University of Nevada, Reno

The Impact of Emotion on Memory Retrieval in Grievers

A dissertation submitted in partial
fulfillment of the requirements for the degree of
Doctor of Philosophy in Psychology.

by

Julie Kahler

Dr. Anthony Papa/*Dissertation Advisor*

August 2018

THE GRADUATE SCHOOL

We recommend that the dissertation

prepared under our supervision by

JULIE KAHLER

Entitled

The Impact Of Emotion On Memory Retrieval in Grievers

be accepted in partial fulfillment of the

requirements for the degree of

DOCTOR OF PHILOSOPHY

Anthony Papa, Ph.D., Advisor

Holly Hazlett-Stevens, Ph.D., Committee Member

William Follette, Ph.D., Committee Member

Markus Kemmelmeier, Ph.D., Committee Member

Yani Dickens, Ph.D., Graduate School Representative

David W. Zeh, Ph. D., Dean, Graduate School

August 2018

Abstract

Emotion, thinking, and memory are interconnected. Mood and thinking reciprocally spur each other, while thinking and autobiographical memory (ABM) recall also bi-directionally impact each other, which can lead to a cognitive vulnerability to developing and maintaining disorder. The current study explores the main premises in the ABM literature: 1) Overgeneral memory (OGM) recall has been implicated in the development of posttraumatic stress disorder (PTSD) and major depressive disorder (MDD), yet its role in prolonged grief disorder (PGD) is still unclear; 2) OGM is theorized to have an affect-regulation function. Yet few studies have explored OGM in the context of emotion. To our knowledge, this is the first study to experimentally induce emotion and assess its effects on ABM retrieval specificity in a bereaved sample. Memory recall specificity levels and whether memories are loss-related versus non-loss related may be implicated in predicting psychopathology. The current study randomly assigned bereaved participants into three groups: happy, sad, and neutral video clip emotion induction. After the emotion induction video, participants completed an autobiographical memory task which involves natural retrieval of memories by completing sentence stems. This type of ABM task has been shown to be a more specific measure of OGM in non-clinical samples, called the Sentence Completion for Events from the Past. Autobiographical memory responses were coded for percentage of specific memory recall and percentage of loss-related memory recall to determine the relationship to psychopathology symptom severity levels within an experimentally manipulated emotional context. Results indicated that PGD predicted greater specific memory recall and greater loss-related recall. In response to the sad emotion induction, loss-related recall was employed as an emotion

regulation strategy, but only for those with PGD. This study helps clarify the role of ABM recall specificity in psychopathology, particularly the role of memory recall in response to different emotional contexts in a population of a bereaved adults with and without PGD. This has implications for treatment targets for those presenting to treatment with pathological responses to bereavement.

Dedication

To Tyler, this dissertation would not be complete without your help. Keep shining like the rockstar you are.

Acknowledgments

I would first like to thank my research advisor, **Dr. Tony Papa, Ph.D.**, for all of the work and effort you put into advising me and mentoring my career development. Thank you for providing opportunities to collaborate on projects with you, and for your insightful clinical supervision. I have learned an immense amount and owe you a debt of gratitude.

Dr. Holly Hazlett-Stevens, Ph.D. taught me so much about mindfulness in her seminar, and was a role model to me as an ambitious successful woman in the field. Thank you for sharing your intelligence and strength.

As the DCT for the first years I was in the program, I deeply enjoyed being mentored by **Dr. Bill Follette, Ph.D.** His research methods class provided the strong foundation for my current research acumen—I am likely in a research postdoc because of him. Your unique perspective and deep knowledge of science and philosophy were an inspiration to me.

My program of research is based on social-cognitive processes in bereavement. I am grateful for **Dr. Markus Kemmelmeier, Ph.D.** imparting wisdom regarding social cognitive and cultural diversity. I enjoyed learning from you for a year and working with you to ponder deep research questions and discuss the nuanced minutia of statistics. It's been a pleasure working with you on research projects and in running focus groups.

Clinical work is a major part of this research degree. Dr. Cindy Marczynski, Ph.D., I am grateful for the clinical and assessment supervision you provided me. I grew as a clinician under your supervision. Thank you for allowing me to be involved in all facets of the counseling center: clinical, administrative, research, and outreach. I am

grateful the years of experience I obtained working for you. In his role as training director, **Dr. Yani Dickens, Ph.D.** also provided immensely enlightening cultural diversity trainings, for which I am grateful. Your clinical supervision and research collaboration have helped me to grow in nuanced ways as a clinician and researcher. Thank you for your mentorship and support over the years. I appreciate you and will keep you and your family in my thoughts.

To **Dr. Steve Hayes, Ph.D.,** I felt we were kindred spirits—intelligent yet misunderstood, but beacons of hope and optimism in this cruel world. Steve, not only did I learn ACT from you, but I learned how to be a compassionate clinician. Your openness and willing to be vulnerable taught me the same virtues. The research methods class has allowed me to search more deeply into the philosophy of science and how it informs our research and clinical work. I appreciate your support over the years.

Mom and Dad, you are the reason I have completed my Ph.D. Your support and love have made me the person I am today and helped me make it through this arduous process. Your inner joy, enthusiasm, intelligence, and curiosity have inspired my pursuit of this clinical research career. You were there for me throughout every obstacle and success; your support was the reason I am completing this long journey and I am grateful. Thank you.

Diane, it was so helpful to have someone who understood the trials and tribulations of advanced training given your own success in completing your Doctor of Physical Therapy. Your courage and perseverance were an inspiration that aided in my completion. I'm so proud of all you continue to accomplish!! Scott and Kassie you are hilarious and we need to hang out more now I'm done with this. You are both amazing in

your own right, thanks for being a sturdy support during the ups and downs in the obtainment of this degree. Matt and Jen, you have been immensely supportive in a myriad of ways during this decade's-long process. I made it through with your aide and support. Matt, all the research coding you've helped me with over the years has been key to my successful completion (and many successful research projects!). My gratitude is boundless.

Krystle and Kelli, though you are my cousins, you have both been like sisters to me. Aunt Janet, you have always been there for me. Uncle Walter, Jennifer and Jeremy, thank you and I wish you all the best. I am extremely grateful for every piece of support you provided over the years. I am lucky to have you as part of my life.

