendency toward overgeneral memory in this study may indicate that this phenomenon does not extend beyond autobiographical memory. Most previous research examining overgeneral memory has focused on depressed individual's autobiographical memories, and thus it may not be applicable to recall of witnessed events that the individual has not participated in directly.

METHOD

Participants were 215 undergraduate students from SFU who were recruited using the university's Research Participation System and who were compensated with course credit for their participation. An inclusion criterion of having spoken English for at least two years was used as a cutoff to determine whether participants were included in data analysis. All 215 participants had spoken English for at least two years; however, four participants had not completed all of the questionnaires and were thus excluded from analyses.   Of the 211 participants whose results were analyzed, 151 were females and 60 were males (71.6% and 28.4%, respectively). Participants were of a mean age of 19.92 (range from 17-33; SD = 2.23).

Constructs that were of interest in this study are depression and anxiety, and the Five Factor Model of personality traits that includes openness, conscientiousness, extroversion, agreeableness, and neuroticism. Depression was measured using the Beck Depression Inventory-II (BDI-II). The BDI-II is a self-report measure that consists of 21 questions representing depressive symptoms from the DSM-IV-TR. It is scored by summing the highest ratings for each question. Each question is rated on a scale from 0 to 3, with total scores ranging from 0 to 63 and higher scores indicating more depressive symptoms. A score of 14 and above indicates the presence of depression. The BDI-II has demonstrated high internal consistency (Cronbach's alpha = .93 among college students), and test-retest reliability of .93 (Beck, Steer, & Brown, 1996). Beck et al. (1996) reported correlations between the BDI-II and the Revised Hamilton Psychiatric

Rating Scale of Depression (.68) and the Beck Hopelessness Scale (.71) indicating

adequate validity. Anxiety was measured using the Spielberger State-Trait Anxiety

Inventory (STAI) Form Y. The STAI assesses state and trait anxiety (Spielberger, 1983).

Both the state and trait scales consist of 20 short statements, with the state questions

answered in relation to how one feels presently, and the trait questions answered in

reference to one's general feelings. Each question is rated on a Likert scale from 0-4 and

total scores range from 20-80 with higher scores indicating higher anxiety level. Ten

items are reverse scored. Internal consistencies greater than .9 are reported for both

scales, and test-retest reliability for trait anxiety is .86 and for state anxiety is .56 for

males, with females showing a similar pattern (Spielberger, 1983). The STAI trait

anxiety scale correlates .73 and .85 with other trait anxiety measures (Anxiety Scale

Questionnaire and Manifest Anxiety Scale, respectively), indicating adequate validity of

the measure (Spielberger, Reheiser, Ritterband, Sydeman & Unger, 1995).

The Big Five personality traits were measured with the Big Five Inventory (BFI;

John, Donahue, & Kental, 1999). The BFI is a self-report instrument with 44 short

descriptors of personality characteristics that one may endorse. Each statement is rated

on a five point Likert scale from 'Disagree Strongly' to 'Agree Strongly'. The mean of the

internal consistencies across the five scales (Conscientiousness, Extraversion,

Agreeableness, Neuroticism, and Openness) is .83. Across all five factors, the BFI

correlated .75 with the Trait Descriptive Adjectives (TDA) and the NEO-Five Factor

Inventory (NEO-FFI), which are instruments measuring the same five personality factors.

This indicates that the BFI has adequate convergent validity with other measures of the

Big Five personality traits. Scale scores are derived by calculating the mean of each

scale. Sixteen items are reverse scored. Scores on each personality dimension scale range from 0-5, with higher scores indicating greater endorsement of the trait.

Design

Participants viewed two 5-min videos that depicted separate events. These videos were obtained from popular media sources. One event is considered a neutral or non-emotional event (e.g., a scene at the park) and one is considered a negative event (e.g., a kidnapping scene). Before the complete study was run, a number of videos were pilot tested to assess their levels of emotional valence (i.e., a neutral or negative category). The videos that best exemplified these categories were chosen for use in the study. This study utilized a mixed design, with within-subjects independent variables of emotional valence of the videos (negative and neutral), and between-subjects variables of attention (full or divided), level of anxiety, depression, and Big Five personality traits. The dependent variables are accuracy scores on two memory questionnaires. Participants viewed a video from each of both categories of emotional valence. The order of presentation of the videos was counterbalanced to assure that any order effects were evenly distributed among participants. Participants were randomly assigned to conditions.

When a participant arrived for an experimental session, informed consent was obtained and then the participant completed the STAI. The STAI was always completed prior to watching the videos so that responses to the 'State' portion of the questionnaire was not influenced by video content since the neutral and negative videos are counterbalanced. Because we were primarily interested in trait, rather than state, measures of depression and anxiety, we did not anticipate that video content would

affect scores on the measures.   After completion of the STAI, participants watched one of the videos. If participants were in the divided attention group, they were asked to count the number of camera perspective shifts that occurred during the video in addition to paying attention to the video content. Participants wrote down the number of perspective shifts they observed. As a result, this number can be compared to the actual number of shifts in the videos to determine if participants completed this task effectively. This divided attention task has been utilized in previous research on divided attention by Peréz-Mata, Read, & Diges (2002). Those in the full attention group simply paid attention to the video content. All participants were instructed to pay attention to the videos because their memory for the videos would be tested later.

Subsequent to the first video, participants completed either the BDI-II or the BFI (depending on counterbalancing of the two measures). After completion of the BDI-II or BFI, participants went on to complete a memory test for this first video. The memory test included 20 multiple-choice questions regarding the content of the video, including details such as appearance of the actors, actions of the actors, and visual information contained in the scene. There were also 20 fill-in-the-blank questions that tested similar content (see appendix A for copies of the memory questionnaires). The multiple-choice questions reflected coarse-grained details from the videos, while the fill-in-the-blank questions required participants to recall fine-grained information for the same detail tested in the multiple choice question. Following completion of this task, participants watched the second video. After watching the second video, participants completed the questionnaire that they had not yet completed, either the BDI-II or BFI. Next, participants completed a memory test for the second video. The memory questionnaires were specific to the content of each video and were comparable in difficulty. Accuracy

rates were computed for each questionnaire by examining coarse and fine details recalled separately. For the coarse detailed questions, each question was scored as incorrect or correct and then all correct answers for each video were summed to produce an accuracy score and then divided by the total numbers of questions in the questionnaire to create a percent correct score. For the fine detailed questions, each question was scored on a two point scale, with a score of 0 representing a completely incorrect answer, a score of 1 representing a partially correct detail, and a score of 2 representing a completely correct answer. Again, correct answers were summed to produce an accuracy score and then divided by the number of questions to produce a percent correct score. Percentages were used to allow for a comparison between coarse and fine grained accuracy. Following this second recall task, participants were debriefed.

Using Cohen's (1988) guidelines, power of .9 was sought in order to decrease the probability of making a type II error. To detect an f^2 medium effect (as described by Cohen) of .15 with 7 predictors approximately 129 participants were required. This sample size was attainable given that undergraduates, rather than members of a special or clinical population, were recruited for participation.

RESULTS

Video selection

Sampling of media materials located five videos of which on a superficial basis two were judged to be "negative" and three as "neutral". One of the three neutral videos was dropped from analyses after it became apparent that it was more positively valenced than neutral. Twenty participants were asked to rate videos on a number of descriptive categories such as how interesting, emotional, anxiety-provoking, negative, neutral, etc. each clip was (see Table 1 for t-tests examining differences between videos on these categories). Alpha was set at .05 for all tests. After comparison of these videos, the negative video that was selected depicted a kidnapping scene. The selected neutral scene was matched on dimensions of how interesting, boring, and exciting the clip was so that it would be comparable to the negative video. In addition, the neutral scene (a scene in a park) varied from the negative video in that it was seen as less negative, less emotional, and less sad. Also see Table 1 for comparisons of the videos on the various dimensions.

Manipulation checks

A manipulation check was carried out during pilot testing to determine whether warning participants that there would be an upcoming memory test would affect memory test scores. Results of a univariate ANOVA indicated that there were no differences in

scores between the warned (*n* = 11) and non-warned groups (*n* = 12). As a result, the remaining participants were not warned of the upcoming memory tests.

A second manipulation check was carried out to determine if dividing attention of participants resulted in reduced memory test performance compared to those who paid full attention to the videos. A univariate ANOVA demonstrated that divided attention resulted in a significant reduction in performance compared to full attention on the fine grained questions for both the emotional, F [1, 209] = 8.01, p = .01 and neutral videos, F [1, 209] = 4.46, p = .04. There were no significant differences between performance on the coarse grained questions between participants in the divided and full attention groups for both videos, indicating that coarse-grained performance was not affected by the attentional manipulation. These results are consistent with studies that find that central details are more easily remembered than more peripheral or fine-grained information in eyewitness tasks even in situations where attentional narrowing may occur (such as through divided attention tasks or in cases of high arousal) (Christianson & Loftus, 1991).

A third manipulation check examined participants' accuracy in their counts of camera perspective shifts in those who were in the divided attention group. Number of camera perspective shifts in each video was calculated, with the emotional video having 59 shifts, and the neutral video having 74 shifts. Accuracy percentages for each video were computed (number of perspective shifts counted by the participant divided by the number of perspective shifts identified by the research assistant) and then compared to determine if participants were more accurate at counting the number of perspective shifts for either of the videos. Results of a paired samples t-test indicated that there were no differences on accuracy of camera perspective shift counts between the two

videos (p > .05), suggesting that camera shifts could be as easily detected in one clip as the other.