To Emerson Epstein, a dear colleague and friend, who is a brilliant stats and research genius. It has truly been a pleasure collaborating and consulting with you—I am grateful for you. Thank you for all the help and support you provided, without which, I could not have completed this degree. I look forward to continued collaboration. To Julie Skutch, the most amazing clinician and brilliant research mind I've met. The strategy meetings, research discussions, and general support was a beacon light in this dark tunnel. Emerson and Julie – you were both essential supports during my time thank you for all of yourself and your wisdom you have shared with me. I am truly lucky to have you both as colleagues during these formative training experiences—I am the luckiest person ever. Heidi La Bash—your perseverance and research acumen inspired me to finish. Thanks for your help along the way; your persistence has been inspiring to me during this process.

To my other colleagues in the program: Olga Cirlugea, Megan Greenlaw, Frances Gonzalez, and Sungjin Im. Commiserating and collaborating with you all taught me so much and I will miss our esoteric discussions when waxing philosophical together—thank you for your openness, friendship, and clinical and research insights.

As Dr. Papa's *Emotion, Stress, and Adversity Lab* coordinator, I worked with a large number of research assistants over the years. I would like to express my gratitude to all of them for their hard work. I am especially grateful to: Arezoo Esnaashari, Anna Martini, and Jena Garrick for your help on my research. Two research assistants have been a particular support: Talia Hamm, who was the second coder for my dissertation study qualitative research. You are an amazing, impressive, professional and I am proud to have worked with you. Janice Ta, you are so competent and talented, you can do anything. Thank you for your professionalism and all of your hard work. I would like to also mention my appreciation of the office staff at the University of Nevada, Reno, for aiding in the administrative support of conducting research.

To my supervisors, mentors, and my patients during my APA-accredited clinical internship at the Portland VA Healthcare System in Portland, OR. You were all so supportive – I learned an immense amount about healthcare-related treatment delivery. I am excited to begin a 2-year research postdoctoral fellowship at the Portland VA in Health Services Research and Development.

Finally, I thank my dissertation committee who helped enhance the quality of my project, and I thank the study participants for your participation.

List of Tables

The Role of Emotion and Symptom Levels on Autobiographical Memory Retrieval for Grievers

Avoidance of negative emotions and of distressing memories can be adaptive initially. When a cue triggers a top-down, hierarchical memory search, if the search is stopped at a more general level before accessing specific, distressing memories, it can be protective against experiencing further discomfort that might occur if a memory of a specific distressing episode is accessed. This avoidant memory search is most adaptive when used sparingly as a short-term coping strategy. However, repeated avoidance of specific distressing memories in the long-term can become associated with other maladaptive avoidant coping processes, as rumination or worry. It can paradoxically lead to intensified negative emotional arousal and high symptomatology, especially in the presence of negative emotion states. The strategy of halting the memory search at an overgeneral or conceptual level in order to avoid the negative emotions brought about by accessing the specific emotionally painful memory has been theorized to function as a maladaptive emotion regulation strategy historically linked to the development of Posttraumatic Stress Disorder (PTSD), and Major Depressive Disorder (MDD), but has not been consistently linked to Prolonged Grief Disorder (PGD)-- a protracted grief response after the loss of a loved one that occurs for a significant minority of grievers (7-10%; Shear et al., 2007). Autobiographical memory recall (ABM) is a hierarchical memory search that comprises meaning making systems and incorporating moment-to-moment stimuli processing. ABM has not been explored within the context of emotion despite emotions differentially directing our attention, motivation, goals, behavior,

memory and cognitive processes. However, only after these avoidance processes become habitually linked to negative emotional arousal patterns, does psychopathology develop. Therefore, emotion *and* symptomatology levels may impact the level of autobiographical memory recall specificity to maintain psychopathology. The current study explores the role of experimentally induced happy, sad or neutral emotions, and self-reported symptom to determine the impact on ABM retrieval in a sample of bereaved adults.

Autobiographical Memory Specificity and Psychopathology

Autobiographical memory (ABM) forms our self-concept. The interplay between our emotional state and the memories we recall dynamically shapes our self-schemas, directs attention toward or away from our goals, and modulates mood and rumination patterns (Conway & Pleydell-Pearce, 2000). Our self-concept is constantly changing and adjusting with the integration of new information from daily stimuli into existing self-representation systems which comprise our identity. At the micro level, whether our memory search is completed and retrieves a memory of a specific will play a role in either the maintenance of a stable identity or whether a maladaptive memory retrieval habit develops, to create and maintain psychopathology (see Sumner, 2012 for a review). Reduced memory specificity, when "captured" at the overgeneral memory retrieval level, instead of retrieving a specific memory of an event, inhibits the accommodation of new information into current self-concepts. Overgeneral memory searches can become captured at this truncated level, leading to maladaptive cycles of negative mood and rumination (Williams, 2006), habitually impairing goal pursuit (Watkins & Nolen-Hoeksema, 2014) and maintaining symptoms of major depressive disorder (MDD),

posttraumatic stress disorder (PTSD), and inconsistently prolonged grief disorder (PGD) (see reviews by Moore & Zoellner, 2007; Williams et al., 2007; Eisma et al., 2015; Kleim & Ehlers, 2008; Sumner, Griffith, Mineka, 2010; Hermans, Vandromme et al., 2008).

Stimuli, or a cue in the environment, trigger a generative, deliberate memory search through the brain's vast stores of information and memory. Autobiographical memories help us maintain a consistent, stable, working concept of the self. This is due to ABM's hierarchical structure. Top-down memory searches begin through pathways which contain broad, general themes of self-schema categories. Then, with decreasing generality and increasing specificity, the memory search continues through heavily-elaborated, semantical categories of the conceptual, personal self, into more episodic classes or categories of events/time periods (Tulving, 1985; Brewer & Gardner, 1996). Until finally accessing discrete, episodic memories of a specific event, and the associated bottom-up sensory and emotional information attached to that specific memory. Re-accessing the memory will attach new information to that memory and either change or reconstruct the memory once it is accessed. Specific autobiographical memories are formed and revisited by progressing through several cognitive, affective, and sensory systems connected with the memory, forming, changing, and maintaining working models of identity (Rubin, 2006). Functional avoidance of the specific memory in order to avoid associated negative emotions, can lead to maladaptive coping efforts, which over time halts effective top-down, schematic processing of this information. Rumination keeps the memory search trapped at the OGM level, recalling schema-level memories or negative memories which cause negative emotions. More direct, and less deliberate,

intrusive recall of specific memories, may block accommodation of new information into existing self-concepts (see Holland & Kensinger, 2010). Instead, habitual avoidance may result in bypassing the top-down hierarchical memory search for direct retrieval of specific memories which is less deliberate, less controllable, and may cause intrusive memories of the specific event. The present study explores the intersection of these bottom-up mood and thinking pathways and their effect on top-down schematic memory specificity retrieval and their role in psychopathology after the loss of a loved one. This intersection has been understudied. I propose that it is by studying this nexus that we will obtain new information about the mechanisms which lead to successful processing of information into existing self-narratives. By the same token, dysfunctional responses to this information begin, maintain, and exacerbate chronic negative mood cycles, creating a vulnerability toward maladaptive coping responses to future similar stimuli.

Theorized Functions of Overgeneral Memory Retrieval

Overgeneral memory (OGM) recall occurs when stimuli trigger a hierarchical, generative ABM search but stops at a general, categorical class of events that spans longer than a day, instead of continuing further down the hierarchal memory structure to retrieve a discrete, specific memory. The search does not reach the specific memory level (i.e., “I was sad the day my grandpa died”). Instead, it stops at a more general level, either categorical periods of events (“My grandfather used to play games with me when I was little”), semantical associates that describe the self broadly (“I was a very shy person”), or extended memories that span a time frame longer than a day (“My time during elementary school when I was happy”). These higher-order levels of memory

describe more general categories. The hierarchical memory search progresses through the more general memories down to the specific memory of an event (see Raes et al. 2008, for more information and examples of memory categories, see Appendix A). Overgeneral memory recall at a categorical level, such as "when I felt safe with my partner," requires further elaboration of cues down the hierarchical memory retrieval system to more specific, time-limited events, such as "when my partner protected me on the sidewalk last week." A specific, episodic memory is defined as remembering a specific, time-limited event (covering a period of no longer than a day), such as "When Jerry forgot to say goodbye yesterday." Instead, overgeneral memories tended to describe abstract, repeated categories of events, such as "all the times people slighted me" (examples from MacLeod, 2016).

CaRFAX Model of Memory Retrieval as an Emotion Regulation Strategy

ABM specificity differences were first observed in suicide attempters. Williams and Broadbent (1986) noticed that patients who had attempted suicide were more likely to recall negative, overgeneral memory categories instead of specific memories in response to positive and negative cue words on the Autobiographical Memory Test (AMT). They theorized that OGM retrieval was related to maintaining psychopathology. After observing OGM recall in suicide attempters, Williams and colleagues (2006, 2007) described a model of OGM functioning where memory capture at a more general level occurs because rumination disrupts memory retrieval processes. Overgeneral memory retrieval occurs as functional avoidance of recalling a specific memory (due to related distress), which impairs executive functioning and retrieval of specific memories

(Williams, 2006). The Capture and Rumination, Functional Avoidance, and eXecutive control model (CaRFAX; Williams, 2006) stated that overgeneral memory may be due to: (1) functionally avoiding painful, distressing memories and emotions; (2) a tendency to ruminate, leading to focus that is "captured" on categoric memories and general themes, and (3) executive processing limitations, such as impairments in working memory, which inhibit adequate retrieval/location of a specific memory episode (Williams, 2006). When a cue triggers memory retrieval, rumination may capture attention at an overgeneral level, disrupting the retrieval of a specific memory. An increase in negative emotion occurs as result of rumination, driving subsequent functional avoidance of these repetitive, negative thoughts and emotions. But this truncates the memory search because more negative, abstract, ruminative and analytical processing is triggered. This analytical processing mode creates ineffective coping because the negative, ruminative focus impedes reality-based/present-moment processing of information. Instead, the memories accessed maintain a focus on what could happen generally (due to the emotional avoidance of the negative emotion associated with rumination and OGM retrieval), heightening the negative emotional impact and increasing functional avoidance of this negative emotional impact. This inhibits access of specific autobiographical memories, which blocks adaptive coping. Theoretically, instead, OGM retrieval causes the griever to maladaptively respond to past information (OGM and rumination) instead of adaptively accessing and processing loss-related information into mental representations of a new working self-concept without the deceased.

The Role of OGM Recall as an Emotion Regulation Strategy in Psychopathology

In the CaRFAX model, OGM recall is hypothesized to be acutely protective against accessing specific, distressing memories. However, OGM recall as a long-term habitual coping strategy has been studied as a transdiagnostic mechanism which contributes to the development or maintenance of psychological disorders.

OGM in MDD. Research supports the supposition that depressed people tend to engage in overgeneral memories that span too long of a period of time or that covers a similar category of events (see reviews by van Vreeswijk & de Wilde, 2004). This creates a cognitive vulnerability toward developing depression (Matthews & Macleod, 1995; Minnen, Wessel, Verhaak & Smeenk, 2005) which is related to a worse prognosis for MDD (Sumner, Griffith, & Mineka, 2010 for meta-analysis). For those with depression, overgeneral memory causes working memory deficits that impair the ability to attend to no-longer relevant information (i.e., maintained focus on a failed goal or a loss): this then inhibits access to memories that are positive or which may aid in emotion regulation (Dalgleish et al., 2007; Sutherland & Bryant, 2007). Instead, negative self-schemas are activated, instigating ruminative self-focus and capturing and interrupting the retrieval of specific memories (Dalgleish et al., 2003). Abstract processing (i.e., ruminative self-focus) modes have been associated with higher overgeneral memory retrieval than a more concrete, experiential processing mode (Raes, Watkins, Williams, & Hermanns, 2008). An abstract processing style has maladaptive consequences because it leads to a "vicious cycle" of negative emotions, avoidance, and continued OGM recall and negative

rumination cycles (Teasdale, 1988; see Watkins, 2008 for a review on constructive and unconstructive repetitive thought patterns).