Finally, because the BDI-II and BFI questionnaires and video order were counterbalanced, ANOVAs were completed to determine if there were any order effects on memory test performance. There was no order effect of the placement of the depression and personality questionnaires on memory test performance. There was, however, a video order effect on performance on both the coarse and fine-grained accuracy of the emotional video in the divided attention group. That is, when participants viewed the neutral video prior to the emotional video, they were more accurate on the fine grained memory test F[1, 106] = 8.24, p = .01 and the coarse-grained memory test F[1, 106] = 6.30, p = .01 for the emotional video than when they watched the neutral video after the emotional video. This effect was not present for the full attention group.

Performance on measures of anxiety, depression, and personality traits

On the BDI-II, participants scores ranged from 0-50, with a mean of 10.78 (SD = 7.97). Scores below 14 indicate minimal depression, and 150 participants scored in this range (71.09%). Sixty-one participants (28. 91%) scored above the cutoff for being considered to be depressed, with 39 participants (18.48%) scoring in the mild depression range, 12 scoring in the moderate depression range (5.69%), and 10 scoring in the high depression range (4.74%). There were six participants who were missing one item from the STAI. Scale scores for these participants were prorated according to the procedure outlined in the STAI manual. On the STAI, the mean score on the trait

anxiety scale was 41.46 (*SD* = 9.27) with a range of scores from 22-69. On the state

anxiety scale of the STAI the mean score was 35.10 (*SD* = 8.87) and scores ranged

from a minimum of 20 to a maximum of 63. On the BFI, the mean rating on

conscientiousness was 3.35 (*SD* = .61), the mean score on neuroticism was 2.90 (*SD* =

.81), the mean score on openness was 3.54 (*SD* = .56), the mean score on

agreeableness was 3.82 (*SD* = .58), and the mean score on extraversion was 3.28 (*SD*

= .74). Scores on each scale ranged from 1-5.

Performance on memory tests

For the emotional video, the mean percent correct for the coarse-grained multiple

choice questions was 75.37% for the divided attention group (*n* = 108; *SD* = 12.28) and

78.25% for the full attention group (*n* = 103; *SD* = 11.84). For the fine-grained fill-in-the-

blank questions the mean percent correct of the divided attention group was 47.75% (*SD*

= 12.60) and the full attention group was 52.56% (*SD* = 12.07). For the neutral video

coarse-grained questions, on the other hand, the mean percent correct for the divided

attention group was 80.31% (*SD* = 10.88) and the full attention group was 81.68% (*SD* =

9.32). The mean percent correct for the fine-grained questions was 53.61% (*SD* = 14.45)

for the divided attention and 57.83% (*SD* = 14.59) for the full attention group. These

results are presented in Table 2.

A mixed repeated measures ANOVA was conducted where the within-subjects

independent variable of grain size (coarse-grained and fine-grained) and the between-

subjects variable of attention (full or divided) were considered to determine if participants

were significantly more likely to answer coarse-grained rather than fine-grained

questions accurately across video type. This was indeed the case, with a main effect of

grain size being found (F[1, 209] = 1887.35, p < .01). Therefore, participants were more accurate in their responses to coarse grained details in comparison to fine-grained details. There was also a main effect of attention whereby those in the divided attention group were less accurate than those in the full attention group (F[1, 209] = 7.03, p = .01). Furthermore, there was an interaction between attention and grain size (F[1, 209] = 3.99, p = .047) that indicated that memory accuracy for coarse-grained detail was fairly similar for those in the full attention and divided attention groups, but that the divided attention group performed much less accurately than the full attention group on fine-detailed questions. In the following sections, emotionality of the videos as well as the individual differences variables are examined in relation to witness memory accuracy.

Correlations

Correlations were conducted between the individual differences variables of the personality traits, anxiety, and depressive symptoms measures and memory accuracy for each video separated by grain size of questions (i.e., percent correct for fine-grained and percent correct for coarse-grained questions). These correlations were calculated in order to determine which variables should ultimately be entered into a repeated measures analysis of covariance (ANCOVA). Variables that were not significantly correlated with the four memory accuracy scores were not included in further analyses.

For the full attention group there were no significant correlations except for a correlation between the personality trait of conscientiousness and fine-grained accuracy in the emotional video (r(101) = .20, p = .046). See Table 4 for a list of all correlations for the full attention group. It appears that the association between anxiety, depression, and

35

the measured personality traits aside from conscientiousness do not predict accuracy on the memory tests for those who paid full attention to the videos.

Correlations were also completed for the divided attention group. See full list of correlations for the divided attention group in Table 3. Depression symptoms were negatively correlated with fine-grained performance on the neutral video (r(106) = -.22, p = .02). Depression scores were not significantly correlated with coarse-grained performance on either the neutral or emotional videos, or on fine-grained performance of the emotional video. This indicates that for more neutral stimuli, those who have greater symptoms indicative of depression are less able to recall more specific, or fine-grained details. The original prediction was that depressed individuals would be able to recall more details from the negatively valenced (emotional) video due to mood congruent memory; however, this hypothesis was not supported. State anxiety was not associated with performance on the memory tests for either of the videos. In terms of trait anxiety, fine-grained performance was negatively correlated for both the neutral (r(106) = -.25, p = .01) and emotional videos (r(106) = -.21, p = .03). There were no significant correlations between trait anxiety and coarse-grained memory accuracy. Therefore, results regarding trait anxiety were in the anticipated direction, with those who are more anxious performing less accurately than those with fewer symptoms of trait anxiety. However, significant correlations were only found in fine-grained performance, indicating that anxious individuals were able to remember more general, or coarse, information from the scenes in a manner similar to those who were not as anxious. Results of the divided attention group differed substantially from those found in the full attention group where there were no associations between accuracy on the memory tests and trait or state anxiety or symptoms of depression.

Correlations were also completed to assess the association of the Big Five personality traits with memory accuracy for both the emotional and non-emotional videos in the divided attention group (Also found in Table 3). Extraversion was positively associated with fine-grained performance on the neutral video (r(106) = .19, p =.049), but not with fine-grained performance on the emotional video or coarse-grained performance on either video. Like extraversion, agreeableness was also positively associated with fine-grained performance on the neutral video (r(106) = .20, p = .04), but not on any other memory measures. These findings were not anticipated. Neuroticism also showed this pattern of demonstrating a correlation with fine-grained performance on the neutral video, though the correlation in this case was negative (r(106) = -.20, p = .04).   This finding was in the hypothesized direction, although it had been predicted that this finding would occur across video type. Higher conscientiousness scores were associated with improved accuracy on both the coarse (r(106) = .22, p = .03) and fine-grained questions (r(106) = .23, p = .02) for the neutral video. Similarly, conscientiousness was also positively associated with fine-grained performance on the emotional video (r(106) = .34, p = .001), and there was some evidence for a correlation with coarse-grained performance on this video, though the relationship did not reach significance (r(106) = .17, p = .08). These findings were in line with predictions that those who are more conscientious may be more accurate in their memory for witnessed events. Predictions for the Big Five traits were, then, partially supported using this measure of accuracy, because conscientiousness was associated with better accuracy on almost all measures of memory. On the other hand, openness was not associated with memory performance, even though it had been hypothesized to be a predictor of memory. These findings, however, do suggest that some personality traits may be associated with ability to accurately recall details from an event.

Association of individual differences variables with memory performance

To examine the association between the individual differences variables and performance on memory test accuracy for the two witnessed videos, a mixed repeated measures ANCOVA was conducted. Use of a repeated measures ANCOVA allows for the within-subjects independent variables of emotionality of the video (neutral or emotional [negative]) and grain size (coarse-grained and fine-grained) to be considered along with the between-subjects variables of attention (full or divided). The individual differences variables of levels of depression, trait anxiety, openness, conscientiousness, extraversion, agreeableness, and neuroticism were entered as covariates. State anxiety had previously been noted to not demonstrate an association with any of the memory test scores and thus this variable was not entered in the ANCOVA.

Results of the repeated measures ANCOVA demonstrated that there was no main effect of emotionality on memory test performance, indicating that performance on the memory tasks did not differ depending on whether the video was neutral or emotional in nature. This finding was not anticipated. There was a main effect of grain size, ($F[1, 202] = 7.89$, $p = .01$) on memory test performance, which reveals that participants performed more accurately on coarse-grained questions than fine-grained questions. This finding was in the anticipated direction. There was also a main effect of divided attention, ($F[1, 202] = 7.79$, $p = .01$) on performance on the memory tests, whereby participants in the full attention group were more accurate on the memory tests than those in the divided attention group. Again, this finding was in line with hypotheses. Further, another main effect of conscientiousness on memory test performance was apparent, ($F[1, 202] = 11.22$, $p = .001$), indicating that those who were more

conscientious performed more accurately on both the coarse and fine-grained questions. None of the other individual differences variables had any statistically significant main effects.

Switching to examine interaction effects, there was a significant but modest interaction between grain size and trait anxiety, (F[1, 202] = 4.34, p = .04). See Figure 1 for a graph of this interaction (To highlight the interaction in this figure and for ease of interpretation, a median split on trait anxiety was completed; hence standard error bars are unavailable). This interaction indicates that there was no difference in the ability to recall coarse-grained details depending on trait anxiety level, but those who scored higher on trait anxiety recalled fewer fine-grained details than those who scored lower on this variable.   Thus, anxiety may interfere with the ability to encode or recall information that is more detailed in nature. There was also an interaction between grain size and neuroticism, (F[1, 202] = 5.50, p = .02). See Figure 2 for a graph of this interaction (To highlight the interaction in this figure and for ease of interpretation, a median split on neuroticism was also completed). Similar to the interaction with trait anxiety, level of neuroticism was not associated with differences in ability to recall coarse-grained details for the events; however, those who scored higher on neuroticism did perform more poorly at recalling fine-grained details. This suggests that neuroticism, or negative affect, may interfere with the ability to recall more detailed information, while recall of more coarse-grained detail is spared. Furthermore, an interaction was found between grain size and divided attention, (F[1, 202] = 5.11, p = .03). See figure 3 for a graph of this interaction. Memory recall for fine-grained details was less accurate for those in the divided attention group than those in the full attention group, whereas memory for coarse-grained detail was not significantly related to level of attention paid to the video.