OGM in PTSD. In PTSD, avoidance of distressing stimuli has long been thought to hinder opportunities for new learning (Foa & Riggs, 1993) which over time creates maladaptive emotion regulation habits. Those then capture attention at the OGM level ("old learning" derived from the trauma), create negative mood and rumination cycles, and lead to further avoidance (Gibbs & Rude, 2004; Raes, Hermans, de Decker, Eelen, & Williams, 2003; Williams, Barnhofer, Crane, Herman, Raes, Watkins, & Dalgleish, 2007). This limits the ability to reintegrate the trauma or loss into current self-conceptions and leads to disordered psychological responses to distressing stimuli (Harvey, Bryant, & Dang, 1998).

Initially developed to explain autobiographical memory abnormalities in PTSD, Conway and Pleydell-Pearce's (2000) *Self-system memory model* suggested that autobiographical memory retrieval will be impacted based on the individual's present-moment goals and emotional goals, consistent with one's working self-concept (see review by Holland & Kensinger, 2010). There is a hierarchy of autobiographical memory with mental representations that span broader, more conceptual categories in a life narrative (e.g., "boyfriends") at the top, to period in one's life (e.g., "when I was in graduate school"), to general events (e.g., "picnics with others"), to specific knowledge linked to an episodic events (e.g., "when I picnicked with friends after we finished the first year of graduate school"; examples from Sumner, 2012). Memory searches can result in the direct retrieval of a specific memory, or top-down, hierarchical memory

retrieval until retrieving an episodic, event-specific memory that is related to specific sensory and perceptual experiences from specific events (see review by Sumner, 2012).

According to the Self-Memory-System model (Conway & Pleydell-Pearce, 2000), accessing memories at more general levels protects against emotional distress, dampening the potentially distressing specific memory stimuli. This suggests an emotion-regulating function for OGM. Underlying this emotion regulation function, OGM recall occurs as a result of functional avoidance to a trauma or loss (particularly formative traumas/losses; Williams, Stiles, & Shapiro, 1999). OGM recall biases develop as a result of avoiding distressing material, but also functions as avoidance itself. OGM recall is protective because it cognitively avoids potentially emotionally-laden memories. At first, these distressing, trauma-related memories are more likely to be avoided because of the negative emotional component attached to it.

However, recurrent avoidance of specific memories negatively reinforces negative emotions (i.e., negative emotions are reduced/taken away), and memory retrieval style becomes overgeneralized--avoidance of specific memories is continually reinforced across more and more contexts (see Sumner, 2012). However, this OGM cognitive avoidance becomes maladaptive. Cognitive processing has been theorized to be necessary to accommodate and integrate the loss or trauma into new meaning structures (Horowitz, Wilner & Alvarez, 1979; Pennebaker, 1997; Greenberg, Wortman, & Stone, 1996). Meaning making and trauma models describe needing to accommodate the trauma/loss and integrate the distressing aspects of the trauma/loss into a new schema in order to provide meaning and control over one's life (Gillies & Neimeyer, 2006;

Horowitz, 1986; Lepore & Revenson, 2006). Instead of accommodating the trauma/loss into existing knowledge and memory self-representations, a maladaptive focus on threatening information or worry or rumination on the trauma or death event/circumstances, may cause re-experiencing or intrusive thoughts on bitterness, anger, numbness, self-blame, shock, consequences of the trauma/death, and feeling stunned (Horowitz, 1986).

This can cause a cycle of feeling distressed by memories related to the trauma, then functionally avoiding this distress by engaging in a nonspecific retrieval habit in order to regulate mood and avoid experiencing negative emotions (Williams et al., 2007). When remembering the past or thinking about the future, combat veterans with PTSD were more likely than combat veterans without PTSD to have overgeneral autobiographical memories that contained combat-related content (Brown, Root, Romano, Chang, Bryant, & Hirst, 2013; McNally, Lasko, Macklin, & Pitman, 1995). Those who developed PTSD after a near-death airline flight recalled both traumatic and non-traumatic memories with external and semantic details, instead of specific, episodic details of the events they recalled (McKinnon, Palombo, Nazarov, Kumar, Khun, & Levine, 2015). Nonspecific memory retrieval appears to be linked with a maladaptive regulation tactic for individuals with PTSD.

Direct, specific memory retrieval is akin to a flashback or intrusive thought in PTSD (Brewin, 2001). Certain cues trigger the direct retrieval of a specific memory, but only when avoidance processes become maladaptive habitual patterns linked to working memory self-concept goals--retrieval is biased for memories rich in specific details,

activating emotions and thoughts associated with the memory recalled (Conway & Pleydell-Pearce, 2000; Watkins & Nolen-Hoeksema, 2014). Generative retrieval is an effortful attempt to recall and reconstruct past memories, activating cognitive and executive processes, requiring attentional focus, and holding the memory cues that triggered the search in working memory while also searching for the retrieval target (Schacter, Norman, & Koutstaal, 1998). While this generative elaboration on a search for a specific memory occurs, a parallel activation of general, emotionally relevant goals (i.e., changing current mood state) can disturb the more effortful process of searching for an event-specific memory. The *Strategic Inhibition Hypothesis* (Philippot, Schaefer, & Herbette, 2003) supported the self-system model and described generative, effortful, top-down memory searches which inhibit the related emotion for the specific event retrieved. If an unexpected memory re-occurs and is met with avoidance, a less-conscious and uncontrollable search stops at overgeneral memory levels. If sensory information is aroused at the OGM level of generative retrieval, then a general memory will be activated. The type of emotional state can impact the level of autobiographical memory recall.

Autobiographical memory provides a coherent self-narrative in that it retrieves personal, self-relevant memories that we hold as our self-concept. Hence, it is important to understand which factors change or alter autobiographical memory recall, especially those factors which impede successful processing of memories, in turn inhibiting a consistent, coherent sense of self and leading to the creation of dysfunctional coping habits (Holland & Kensinger, 2010).

Conversely, specific memory recall can occur without necessarily experiencing past affective states, but only if the hierarchical, generative recall search can progress naturally down to the specific memory without interruption (Demaree et al., 2005; Liotti & Tucker, 1995; Holland & Kensinger, 2010). For instance, taking on an observer perspective during memory recall—where one observes oneself in the memory versus remembering the scene from one's own point of view--has been related to reductions in re-experiencing and re-living the emotional and sensory experience of the emotional event (Berntsen & Rubin, 2006). This suggests that the abstract processing (or observer) function of rumination can actually be protective against experiencing a negative emotion because the rumination functions to avoid the painful memory recall. However, a paradoxical effect occurs if this maladaptive coping pattern is maintained through persistent avoidance. This continued avoidance pattern actually heightens negative emotional arousal because thoughts/feelings/information never get processed into existing mental representations of one's self-concept. Emotion and memory interact, as memory retrieval pathways toward specific memories may be influenced or accessed in a manner that is consistent with one's current working self-concept (Conway, 1994).

There are several factors that can influence the interaction of memory and emotion. Executive functioning helps to challenge errant, de-contextualized information from an OGM learning history. If executive functioning is impaired or directed toward OGM which causes rumination and responding to past consequences rather than to present-moment stimuli. As memories are re-accessed, different emotional and sensory connections are linked to the memory, strengthening the connection of the memory to

other important semantical networks. The strength of the connection to other networks increases, making those memories and emotions more readily accessible. When memories are stored, they are constructed or influenced by emotion and personal goals in the moment (see Bäuml & Kuhbandner, 2007). By retrieving a memory, the original event or detail is reconstructed, further strengthening processing pathways. In addition to executive functioning deficits leading to rumination, whether one adopts a first-person perspective, or whether an observer perspective is adopted will influence ABM retrieval. When a memory is recalled, the emotions linked with that memory can influenced whether a first-person or third-person perspective is utilized in recalling the memory, which then influences subsequent experience of the emotion linked memory recall. Emotional processing from a first-person perspective--attending to contextual and environment details of the memory—compared to whether the memory recalled is linked with more emotion-based, phenomenologically-linked pathways, and more likely to access the memory from an observer-perspective—a memory where one is observing oneself in the memory rather than experiencing the memory from a first-hand perspective can expose or shelter oneself from emotional responses related to the memory recalled (Berntsen & Rubin, 2006). Positive affect was associated with greater ability to attend to situational details when recalling a memory, with greater likelihood of a first-person perspective rather than an observer (or third-person) perspective when recalling the memory. Conversely, the more a memory was associated with negative emotion, the greater likelihood of developing repertoire-narrowing, abstract rumination and negative

arousal linked to de-contextualized coping responses (Talarico, Berntsen, & Rubin, 2009).

Repeatedly recalling emotions about past events allows for understanding negative events within frameworks of self-schemas (Frattaroli, 2006). Emotions can occur both as the memory is being initially processed, and as it is being retrieved. Additionally, affective memories, or memories of how one felt in a specific moment, can be retrieved even when the episodic memory cannot, as in the case of amnesiacs (Tranel & Damasio, 1993; Johnson, Kim, & Risse, 1985). However, rumination stops the recall or impact of affective information, functioning to avoid the re-experiencing of distressing emotions connected with completing the full memory search down to the specific memory being retrieved (Brewin, Dalgleish, & Joseph, 1996). Rumination can maintain truncated OGM and negative emotional arousal process.

Conflict: PGD Not Consistently Linked to OGM Recall

Emotions are responses to information from the environment, that motivate action, and aide in the prevention, coping with, or maintaining changes in the status of one's goals (Levine & Pizarro, 2004; Levine & Edelstein, 2009). Especially for grief-related emotions, which are a mixture of positive and negative emotional responses and linked to no-longer-relevant life goals with the deceased, it is essential to study memory retrieval processes. The central focus of the present study is the under-addressed role of emotion in memory recall specificity, particularly in the role of prolonged grief disorder (PGD) in a bereaved sample. As the following sections will indicate, the current literature suggests that loss-related memories are "immune" to the more-commonly observed

emotion-regulation functions of overgeneral memory retrieval, but only for individuals with higher grief-related distress. This is in contrast to a myriad of evidence that decreased specificity is associated with negative schemas in MDD and trauma content in PTSD. MDD, PTSD, and PGD all appear to have similar etiologies and functions, and even a cognitive vulnerability for remission due to these emotionally avoidant, overgeneral memory retrieval patterns, yet OGM recall appears to function differently in the development and maintenance of PGD compared to MDD and PTSD.

OGM and PGD

In PTSD, OGM functions to regulate negative emotions related to distressing trauma memories. Similarly one might hypothesize that for those with PGD, specific memories of the deceased and death-event would be avoided due to the distress associated with the loss. Resilient grievers have been found to experience relatively little distress after the loss of a loved one and then quickly return to pre-loss functioning (Bonanno, Keltner, Boelen, & Horowitz, 1995; Bonanno et al., 2002; Bonanno, Papa, Lalande, Zhang & Knoll, 2005; Coifman, Bonanno, Ray, & Gross 2007; Eisma et al., 2014). However, contrary to this emotion-regulation function for OGM recall in maintaining PTSD, for PGD recent evidence suggests that those with higher grief symptoms may recall more specific, loss-related memories, while being more likely to retrieve *overgeneral* retrieval of autobiographical memories of the self, and fewer self-defining memories that are without the deceased (Golden, Dalgleish, & Mackintosh, 2007; Maccallum & Bryant, 2008). Preferential retrieval biases for specific loss-related memories have been associated with greater, suggesting that pathological grief responses

are related to the specific retrieval of loss-related memories symptomology (Boelen, Huntjens, van Deursen, & van den Hout, 2010). This refutes a functional avoidance/emotion-regulating theory of OGM retrieval for PGD, in stark contrast to OGM retrieval for distressing material contributing to PTSD and MDD. It is unclear whether loss-related memories are *not* distressing (e.g., positive memories of the time with the deceased are preferred over confronting the distressing reality of the loss), whether specific retrieval and getting "stuck" on the loss memory is the mechanism that contributes to PGD, and it is unclear what role rumination plays in this process for PGD.