No other statistically significant interactions were detected. Thus, hypotheses that depressive symptoms would be associated with better recall of the negatively valenced video, and that those who reported more symptoms of anxiety would recall the negative scene better than the neutral scene were not supported. In addition, the hypothesis that there would be an interaction of anxiety with attention condition was not supported.

In sum, there were several variables that were associated with memory performance. Grain size of details was related to ability to answer accurately, with participants better able to recall coarse details from the videos. The attention manipulation had an effect on performance, with participants in the divided attention group recalling fewer details on average than those in the full attention group, and those in the divided attention group did comparatively worse on the fine-grained questions than the full attention participants. In terms of the individual differences variables, being more conscientious was linked to reporting more accurate details of the events.   Moreover, high scores on trait anxiety and neuroticism were related to recalling fewer fine-grained details than those who had lower scores on these measures.

Difference scores

Difference scores were also calculated for each participant on each video (i.e. percent of coarse-grained questions correct minus percent of fine-grained questions correct for each video) and correlations between the difference scores and variables of interest were calculated. Difference scores may be useful because higher scores could indicate the presence of overgeneral memory since a higher score would demonstrate that relatively more coarse details are recalled in comparison to fine-grained details. First, correlations for the full attention group were examined. See Table 5 for a list of all

correlations for the full attention group. For the neutral video there were no statistically

significant correlations between the difference scores and any of the individual difference

variables. There was a modest correlation between state anxiety and memory

performance, though the correlation was not statistically significant (r(101) = .19, p =

.05). This finding suggests that those with higher state anxiety scores were more likely

answer coarse-grained questions correctly when compared with accuracy of fine-grained

questions.   For the emotional video, there was a significant association between

neuroticism and memory recall as measured by difference scores (r(101) = -.21, p =

.03), which had not been anticipated. This finding indicates that those who scored

higher on neuroticism had lower difference scores, or demonstrated less of a

discrepancy between their coarse and fine-grained accuracy. Again there was a

numerical difference in favour of state anxiety being associated with memory recall

(r(101) = -.18, p = .07), though in this case, higher state anxiety scores were associated

with lower difference scores.

Next, correlations were calculated for the divided attention group. See Table 6 for

a full list of correlations for the divided attention group. There were no significant

correlations between difference scores and individual differences variables for the

emotional video. There was, however, some evidence that conscientiousness was

associated with memory recall, though this was not statistically significant (r(106) = -.18,

p = .07). Higher conscientiousness scores were associated with lower difference scores,

but the correlation was not reliable. However, in contrast there were several significant

correlations between individual differences variables and difference scores for the

neutral video. Higher scores on trait anxiety predicted higher difference scores (r(106) =

.22, p = .02). Thus, being more anxious was related to being relatively more likely to

correctly answer coarse rather than fine-grained questions. Similarly, higher scores on

the state anxiety measure predicted higher difference scores (r(106) = .32, p = .001).

This indicates that higher state anxiety was also associated with an increased tendency

to more accurately recall only coarse-grained details from the neutral video. That is,

there was a larger difference between these two measures of memory.   In addition,

there was a correlation between depression scores and memory recall, with higher

depression scores predicting higher difference scores (r(106) = .20, p = .04), which

indicates that those with higher depression scores may have more overgeneral memory.

This finding had been hypothesized to occur. There was also some tentative evidence

that agreeableness was associated with memory performance (r(106) = -.19, p = .06),

whereby those with higher agreeableness ratings had lower difference scores.

Following the examination of correlations between memory performance

(measured using difference scores) and the other variables of interest, a repeated

measures ANCOVA was conducted with the within subjects independent variable of

emotionality of the video (neutral or emotional) and the between-subjects variable of

attention (full or divided). The individual differences variables of levels of depression,

trait anxiety, state anxiety, openness, conscientiousness, extraversion, agreeableness,

and neuroticism were entered as covariates. State anxiety was included in this

ANCOVA because there were correlations between this variable and memory

performance, unlike the previous section that examined simple memory performance

(i.e., not using difference scores).

Results of the ANCOVA indicated that there was no main effect of emotionality of

the videos on memory performance as measured by difference scores. Thus, the

emotionality of the video did not affect whether participant's were more likely to

42

accurately recall coarse vs. fine-grained details, which is similar to the results for memory accuracy in the previous section that did not use difference scores. There was a main effect of divided attention on memory performance ($F[1, 201] = 4.86$, $p = .03$), whereby those in the divided attention group were more likely to have higher difference scores when compared to those in the full attention group. This effect indicates that there is a greater discrepancy between being able to recall coarse vs. fine-grained details for those in the divided attention group. Specifically, divided attention participants did well at recalling coarse-grained details, but their ability to recall fine-grained detail was not as well-developed as those in the full attention group. Regarding the individual differences variables, there was a main effect of neuroticism on memory performance ($F[1, 201] = 6.13$, $p = .01$). Those who scored higher on neuroticism had higher differences scores than those who scored lower on the measure of neuroticism. Thus, higher levels of neuroticism are consistent with having a larger discrepancy between ability to answer coarse vs. fine-grained questions accurately. There was also a numerical difference in favour of a main effect of trait anxiety on memory performance ($F[1, 201] = 2.99$, $p = .08$), where those who were more anxious had larger difference scores than those who were less anxious, however this difference was not statistically significant. There was no association between depression scores and memory performance, which had been hypothesized to occur. As such, it appears that overgeneral memory was not apparent in those who scored higher on the measure of depressive symptomatology.

In terms of interaction effects, there was an interaction effect of emotionality and state anxiety ($F[1, 201] = 8.38$, $p = .004$) (see Figure 4 - To highlight the interaction in this figure and for ease of interpretation, a median split on state anxiety was completed).

Difference scores for the emotional video did not differ depending on level of state anxiety. For the neutral video, however, participants who scored higher on a measure of state anxiety had larger difference scores than those who scored lower on state anxiety. There was also modest evidence of an interaction effect of emotionality and openness, but this association was not statistically significant (F[1, 201] = 3.05, p = .08). Figure 5 graphs this interaction (To highlight the interaction in this figure and for ease of interpretation, a median split on openness was completed). Similar to the preceding interaction effect, for the emotional video, difference scores did not differ depending on level of openness. In contrast, for the neutral video, participants who scored higher on openness demonstrated a modest tendency towards higher difference scores than participants who had lower state anxiety scores.

To summarize the findings of this analysis using difference scores, the attentional manipulation did have an effect on differences scores, with those in the divided attention group demonstrating higher difference scores, and thus a relatively greater tendency to answer coarse rather than fine-grained questions correctly. Neuroticism was related to higher difference scores, as was trait anxiety, though only the association for trait anxiety was statistically significant. Emotionality of the videos interacted with two individual differences variables, state anxiety and openness, though again the association with openness was not statistically significant. For both of these findings, difference scores varied in the neutral video, but not the emotional video, for those who had higher scores on the individual differences variables of openness and state anxiety.

Originally, openness was hypothesized to be associated to accuracy independently of other factors, but it now appears that openness may be related to memory accuracy only in the neutral valence condition.

DISCUSSION

This exploratory study examined memory for neutral and emotional videotaped events, in order to assess the relationship between several individual difference variables, namely anxiety, depression, and the Big Five personality traits, and accuracy for details seen in the videos. After examining the data, it is possible to conclude that individual differences variables may be associated with performance on an eyewitness memory task, with trait anxiety, neuroticism, conscientiousness, and state anxiety showing the greatest likelihood of predicting performance.

The inclusion of an attentional manipulation during encoding of the videos resulted in a number of interesting findings. Most significant correlations that were found in the analyses were in the divided attention group, indicating that the increased demands placed on resources during encoding in this group may allow differences in recall to be seen more readily. As a result, individual differences variables may show a stronger association with memory accuracy under dual task conditions, which may explain why previous research examining individual differences has not consistently found a relationship to memory performance. This is because previous research in the eyewitness area has not studied the association between divided attention during an event and individual differences variables. Because dual task situations are often present during witnessed events (e.g. the weapon focus effect, the presence of more than one perpetrator for the witness to attend to), this suggests that it is an important factor to consider.

The data gleaned from this study indicates that the examination of coarse and fine-grained details is also important. First, the use of both coarse and fine grain sizes enabled the creation of difference scores that can illustrate a relative tendency to more accurately report coarse- grained details. This use of difference scores was hypothesized to allow for the examination of overgeneral memory in those who have depressive symptoms. This is because research discussed previously indicates that those who score higher on measures of depression may be more likely to demonstrate overgeneral memory, or a tendency to be less likely to relate specific details about an event that they are remembering. Research on overgeneral memory has not previously examined memory in an eyewitness context. The results of this study indicate that depression was not associated with a tendency to engage in overgeneral memory. An explanation for this lack of association between depression and memory performance may be that overgeneral memory only occurs in those with depression who are recalling autobiographical events. Previous research on overgeneral memory has focused on an individual's memory for events that have occurred in their past (e.g., Goddard et al., 1996; Kuyken and Brewin, 1995). Therefore, memory for details of an event that has been viewed on videotape may be different from an event that one has experienced themselves. Future research could aim to examine this by staging a live event that participants are engaged in to determine if memory for this type of witnessed event is overgeneral in those with depressive symptoms.

The fact that grain size interacted with divided attention in predicting memory performance is notable, because it demonstrates that eyewitnesses who are dividing their attention at the time of witnessing an event are still able to recall more broad, general information (i.e., the type of information that is considered coarse in nature).

This finding may be explained by fuzzy trace theory which posits that memory for gist details (i.e., an underlying fuzzy meaning/structure of an event) is more easily remembered and less subject to interference than verbatim information (i.e., an exact representation of an event) (Brainerd & Reyna, 1990). Dividing attention has a larger effect on the encoding of finer-grained details/verbatim information, rather than coarse-grained/gist information, making it more difficult to recall finer grained details for those who experienced dual task conditions.

Furthermore, if only coarse-grained details had been examined in this study, the findings would have been quite different. This underscores the need for researchers conducting eyewitness studies to consider level of detail in their studies. The individual difference variables of trait anxiety and neuroticism both interacted with grain size. It is at high levels of both of these traits that differences are seen in ability to accurately recall fine-grained details. Both anxiety and neuroticism may begin to interfere with ability to encode and recall details that are more precise, which is the case with fine-grained details. Research by Eysenck and Calvo (1992) support this finding with trait anxiety, demonstrating that anxiety interferes with these memory processes by diverting cognitive resources to task-irrelevant information including worrying. Therefore, one may need to have more processing resources available to encode such fine-grained information. In terms of neuroticism, it had been predicted that these findings would occur due to the negative emotionality that is characteristic of those who are neurotic, with this negative emotionality in turn increasing stress. This increase in stress may then have had a similar effect on ability to recall fine-grained details by diverting cognitive resources in the same way that occurs in anxious individuals. Taken together, these results suggest grain size is a useful measure that should be incorporated into

studies examining memory for events. In fact, other researchers have discussed the merits of taking grain size of details into account in eyewitness memory studies (Weber & Brewer, 2008). Eyewitnesses may often strategize their recall to provide the most informative, yet also the most accurate information and such a strategy can result in different levels of detail being reported to authorities. Investigators should, therefore, take into account grain size when questioning witnesses, possibly by altering the type of interview they use to elicit information from witnesses. Interviewers would be wise to ask witnesses questions that are both more broad in nature to elicit coarse-grained details, while also asking more specific pertinent information about the event.

An interesting finding of this study was that emotionality of the videos did not affect performance on the memory tests when accuracy was only considered (as opposed to difference scores, which will be discussed shortly). It was hypothesized that those who scored higher on experiencing depressive symptoms would show increased recall of the negative scene because of a tendency for memory to be enhanced when the event that is to be encoded is consistent with one's mood (e.g., Eich & Macauley, 2000; Bower & Forgas, 2001). However, this prediction was not supported by the data. Furthermore, those high in anxiety were hypothesized to demonstrate a threat bias that would allow them to recall more details from the negatively valenced video, and neuroticism was proposed to demonstrate the same association. Like the findings with depression, this hypothesis was not supported. It is possible that the emotional scene was not sufficiently arousing to cause a threat bias or that the theme of the movie was not consistent with what emotions one would experience while in a depressed mood. Or perhaps simply watching a videotaped event, as opposed to actually experiencing an event, was not a sufficient stimulus to cause a threat bias.

An unanticipated result occurred, when difference scores were used as a measure of memory performance. When difference scores were used, state anxiety interacted with emotionality. It was in the opposite direction than had been predicted, because higher difference scores were seen in the neutral video for those who scored higher on state anxiety, indicating that experiencing higher rates of state anxiety was related to being more accurate at identifying coarse rather than recalling fine-grained details. Had this finding occurred irrespective of the emotionality of the videos, it would likely be a result of processing resources being consumed by a focus on the anxiety which would in turn lead to less ability to recall more detailed information. As it stands, a theoretical explanation for this finding is difficult to determine.

The individual difference variable of conscientiousness was one that was associated with greater recall of details from the videotaped events. Thus, those who are conscientious have better memory for details of a videotaped event. This finding is similar to that reported by Porter et al. (2000) wherein higher conscientiousness scores showed some evidence of being associated with less tendency to report false memory. Thus, conscientious individuals may be more likely to accurately recall events. High levels of conscientiousness have been found to predict higher performance in other areas such as job performance and academic achievement (e.g., Barrick & Mount, 1991; Di Fabio & Busoni, 2007), suggesting that the need to achieve that is characteristic of those who are conscientious may also extend to performance on memory tasks.

Limitations

This study does have a number of limitations which are important to mention. Limitations of this study include that an undergraduate population was used, thus

generalization to other populations may not be appropriate. Similarly, because undergraduates are a non-clinical sample, the range of anxiety and depression that we found may have been truncated. Use of a clinical population would presumably result in an increase in more severe cases of depression and anxiety, whereas the undergraduate population may be biased towards less severity. Although this may have been the case, it appears that there was sufficient variability in scores on these measures to allow for meaningful interpretation of the data.   The use of self-report measures of anxiety, depression, and personality traits may also be seen as a limitation. There were no ratings of these participants by a clinician to confirm the presence of symptoms of psychopathology or personality traits.   Another possible limitation of the present study is that by using videotaped stimuli the emotionality of the event may not have affected the participants' memory to the extent it would have if a live action event had been used. There may be less arousal than would have been present during a live event. This reduced arousal may have played a role in the findings where emotionality of the videos was not a significant predictor of recall performance. Furthermore, conditions encountered by people when they witness an actual crime are much different than those encountered in a laboratory situation where videotaped stimuli are used. Recalling details that are inaccurate or not recalling all possible details do not carry penalties such as imprisonment of an innocent suspect in the laboratory situation, whereas in real life situations such penalties may increase motivation for correct recall of information.

Despite these limitations, this study contributes to the eyewitness memory research area because it is the first study to examine the association between an individual's trait anxiety and depression scores and whether these variables predict

accuracy for recalling information from either emotional or neutral stimuli. Anxiety and depression both affect a significant number of people in the population and the relationship of these disorders to memory performance in eyewitnesses had not been studied previously. Furthermore, the addition of measures of grain size allow for a unique contribution to the literature, given that previous examination of grain size in eyewitness studies has focused on details that are easy to quantify such as height and weight, while this study makes an attempt to utilize a wider range of detail types (see Appendix for exact details that comprised the memory questionnaires). This study highlights the need for more research in this area.

This research demonstrates a need for the court and investigators of crimes to take into account, or at least recognize the fact that individuals may have different abilities to accurately recall and report information at the time of an investigation by police or at trial, based on personality traits or symptoms of psychopathology that they may have. To my knowledge, neither courts nor investigators often take into account these types of individual differences variables. Instead, there has been much more of a focus on the effect of system variables on witnesses. While this focus on system variables is certainly important, individual differences are likely to play a large role in how accurate a witness may be when recalling details from an event. Further research on how these individual differences variables may be associated with memory will help to provide valuable information to the courts and investigators. Although it is unlikely that courts would consider administering personality inventories or measures of psychopathology to witnesses who are testifying, particularly given the lack of training that the court would have with utilizing these instruments, in cases where the mental health background is known for a particular witness, this information should be taken into

account. For example, if in a case where credibility of the accuracy of the witness' recall of events is in question, and it is revealed in court that an individual has a diagnosis of an anxiety disorder, this may be something that should be taken into account when determining how accurate a witness may be in his or her recall of an event. Ideally, psychologists or other mental health professionals would be involved in screening of personality and/or mental health symptoms. However, if this were not possible, there are some personality screening measures such as the Big Five Inventory used in this study can be administered by individuals who are not health professionals. Such a screen only takes approximately 5-10 minutes to complete, and could provide useful information to triers-of-fact.   Despite the relatively short administration time required for these measures, courts may be reluctant to institute this type of testing with witnesses, because it may be seen as an invasion of privacy or a restriction of the rights of the witness.   Thus, the rights of the witness would have to be respected, and completion of such personality measures would need to occur on a voluntary basis. In cases where all evidence rests on the conflicting reports of eyewitnesses, having more information about the witness' personality traits or psychopathology could assist in determining which witness may be more credible.

In addition to the roles of measures of personality and symptoms of psychopathology in court, the examination of personality traits and symptoms of psychopathology may also be helpful to police investigators during an initial investigation of a crime. They could be used as a tool during investigations to improve credibility assessment of eyewitnesses. Of particular importance in investigations would be the administration of these types of measures soon after a crime has occurred, in order to capture a snapshot of the witness' functioning as close as possible to when the crime

was witnessed, since symptoms of psychopathology in particular can change over time. Given that this study was exploratory in nature, much more research will be needed to determine the precise nature of the relationship between individual differences and memory, and the mechanism of their action before such measures could likely be adopted by investigators or courts. Furthermore, the strength of association that was found between the examined individual differences variables and memory was small. Therefore, there must be caution in interpreting and utilizing these findings. In particular, there is a possibility that these findings could be used to stigmatize those who may experience anxiety or depressive symptoms. This is not the intention of the research study, and the results of this study do not suggest that those who experience psychopathology will necessarily be less accurate in their recall of events.

In conclusion, this study indicates that individual differences variables at the time of viewing an eyewitness event may be important in determining how well one can recall an event. Many factors contribute to how accurate a witness will be when recalling an event, and research to date has only scratched the surface of possible variables that may play a role in accuracy. Given the exploratory nature of this study, future research should examine additional individual differences to determine their association with memory accuracy. Some individual differences variables that could be examined include likelihood of dissociating, self-monitoring style, or a diagnosis of Post-Traumatic Stress Disorder, and Obsessive Compulsive Disorder. Future studies in this area should also consider staging live events to provide a more ecologically valid base of information as to how witnesses would react in an actual witnessing scenario. Furthermore, varying the length of retention interval between when one views the event and when one is required to recall the event would be beneficial, given the fact that witnesses may not

provide statements to investigators right after the event occurs, and they will not testify in

court until an even longer time has elapsed since they witnessed the event.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.