However, the finding that loss-related recall was *more* specific, is just one of many contradictory findings in the grief and ABM literature. Other ABM studies of PGD have found discrepant findings to Golden et al.'s (2007) and Boelen et al.'s (2010) loss-related specific recall findings, which would alternatively provide support for the functional avoidance, emotion-regulating function of OGM in PGD. For instance, Maccallum and Bryant (2010a) found that OGM recall occurred in response to both positive and negative cues on the AMT for those with PGD compared to those without PGD (Maccallum & Bryant, 2010c). High grief symptoms are related to memory specificity levels, but diverse findings in the PGD literature make it difficult to discern the exact role and function of memory specificity in the pathogenesis and maintenance of maladaptive grief responses. Differences across methodologies makes comparisons of ABM specificity findings in the bereavement literature difficult to directly compare (see ABM studies in bereavement section below, for details). Findings suggest that current grief symptom severity in itself does not produce avoidance and OGM recall, but instead

a chronic pattern of rumination and avoidance of negative emotion, over time, creates a more direct retrieval of loss-related memories which impairs the assimilation of this loss-information into new-self-schemas, causing prolonged grief reactions and unsuccessful recovery from loss.

In addition to the confusion regarding how OGM functions in PGD, the role of rumination to "capture" memory recall at the overgeneral level and it is also unclear exactly to what extent rumination or memory recall impact functioning such as working memory, if at all, to contribute to PGD. Bereaved individuals who ruminated in response to sad feelings were less able to prevent grief-related stimuli from entering working memory (WM; Delespaux & Zech, 2015). WM inhibition deficits prompt rumination and prevent activation or implementation of essential emotional regulation strategies. However, inhibitory deficits were *not* significant for rumination when accounting for grief symptoms in their model. This makes it unclear whether loss-specific memory recall in PGD is related to preferential selection/activation of grief-related information pathways in the brain, or rumination and negative emotion interact to create deficits in access limitations so that grief-related information is harder to turn away from, and harder to control from entering WM. Since the authors did not include a condition that tested the rejection of no-longer relevant information from working memory, they were unable to explore these last two questions, however. This indicates that solely higher grief symptoms or solely rumination alone do not interfere with effective emotion regulation pathways in the brain, without also taking into account the context of sad/negative emotions contributing to maladaptive processes of PGD. Hence, emotion

regulation strategies such as positive reappraisal and positive event interpretation are necessary for adaptive coping and emotion regulation post-loss (Stroebe, Schut, & Stroebe, 2005). Yet the CaRFAX model would suggest WM deficits that impede positive emotion regulation or attentional activation.

More likely, those who perseverate on the loss and those with PGD will have a bias for loss-related memory retrieval and rumination, with an inability to disengage from idiographic, loss-related stimuli when in a negative mood/arousal state. The anterior cingulate cortex (ACC) is generally related to grief responses in the brain. In the non-PGD group, the orbito-frontal cortex was activated more than in the no-bereaved control group, and autobiographical memory pathways were activated in the non-PGD group compared to the PGD group, who did not have these pathways activated (Arizmendi, Kaszniak, & O'Connor, 2016). If the successful activation of the lower rostral ACC (rACC)-- which is responsible for emotion regulation (i.e., negative emotion processing in the amygdala)-- is stopped, there is impaired ability to disengage from grief-stimuli and negative emotion. For individuals who met criteria for PGD, there was an inability to disengage from negative emotion information (Arizmendi et al., 2016). Higher dorsal ACC (dACC) was activated for those with PGD, which is responsible for the appraisal and monitoring aspect of our brain (i.e., rumination), which came "online" during the last block of presented grief stimuli, stopping effective emotion regulation. This suggests preferential retrieval of loss-related memory specificity retrieval for those experiencing higher grief symptoms. Top-down, schema-driven memory processes are instead interrupted by bottom-up rumination in order to avoid negative emotion associated with

the loss-memory. However, this has a contradictory result: inhibiting specific loss-memories from being incorporated into conceptions of the self without the deceased, causing the loss-memory to be more directly retrieved over time, intensifying grief symptoms, and other negative emotions and stopping the griever from moving on. Weick and Guinote (2008) described phenomenological experiences such as negative emotional arousal increasing the power of ease of retrieval/heuristics, which appears to become the case for individuals with PGD. Ease of retrieval for loss-related stimuli may impair effective emotion regulation and instead causes the griever to feel stuck in that emotion.

Overview of Autobiographical Memory Studies in Bereavement

The ABM literature within the bereavement field has found contradictory relationships between OGM and symptom levels. Two ABM tests have been utilized: 1) The autobiographical memory test (AMT) asks participants to provide memories in response to positive and negative cue words; and more recently the Sentence Completion for Events in the Past (SCEPT; Eisma et al., 2015). Most autobiographical studies in the bereavement literature to this point have used four different types of memory tests. One asks the bereaved to rate their current distress levels and asks participants to recall their emotional state after a period of time has elapsed (e.g., Safer, Bonanno, & Field, 2001). A second type is the Autobiographical Memory Test (AMT), which requires participants to retrieve either specific memories or any memories (without instruction to recall a specific memory) in response to emotion-cue words (see Golden et al., 2007, Boelen et al., 2010; Maccallum & Bryant, 2008a, 2008b, 2008c). A third type of memory test asked participants to describe self-defining memories and post-loss goals (Maccallum &

Bryant, 2008). Finally, a recent fourth method, Sentence Completion for Events in the Past (SCEPT), asked participants to retrieve memories in response to unfinished sentence stems, which are then coded for memory retrieval specificity and loss-relatedness (Eisma et al., 2015). Discrepancies between these memories both within the bereavement literature and compared to PTSD and MDD studies make it unclear how OGM recall for loss and non-loss memories work to protect against or contribute to, post-loss psychopathology. These differences could be due to the variance in memory recall techniques, or how the instructions for loss-recall were phrased. However, more likely, these discrepant findings are due to the complexity in how responses to emotions impact memory retrieval over time to create maladaptive responses to specific loss-related memories.