Austin, M. -., Ross, M., Murray, C., & O'Carroll, R. E. (1992). Cognitive function in major depression. *Journal of Affective Disorders, 25*(1), 21-29. doi:10.1016/0165-0327(92)90089-O

Baddeley, A., Lewis, V., Eldridge, M., & Thomson, N. (1984). Attention and retrieval from long-term memory. *Journal of Experimental Psychology: General, 113*(4), 518-540. doi:10.1037/0096-3445.113.4.518

Bar-Haim, Y., Lamy, D., Pergamin, L., Bakermans-Kranenburg, & van IJzendoorn, M. H.

(2007). Threat-related attentional bias in anxious and non-anxious individuals: A meta-analytic study. *Psychological Bulletin, 133*, 1−24.

Barrick, M. R., & Mount, M. K. (1991). The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology, 44*, 1–26. doi: 10.1111/j.1744-6570.1991.tb00688.x

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for Beck Depression Inventory-II.* San Antonio, TX: Psychological Corporation.

Bless, H. (2000). The interplay of affect and cognition: The mediating role of general knowledge structures. In J. P. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition.* (pp. 201-222). New York, NY US: Cambridge University Press. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2000-07085-008&site=ehost-live

Bornstein, B. H., Deffenbacher, K. A., Penrod, S. D., & McGorty, E. K. (2012). Effects of exposure time and cognitive operations on facial identification accuracy: A meta-analysis of two variables associated with initial memory strength. *Psychology, Crime & Law, 18*(5), 473-490. doi:10.1080/1068316X.2010.508458

Bothwell, R. K., Brigham, J. C., & Malpass, R. S. (1989). Cross-racial identification. *Personality and Social Psychology Bulletin, 15*(1), 19-25. doi:10.1177/0146167289151002

Bothwell, R. K., Brigham, J. C., & Pigott, M. A. (1987). An exploratory study of personality differences in eyewitness memory. *Journal of Social Behavior & Personality, 2*(3), 335-343. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1988-32641-001&site=ehost-live

Bothwell, R. K., Deffenbacher, K. A., & Brigham, J. C. (1987). Correlation of eyewitness accuracy and confidence: Optimality hypothesis revisited. *Journal of Applied Psychology, 72*(4), 691-695. doi:10.1037/0021-9010.72.4.691

Bower, G. H., & Forgas, J. P. (2001). Mood and social memory. In J. P. Forgas (Ed.), *Handbook of affect and social cognition.* (pp. 95-120). Mahwah, NJ US: Lawrence Erlbaum Associates Publishers. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2000-16445-005&site=ehost-live

Brainerd, C. J., & Reyna, V. F. (1990). Gist is the grist: Fuzzy-trace theory and the new intuitionism. *Developmental Review, 10*, 3–47.

Brewer, N., Caon, A., Todd, C., & Weber, N. (2006). Eyewitness identification accuracy and response latency. *Law and Human Behavior, 30*(1), 31-50. doi:10.1007/s10979-006-9002-7

Brittlebank, A. D., Scott, J., Williams, J. M., & Ferrier, I. N. (1993). Autobiographical memory in depression: State or trait marker? *British Journal of Psychiatry, 162*, 118-121. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1993-25756-001&site=ehost-live

Burke, A., Heuer, F., & Reisberg, D. (1992). Remembering emotional events. *Memory & Cognition, 20*(3), 277-290. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1992-37912-001&site=ehost-live

Christianson, S., & Loftus, E. F. (1991). Remembering emotional events: The fate of detailed information. *Cognition and Emotion, 5*(2), 81-108. doi:10.1080/02699939108411027

Cisler, J. M., & Koster, E. H. W. (2010). Mechanisms of attentional biases towards threat in anxiety disorders: An integrative review. *Clinical Psychology Review, 30*(2), 203-216. doi:10.1016/j.cpr.2009.11.003

Craik, F. I. M., Govoni, R., Naveh-Benjamin, M., & Anderson, N. D. (1996). The effects of divided attention on encoding and retrieval processes in human memory. *Journal of Experimental Psychology: General, 125*(2), 159-80. doi:10.1037/0096-3445.125.2.159

Delduca, C. M., Jones, S. H., & Barnard, P. (2010). A preliminary investigation of the effect of hypomanic personality on the specificity and speed of autobiographical memory recall. *Memory, 18*(1), 12-26. doi:10.1080/09658210903387513

Di Fabio, L. Busoni (2007). Fluid intelligence, personality traits and scholastic success: Empirical evidence in a sample of Italian high school students. *Personality and Individual Differences, 43,* 2095–2104. doi: 10.1348/000712604773952458

Dobson, M., & Markham, R. (1992). Individual differences in anxiety level and eyewitness memory. *Journal of General Psychology, 119*(4), 343-350. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1993-24460-001&site=ehost-live

Dysart, J. E., & Lindsay, R. C. L. (2007). The effects of delay on eyewitness identification accuracy: Should we be concerned? In M. P. Toglia (Ed.), *The handbook of eyewitness psychology, vol II: Memory for people.* (pp. 361-376). Mahwah, NJ US: Lawrence Erlbaum Associates Publishers. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2007-04817-015&site=ehost-live

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*, 183-201. doi:10.1037/h0047707

Eich, E., & Forgas, J. P. (2003). Mood, cognition, and memory. In R. W. Proctor (Ed.), *Handbook of psychology: Experimental psychology, vol. 4.* (pp. 61-83). Hoboken, NJ US: John Wiley & Sons Inc. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2003-04681-003&site=ehost-live

Eich, E., & Macaulay, D. (2000). Are real moods required to reveal mood-congruent and mood-dependent memory? *Psychological Science, 11*(3), 244-248. doi:10.1111/1467-9280.00249

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition and Emotion, 6*(6), 409-434. doi:10.1080/02699939208409696

Forgas, J. P., Laham, S. M., & Vargas, P. T. (2005). Mood effects on eyewitness memory: Affective influences on susceptibility to misinformation. *Journal of Experimental Social Psychology, 41*(6), 574-588. doi:10.1016/j.jesp.2004.11.005

Goddard, L., Dritschel, B., & Burton, A. (1996). Role of autobiographical memory in social problem solving and depression. *Journal of Abnormal Psychology, 105*(4), 609-616. doi:10.1037/0021-843X.105.4.609

Goldsmith, M., Koriat, A., & Pansky, A. (2005). Strategic regulation of grain size in memory reporting over time. *Journal of Memory and Language, 52*(4), 505-525. doi:10.1016/j.jml.2005.01.010

Goldsmith, M., Koriat, A., & Weinberg-Eliezer, A. (2002). Strategic regulation of grain size memory reporting. *Journal of Experimental Psychology: General, 131*(1), 73-95. doi:10.1037/0096-3445.131.1.73

Hulse, L. M., Allan, K., Memon, A., & Read, J. D. (2007). Emotional arousal and memory: A test of the poststimulus processing hypothesis. *American Journal of Psychology, 120*(1), 73-90. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2007-04906-005&site=ehost-live

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). <u>*The Big Five Inventory--Versions 4a and 54.*</u> Berkeley, CA: University of California,Berkeley, Institute of Personality and Social Research.

Kuyken, W., & Brewin, C. R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology, 104*(4), 585-591. doi:10.1037/0021-843X.104.4.585

Kuyken, W., & Dalgleish, T. (1995). Autobiographical memory and depression. *British Journal of Clinical Psychology, 34*(1), 89-92. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1995-25306-001&site=ehost-live

Lane, S. M. (2006). Dividing attention during a witnessed event increases eyewitness suggestibility. *Applied Cognitive Psychology, 20*(2), 199-212. doi:10.1002/acp.1177

Laney, C., Heuer, F., & Reisberg, D. (2003). Thematically-induced arousal in naturally-occurring emotional memories. *Applied Cognitive Psychology, 17*, 995-1004. doi:10.1002/acp.951

Liebman, J. I., McKinley-Pace, M., Leonard, A. M., Sheesley, L. A., Gallant, C. L., Renkey, M. E., & Lehman, E. B. (2002). Cognitive and psychosocial correlates of adults' eyewitness accuracy and suggestibility. *Personality and Individual Differences, 33*(1), 49-66. doi:10.1016/S0191-8869(01)00135-0

Lindsay, D. S., Read, J. D., & Sharma, K. (1998). Accuracy and confidence in person identification: The relationship is strong when witnessing conditions vary widely. *Psychological Science, 9*(3), 215-218. doi:10.1111/1467-9280.00041

Loftus, E. F., Loftus, G. R., & Messo, J. (1987). Some facts about 'weapon focus.'. *Law and Human Behavior, 11*(1), 55-62. doi:10.1007/BF01044839

McCrae, R.R., & Costa, P.T. (1987) Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, 52, 81-90.

MacLeod, C., & Mathews, A. (2004). Selective memory effects in anxiety disorders: An overview of research findings and their implications. In P. Hertel (Ed.), *Memory and emotion.* (pp. 155-185). New York, NY US: Oxford University Press. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2004-00069-005&site=ehost-live

McDermott, L. M., & Ebmeier, K. P. (2009). A meta-analysis of depression severity and cognitive function. *Journal of Affective Disorders, 119*(1-3), 1-8. doi:10.1016/j.jad.2009.04.022

Meissner, C. A., Brigham, J. C., & Butz, D. A. (2005). Memory for own- and other-race faces: A dual-process approach. *Applied Cognitive Psychology, 19*(5), 545-567. doi:10.1002/acp.1097

Mitte, K. (2008). Memory bias for threatening information in anxiety and anxiety disorders: A meta-analytic review. *Psychological Bulletin, 134*(6), 886-911. doi:10.1037/a0013343

Mogg, K., & Bradley, B. P. (1998). A cognitive-motivational analysis of anxiety. *Behaviour Research and Therapy, 36*, 809−848.

Naka, M., Itsukushima, Y., & Itoh, Y. (1996). Eyewitness testimony after three months: A field study on memory for an incident in everyday life. *Japanese Psychological Research, 38*(1), 14-24. doi:10.1111/j.1468-5884.1996.tb00004.x

Naveh-Benjamin, M., Craik, F. I. M., Perretta, J. G., & Tonev, S. T. (2000). The effects of divided attention on encoding and retrieval processes: The resiliency of retrieval processes. *The Quarterly Journal of Experimental Psychology A: Human Experimental Psychology, 53A*(3), 609-625. doi:10.1080/027249800410454

Naveh-Benjamin, M., Guez, J., & Marom, M. (2003). The effects of divided attention at encoding on item and associative memory. *Memory & Cognition, 31*(7), 1021-1035. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2003-10705-003&site=ehost-live

Nolan, J., & Markham, R. (1998). The accuracy–confidence relationship in an eyewitness task: Anxiety as a modifier. *Applied Cognitive Psychology, 12*(1), 43-54. doi:10.1002/(SICI)1099-0720(199802)12:1<43::AID-ACP487>3.0.CO;2-1

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*(5), 400-424. doi:10.1111/j.1745-6924.2008.00088.x

Pearman, A. (2009). Predictors of subjective memory in young adults. *Journal of Adult Development, 16*(2), 101-107. doi:10.1007/s10804-009-9063-1

Peeters, F., Wessel, I., Merckelbach, H., & Boon-Vermeeren, M. (2002). Autobiographical memory specificity and the course of major depressive disorder. *Comprehensive Psychiatry, 43*(5), 344-350. doi:10.1053/comp.2002.34635

Pérez-Mata, M. N., Read, J. D., & Diges, M. (2002). Effects of divided attention and word concreteness on correct recall and false memory reports. *Memory, 10*(3), 161-177. doi:10.1080/09658210143000308

Pezdek, K., & Blandon-Gitlin, I. (2005). When is an intervening line-up most likely to affect eyewitness identification accuracy? *Legal and Criminological Psychology, 10*(2), 247-263. doi:10.1348/135532505X49846

Porter, R. J., Gallagher, P., Thompson, J. M., & Young, A. H. (2003). Neurocognitive impairment in drug-free patients with major depressive disorder. *British Journal of Psychiatry, 182*(3), 214-220. doi:10.1192/bjp.182.3.214

Porter, S., Birt, A. R., Yuille, J. C., & Lehman, D. R. (2000). Negotiating false memories: Interviewer and rememberer characteristics relate to memory distortion. *Psychological Science, 11*(6), 507-510. doi:10.1111/1467-9280.00297

Porter, S., Spencer, L., & Birt, A. R. (2003). Blinded by emotion? effect of the emotionality of a scene on susceptibility to false memories. *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement, 35*(3), 165-175. doi:10.1037/h0087198

Reisberg, D. (.)., & Hertel, P. (.). (2004). *Memory and emotion.* New York, NY,US: Oxford University Press. Retrieved from http://proxy.lib.sfu.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2004-00069-000&site=ehost-live

Sanderson, W. C., Beck, A. T., & Beck, J. (1990). Syndrome comorbidity in patients with major depression or dysthymia: Prevalence and temporal relationships. *The American Journal of Psychiatry, 147*(8), 1025-1028. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1991-04709-001&site=ehost-live

Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In R. M. Sorrentino (Ed.), *Handbook of motivation and cognition: Foundations of social behavior, vol. 2.* (pp. 527-561). New York, NY US: Guilford Press. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1990-98254-015&site=ehost-live

Siegel, J. M., & Loftus, E. F. (1978). Impact of anxiety and life stress upon eyewitness testimony. *Bulletin of the Psychonomic Society, 12*(6), 479-480. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1980-08769-001&site=ehost-live

Spielberger, C. D. (1983). *Manual for the State–Trait Anxiety Inventory (Form Y)*. Palo Alto, CA: Mind Garden.

Spielberger, C. D., Reheiser, E.C., Ritterband, L.M., Sydeman, S.J., and Unger, K.K. (1995). Assessment of Emotional States and Personality Traits: Measuring Psychological Vital

Signs. In Butcher, J.N. (Ed.) *Clinical Personality Assessment: Practical Approaches.*New York: Oxford University Press, 1995.

Statistics Canada (2002). *Canadian Community Health Survey*, (Catalogue number 82-617-XIE) Retrieved from Statistics Canada: http://www.statcan.gc.ca/pub/82-617-x/index-eng.htm

Steblay, N. M. (1992). A meta-analytic review of the weapon focus effect. *Law and Human Behavior, 16*(4), 413-424. doi:10.1007/BF02352267

Steer, R. A., & Clark, D. A. (1997). Psychometric characteristics of the beck depression Inventory–II with college students. *Measurement and Evaluation in Counseling and Development, 30*(3), 128-136. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1997-41270-002&site=ehost-live

Sutherland, K., & Bryant, R. A. (2007). Rumination and overgeneral autobiographical memory. *Behaviour Research and Therapy, 45*(10), 2407-2416. doi:10.1016/j.brat.2007.03.018

Teplin, L. A., McClelland, G. M., Abram, K. M., & Weiner, D. A. (2005). Crime victimization in adults with severe mental illness: Comparison with the national crime victimization survey. *Archives of General Psychiatry, 62*(8), 911-921. doi:10.1001/archpsyc.62.8.911

Valentine, T., & Mesout, J. (2009). Eyewitness identification under stress in the london dungeon. *Applied Cognitive Psychology, 23*(2), 151-161. doi:10.1002/acp.1463

Weber, N., & Brewer, N. (2008). Eyewitness recall: Regulation of grain size and the role of confidence. *Journal of Experimental Psychology: Applied, 14*(1), 50-60. doi:10.1037/1076-898X.14.1.50

Wells, G. L. (1978). Applied eyewitness-testimony research: System variables and estimator variables. *Journal of Personality and Social Psychology, 36*(12), 1546-1557. doi:10.1037/0022-3514.36.12.1546

Williams, J. M., & Broadbent, K. (1986). Autobiographical memory in suicide attempters. *Journal of Abnormal Psychology, 95*(2), 144-149. doi:10.1037/0021-843X.95.2.144

Williams, J. M., Teasdale, J. D., Segal, Z. V., & Soulsby, J. (2000). Mindfulness-based cognitive therapy reduces overgeneral autobiographical memory in formerly depressed patients. *Journal of Abnormal Psychology, 109*(1), 150-155. doi:10.1037/0021-843X.109.1.150

Zhu, B., Chen, C., Loftus, E. F., Lin, C., He, Q., Chen, C., . . . Dong, Q. (2010). Individual differences in false memory from misinformation: Personality characteristics and their interactions with cognitive abilities. *Personality and Individual Differences, 48*(8), 889-894. doi:10.1016/j.paid.2010.02.016

Table 1 Video selection: t-tests examining differences between videos

Questionnaire Item	Bank robbery vs. Picnic	Kidnap vs. Picnic	Bank robbery vs. Park	Kidnap vs. Park
	t-values	t-values	t-values	t-values
Sad	3.23**	8.14**	5.45**	11.70**
Happy	-9.23**	-8.34**	-11.90**	-14.25**
Emotional	4.00**	8.87**	2.70**	6.10**
Funny	-.83	-.38	-3.71**	-2.60*
Exciting	11.83**	4.07**	5.81**	1.44
Interesting	6.24**	4.24**	1.93	.69
Surprising	6.10**	9.79**	1.70	4.66**
Disappointing	-1.07	.00	1.32	2.07*
Hopeful	-.97	-1.12	-2.23*	-2.54*
Active	9.58**	5.81**	5.67	3.34**
Anxiety-provoking	13.66**	12.00**	9.52**	9.80**
Depressing	5.14**	7.59**	7.37**	8.33**
Boring	-10.79**	-8.31**	-2.43*	-1.29
Positive	-4.81**	-6.47**	-6.24*	-9.45**
Negative	7.18**	9.52**	7.94**	11.60**

Note. * p < .05; ** p < .01

Table 2 Accuracy on memory tests

	Neutral Video Coarse-grained accuracy	Neutral Video Fine-grained accuracy	Emotional Video Coarse-grained accuracy	Emotional Video Fine-grained accuracy
Divided Attention Group (n = 108)	80.31 (10.88)	53.61 (14.45)	75.37 (12.28)	47.75 (12.60)
Full Attention Group (n = 103)	81.68 (9.32)	57.83 (14.59)	78.25 (11.84)	52.56 (12.07)

Note. Accuracy is measured using percent correct (*SD* in parentheses)

Table 3 Correlations between video accuracy and personality, anxiety, and depression variables in the divided attention group

	Neutral Video Coarse-grained accuracy	Neutral Video Fine-grained accuracy	Emotional Video Coarse-grained accuracy	Emotional Video Fine-grained accuracy
Depression	-.06	-.22**	-.05	-.16
State Anxiety	.12	-.19	-.06	-.11
Trait Anxiety	-.08	-.25*	-.11	-.21*
Openness	.10	.04	.23*	.24*
Conscientiousness	.22*	.23*	.34**	.17
Extraversion	.09	.19*	.16	.17
Agreeableness	.05	.20*	-.03	.05
Neuroticism	-.13	-.20*	-.06	-.15

Note. *$p < .05$, **$p < .01$

Table 4 Correlations between video accuracy and personality, anxiety, and depression variables in the full attention group

	Neutral Video Coarse-grained accuracy	Neutral Video Fine-grained accuracy	Emotional Video Coarse-grained accuracy	Emotional Video Fine-grained accuracy
Depression	-.02	-.15	-.04	.02
State Anxiety	.04	-.15	-.12	.05
Trait Anxiety	-.01	-.16	-.12	-.03
Openness	.03	-.004	-.01	.11
Conscientiousness	.18	.18	.17	.20*
Extraversion	.01	.04	.07	.04
Agreeableness	.19	.05	.10	.13
Neuroticism	-.03	-.03	-.17	.02