A seminal study of ABM in bereavement asked participants to complete three different memory tests in which they were asked to retrieve ABM of the self, biographical memories of another close friend's life, and biographical memories of the deceased's life (Golden et al., 2007). The AMT was used to elicit memories in response to emotion-cue words. In the PGD group (vs. non-PGD group), negative cues were related to OGM retrieval for autobiographical memories of the self and biographical memories of a close other; yet *more specific* biographic memories of the deceased. In other words, memories of the deceased, which are expected to be distressing, and thus prone to OGM recall to protect against distress, were instead found to have a specific recall bias for the deceased's life yet an overgeneral recall bias to self and friend's memories in response to negative cues but only for those in the PGD group. This effect

did not occur in response to positive cue words. The authors interpreted these findings to mean that loss-related recall was "immune" to the reduced specificity of the CaRFAX model because loss-related memories tended to be more specific. They hypothesized that loss-related memories tended to be more specific. They hypothesized that loss-related memories are more likely to be directly retrieved, uncontrollably, akin to intrusive thoughts.

Another study conducted a year later had conflicting findings that suggested that instead of this immunity effect, those with higher grief symptoms actually produced the expected (and similar responses of OGM seen in PTSD and MDD) OGM recall bias to loss-related memories, supportive of the CaRFAX model and contradicting Golden et al.'s (2007) "immunity effect" of directly retrieving highly rehearsed details of the deceased's life. Maccallum and Bryant (2008) asked bereaved participants to "Describe 3, self-defining memories." The PGD group recalled more self-defining memories that included the deceased than the non-PGD group. The authors concluded that continued post-loss attachment to an identity that still involves the deceased leads to increased yearning and distress, and bereavement-related psychopathology.

In another test of ABM in bereavement utilizing the standard AMT test, Boelen, Huntjen, van Deursen, van den Hout (2010a) compared a standard AMT to a trait AMT. In this study, Golden et al.'s original "immunity effect" for loss-related specificity was supported. For the standard AMT, those with PGD had more specific, loss-related recall while for the trait AMT, PGD, PTSD, and MDD-- were related to more specific loss-related recall.

Boelen et al.'s (2010) discrepant findings seem to suggest that those with higher grief symptoms have been found to avoid grief-related stimuli, thoughts, and memories. Maccallum and Bryant (2010b) tested emotional information processing deficits for PGD versus non-PGD grievers. The Stroop test was utilized to determine how quickly target words that were death-related were processed. They asked one group to suppress thoughts of deceased, and asked another group to openly think of whatever comes to mind, even thoughts of the deceased. Higher memory recall of, and thought suppression about the deceased occurred more for those with PGD overall. Individuals with PGD were slower to emotionally name death words versus neutral words. Alternately, another test of executive functioning and potential emotional processing impairments in pathological bereavement, findings did not support impairments in processing emotional information for those with PGD, but did find difficulties with future novel event simulation for those with higher grief symptoms (Robinaugh, 2015). When considering the future and remembering the past, Maccallum and Bryant (2011a) found that PGD symptom severity was related to reduced specificity in imagining future positive events and a higher likelihood of recalling events related to the loss. However, a recent study was unable to find support for this, and did not obtain differences in grief symptom severity and memory specificity. Robinaugh and McNally (2013) found no differences between PGD versus no-PGD groups regarding the retrieved specificity of events with the deceased. However, PGD was related to OGM recall for the past *and* a future that did not include the deceased. Autobiographical memories for a griever with PGD were more likely to be overgeneral if they do not contain the deceased. As such, OGM recall for

non-loss related memories or difficultly imaging a future without the deceased, may cause a loss-related-identity, subsequent hopelessness, and protracted grief responses.

Maccallum and Bryant (2010c) gave grievers the AMT, and then a means-end social problem solving task. Social problem-solving was lower in those with PGD. In those with PGD, categoric, OGM recall was *more likely* (fewer specific memories were recalled than those with non-PGD). This is in sharp contrast to the Golden et al. (2007) and Boelen et al. (2010a) studies. The PGD grievers produced fewer steps to solve a social problem that was more likely to be rated as an ineffective solution by outside raters. These same authors conducted a similar study utilizing the AMT but finding contrasting results, Maccallum and Bryant (2011a) asked participants to recall specific memories and were given 60 seconds to respond by retrieving memories of their own lives and their imagined future with and without the deceased. Findings indicated that for those with higher grief symptoms, OGM recall occurred for both positive and negative cues; more loss-related memories were recalled, particularly in response to negative cues. These findings conflict with Maccallum and Bryant's other study (2010c) which suggested that higher grief symptoms were related to OGM retrieval memory recall, as one would expect given PTSD and MDD literatures. However, instead of OGM recall for loss-related memories (2010c), their other study's findings (2010a) suggested that loss-related memories were *more likely* to be recalled for individuals with higher grief symptoms. However, higher OGM recall tended to occur generally in people reporting higher distress in the face of negative cue words partially consistent with their other study's results. Additionally, when considering cue valence, there was a difference in

Golden et al.'s (2007) findings between negative cues and less specific recall for non-loss related memories while in a separate treatment study, changes in positive valenced specific memory recall was associated with symptom reductions after a ten-week CBT treatment for PGD (Maccallum & Bryant, 2011b). This adds another layer of uncertainty around the role of emotion in ABM recall.

Discrepant findings in these bereavement studies indicate that the way emotion and memory retrieval uniquely interact for those with high versus low grief symptoms can dynamically cause OGM recall to either be protective and support recovery from loss, or create maladaptive post-loss processing habits which impede recovery from loss. The difference in memory retrieval specificity appears to function differently in bereaved samples compared to PTSD and MDD samples. This understudied nexus between emotion and bereavement is explored further in the following sections.