Note. *$p < .05$, **$p < .01$

Table 5 Correlations between video accuracy using difference scores and personality, anxiety, and depression variables in the full attention group

	Neutral Video Difference Score	Emotional Video Difference Score
Depression	.13	-.06
State Anxiety	.19~	-.18
Trait Anxiety	.16	-.10
Openness	.04	-.13
Conscientiousness	-.04	-.04
Extraversion	-.04	.04
Agreeableness	.09	-.04
Neuroticism	-.02	-.21*

Note. *p < .05, **p < .01, ~p=.051

Table 6 Correlations between video accuracy using difference scores and personality, anxiety, and depression variables in the divided attention group

	Neutral Video Difference Score	Emotional Video Difference Score
Depression	.20*	.12
State Anxiety	.32**	.06
Trait Anxiety	.22*	.11
Openness	.04	-.01
Conscientiousness	-.08	.18
Extraversion	-.14	-.01
Agreeableness	-.19	-.08
Neuroticism	.12	.10

Note. *$p < .05$, **$p < .01$

Figure 1 ***Interaction of Grain Size x Trait Anxiety***
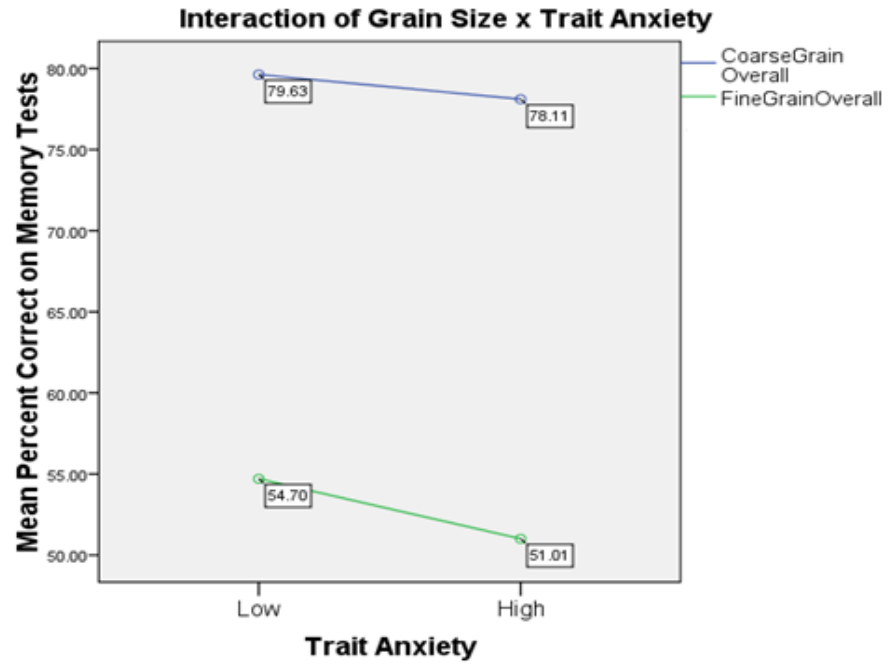
Figure 2   *Interaction of Grain Size x Neuroticism*

Interaction of Grain Size x Neuroticism
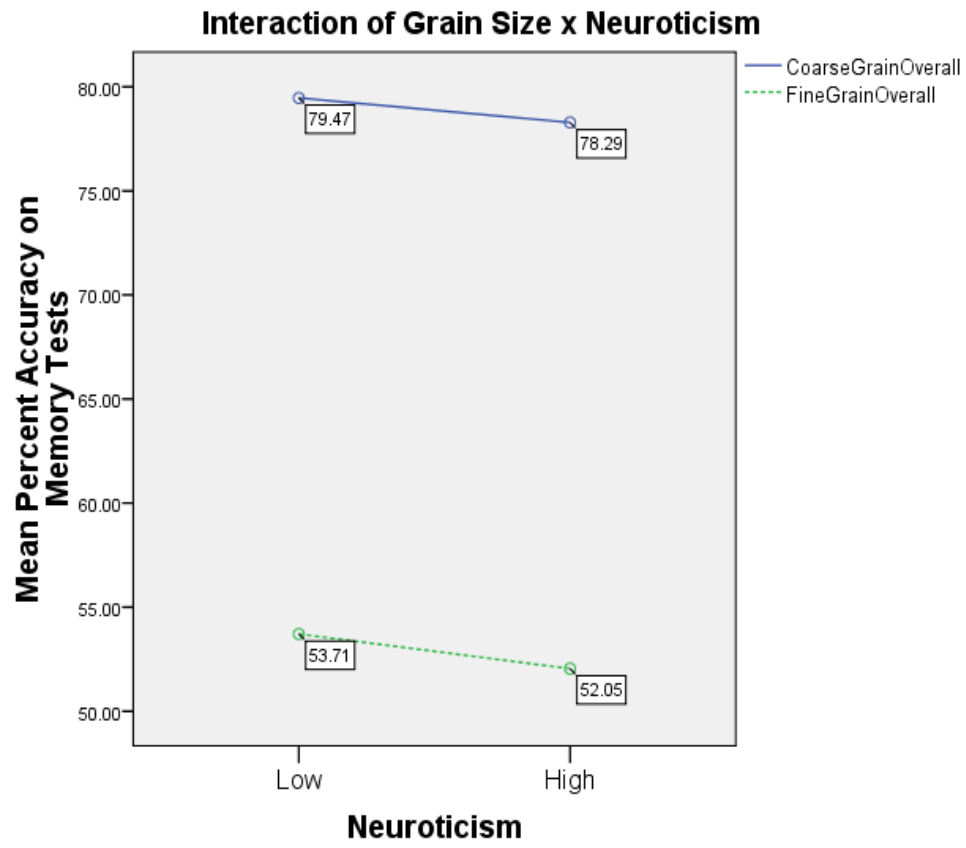
Figure 3   ***Interaction of Attention and Grain Size***
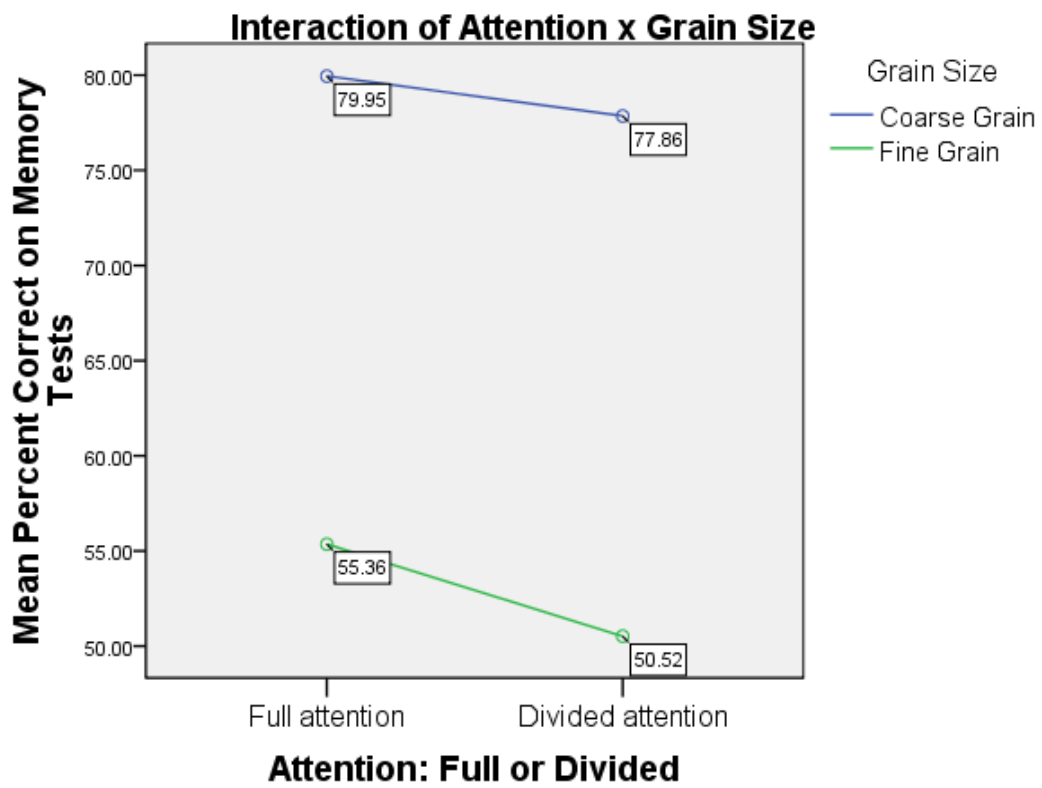
Figure 4   ***Interaction between Emotionality and State Anxiety***
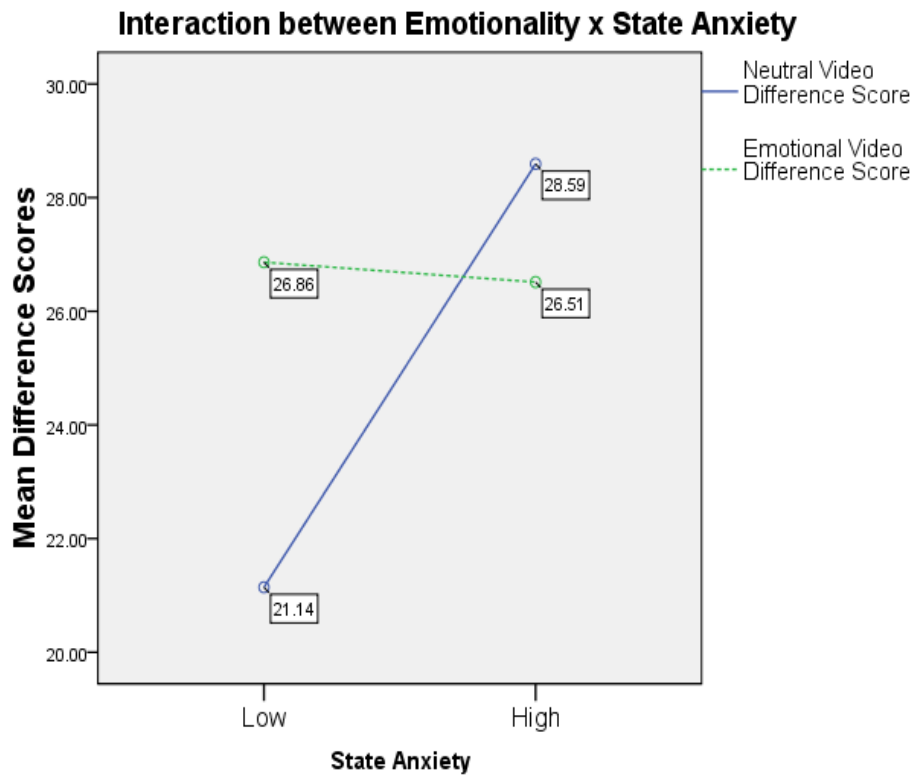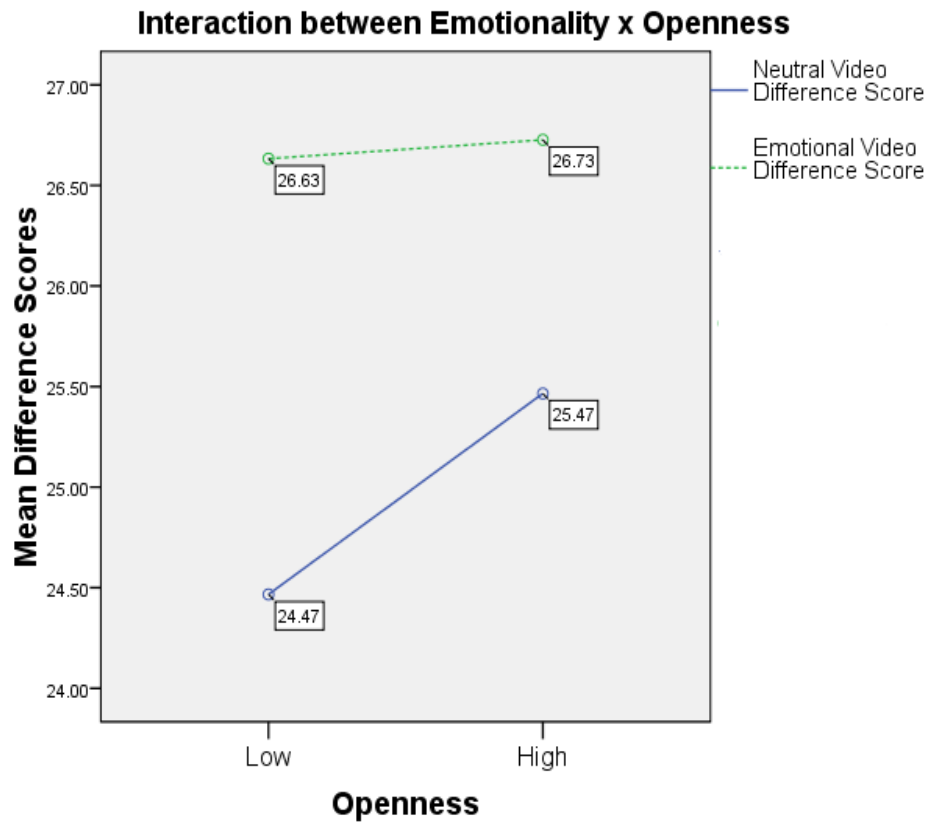
Figure 5   *Interaction between Emotionality and Openness*

Appendix

Appendix A.

Neutral and Negative Video Questionnaires with Answer Keys

Neutral Video Questionnaire

Instructions: Please circle the correct answer for each multiple choice question and write in your answer for the open-ended questions. Be as specific as you can.

1. In his first appearance in the video clip, the main male character is:

a) moving

b) stationary

What exactly is the male character doing in his first appearance?

_____

2. How old is the female that the man was chatting with?

a) Between the ages of 12-17

b) Between the ages of 18-23

What is the exact age of the female that the man was chatting with?

_____

3. Where were the two girls headed after the park?

a) A practice

b) A lesson

Where specifically were the two girls headed?

_____

4. What is the name of the female who stays behind to chat with the man?

a) A name that begins with a 'C' or a 'K'

b) A name that begins with an 'N' or an 'M'

What was the female's exact name?

_____

5. The main male character meets up with another male in this clip. What was the main point of this meeting?

a) To exchange information

b) To exchange goods

What exactly was the main point of this meeting (i.e. what information or goods were exchanged)?

_____

6. What colour is the main male character's shirt that is under his jacket?

a) Light coloured

b) Dark coloured

What is the exact colour of the main male character's shirt that is under his jacket?

_____

7. The two female characters were using some playground equipment. Did this equipment require them to:

a) Stand

b) Sit

What is the exact type of playground equipment the two females are using?

_____

8. Instead of heading to the lesson or practice, one of the females suggested going where instead?

a) Someone's house

b) Out to eat

Where exactly did the female suggest they go?

_____

9. What does the male character do with the lighter that he borrows?

a) Borrows the lighter to make conversation with the girls

b) Lights something

What exactly is his purpose in borrowing the lighter?

_____

10. What colour are the shirts the two main female characters are wearing?

a) Light coloured

b) Dark coloured

What is the exact colour of the female's shirts?

_____

11. Can any animals be seen during this video clip?

a) Yes

b) No

If you answered no above, write in not applicable. If you answered yes, what type of animal was seen?

_____

12. Which female knows the male character from a previous encounter?

a) The one who leaves the video early

b) The one who stays until the end

Where does the female know the male character from?

_____

13. Where does the male character think the female character is from?

a) Uptown

b) Riverdale

Where does the female say she is from? If she doesn't mention where, write in not applicable.

_____

14. What sports team does the female play for?

a) Baseball team

b) Basketball team

What position does she play on the team?

_____

15. The female who leaves early is carrying?

a) A piece of sports equipment

b) A type of bag

What exactly is she carrying (be specific)?

_____

Have you ever seen this video clip before?   Yes   No

Answer key

b; sitting on top of the bench

b; 18

a: basketball practice

b; Naturelle

b; He hands the main character a piece of paper

a; grey

b; tire swing

a; to her house

b; lights a piece of paper on fire

a; white

a; bird/pigeon

a; he was in her brother's class

a; not applicable

b; small forward

b; blue backpack

Negative Video Questionnaire

Instructions: Please circle the correct answer for each multiple choice question and write in your answer for the open-ended questions. Be as specific as you can.

1. What colour was the kidnappers' car?

a) Light coloured

b) Dark coloured

What was the specific colour of the kidnappers' car?

_____

2. Did the male kidnapper use a weapon to subdue the girl?

a) Yes

b) No

If no, how did he subdue the girl, and if yes, what type of weapon was used?

_____

3. The kidnapping occurred:

a) In a secluded area

b) In a public place

Where exactly did the kidnapping occur?

_____

4. When asking for directions, the female kidnapper was looking for:

a) A specific street name

b) A specific landmark

What exactly did the female kidnapper say she was looking for?

_____

5. What is the name of the female kidnapper?

a) A name that begins with a 'C' or a 'K'

b) A name that begins with an 'N' or an 'M'

What was the female kidnapper's exact name?

_____

6. What item did the kidnapped girl leave behind at the crime scene?

a) A personal belonging

b) An article of clothing

What was the specific item that the kidnapped girl left behind at the crime scene?

_____

7. What colour was the male kidnapper's shirt?

a) Light coloured

b) Dark coloured

What was the specific colour of the male kidnapper's shirt?

_____

8. What does the male kidnapper ask the female kidnapper to do when they first arrive at the house?

a) Go into another room

b) Stay in the room she's already in

What specifically does the male kidnapper ask the female kidnapper to do in the room?

_____

9. What colour is the outside of the house that the kidnappers take the victim to?

a) Light coloured

b) Dark coloured

What exact colour is the outside of the house?

_____

10. Does the kidnapping victim have an injury from the struggle in the car?

a) Yes

b) No

If yes, indicate what type of injury and where it was located. If no, write not applicable.

_____

11. The male kidnapper notices that the victim is wearing:

a) An article of clothing

b) A piece of jewelry

What specific item does he notice the victim wearing?

_____

12. What colour are the victim's stockings?

a) Light coloured

b) Dark coloured

What is the specific colour of the victim's stockings?

_____

13. What is the name of the victim's boyfriend?

a) A name that begins with a 'C' or a 'K'

b) A name that begins with an 'N' or an 'M'

What is the victim's boyfriend's exact name?

_____

14. Does the female kidnapper touch the victim in the bedroom?

a) Yes

b) No

If no, write in not applicable; If yes, write in how and where (i.e. body part(s)) the female kidnapper touches:

_____

15. The male kidnapper removes what from the victim?

a) A piece of jewelry

b) An article of clothing

What specific item does the male kidnapper remove from the victim?
_____

Have you ever seen this video clip before?   Yes   No

Answer key:

1.a; beige

2. a; knife

3. b; in a driveway

4. b; Penn Centre

5.a; Karla or Carla

6. b; shoe

7. b; blue

8. b; take care of the phone

9. a; white with some beige/brown

10. a; scratch on neck

11. b; ring

12. b; red

13. a; Chris

14. a; touches her hair, nose, and cheeks

15. b; sweater