Considering the Role of Emotional Context in ABM Retrieval

The preceding overview of ABM studies highlighted discrepancies in the level of specificity of ABM recall, the degree symptom levels are associated with ABM recall and the role of emotional valence and emotional arousal compared to emotion regulation processes found for MDD and PTSD. The CaRFAX model and other bereavement models suggest that loss-related memories are distressing and should be avoided, leading to the development of maladaptive OGM retrieval habits over time that leads to general negative mood. A major part of the CaRFAX theory (Williams, 2006) and the *Self-system memory model* (Conway & Pleydell-Pearce, 2000) emphasizes the initial emotion-regulation function of overgeneral memory recall before paradoxical processes of

avoidance ultimately leads to the chronic negative emotional arousal found in psychopathology. However, only one recent study has explored the effect of emotion on ABM specificity. A written, emotion-induction technique (Velten, 1969) was used to induce negative emotion in those with and without depression utilizing the SCEPT memory task (Mitchell, 2015). OGM recall occurred for those in the negative emotion induction condition, *but only for those with a history* of depression. Those with a previous history of depression had greater OGM retrieval and larger reduction in specific memory retrieval from pre- to post-negative emotion induction. Those without a history of depression did not experience OGM retrieval in the negative mood state (Mitchell, 2015), suggesting a cognitive vulnerability for OGM recall, *in the presence of negative mood* but only for those who have experienced depression previously (see a review on cognitive vulnerability to depression by MacLeod & Matthews, 2005).

Interaction of Emotion and Autobiographical Memory in Bereavement

The level of specificity of ABM recall has been linked to greater distress levels and disordered emotion and rumination habits that lead to psychopathology (see Watkins & Nolen-Hoeksema, 2014). Autobiographical memories of suicide attempters were more negative and centered around recurrent, general themes rather than discrete memories of events that lasted less than one day (Williams & Broadbent, 1986). This suggests that a negative mood state can bias negative, overgeneral memory retrieval, triggering habitual negative affective and thinking patterns (McFarland & Buehler, 1998). The relationship between ruminative self-focus and negative affect has long been established (Moberly & Watkins, 2008) both are associated with emotional extrapolation--expectations that future

events will be negative and distressing, possibly leading to social withdrawal or further avoidance processes (Watkins, Moberly & Moulds, 2008).

Given that negative emotion is more likely to spark a negative, analytic and ruminative processing mode especially for those with high symptomology, it is likely to bi-directionally interact with ABM recall specificity for those experiencing PGD. This interaction can either be adaptive or it can create an entropic cycle of negative emotion that biases memory recall specificity levels and instigates rumination on loss stimuli, impairing the accommodation of the loss into a new self-concept. For instance, Lyubomirsky, Caldwell, and Nolen-Hoeksema (1998) tested rumination versus distraction strategies across several studies and found that rumination in response to depressed mood lead to a bias of retrieving and remembering negative life events and possibly making positive memories less enjoyable or less positive. This effect did not occur when they primed rumination in the absence of dysphoria. Dysphoric participants in the distraction-as-coping condition, and non-dysphoric participants, were less likely to generate negative memories, negative life events, and negative predictions about the future. These findings raise the possibility that certain types of rumination could impair autobiographical memory retrieval in the presence of dysphoric mood. Thus, the valence of the mood and rumination could be leading to the contradictory findings in the autobiographical memory and bereavement literature. For instance, Segerstrom et al. (2003) measured dimensional variables of repetitive thinking and found that negatively valenced rumination was likely to be interpreted as less controllable than positive repetitive thinking. The authors identified specific strategies that could help foster more

feelings of control, such as using refocusing and reframing strategies that would allow an attentional shift in focus to promote more positively valenced, and adaptive repetitive thinking.

Moreover, the emotional tone of repetitive thinking (e.g., rumination and worry), is an important factor impacting symptomology levels and self-view. Segerstrom, Schipper, and Greenberg (2008) studied negative and neutral repetitive thinking habits in 14 bereaved caregivers and 30 controls. In both groups, negative rumination was associated with higher depression symptoms while neutral repetitive thinking was related to fewer depressive symptoms. Emotional valence matters after the loss of a loved one, as a ratio of five to one positive to negative self-evaluations were related to better adjustment (Bauer & Bonanno, 2001b). Potentially, valence of thought or valence of the memory retrieved could contribute to a negative thought/mood/memory retrieval habit which can become disordered (Watkins & Nolen-Hoeksema, 2014).

ABM and Negative Emotion

Negative emotion enhances negative memory recall (Cahill & McGaugh, 1995; Heuer & Reisberg, 1990). Yet the bereavement literature has not experimentally manipulated or controlled for emotion when considering autobiographical memory specificity retrieval. ABM retrieval deficits have been demonstrated in those reporting higher grief symptoms, but it is unclear why loss-related memory retrieval is more likely to be more-specific and “immune” to the affect-regulation function of OGM observed in PTSD and MDD (Golden et al., 2007; Boelen et al., 2010a). Pathologically bereaved adults tend to experience increased distress and less discomfort from specific memories

of the deceased than controls (Mancini, Sinan, & Bonanno, 2015), while non-bereavement ABM studies tend to find a link between higher symptoms and OGM recall (e.g., Smets Griffith, Wessel, Walschaerts, & Raes, 2013). Individuals who maintained higher grief symptoms over time were more likely to overestimate severity of grief emotions both immediately after the loss, and up to 4.5 years later (Safer, Bonanno, & Field, 2001). Taken together, it is likely that the mixed emotions that comprise grief are contributing to the contradictory ABM findings in the bereavement literature. During bereavement, the experience of OGM retrieval of loss-related memories would be expected to be adaptive early after the loss but maladaptive the greater the time elapsed after the loss. However, in contrast, findings suggest a bias for specific recall of grief-related stimuli in some studies, while this relationship does not hold in other similar studies (Robinaugh, Lubin, Babic, & McNally, 2013). It is likely that the absence of emotional context has contributed to these disparate findings.

Emotions Differentially Direct Our Attention, Memory, and Thinking

Negative emotions are purported to make memory recall more specific and accurate (see review by Kensinger, 2007), while positive emotions are purported to activate heuristic responding, which leads to more of a "big picture" focus (Bohanek, Fivush, & Walker, 2005; Bohn & Berntsen, 2007; Levine & Bluck, 2004; Kensigner & Schacter, 2006). Additionally, positive emotion increases the ability to be cognitively flexible in shifting attention to attend to the needs of the environment (Dreisbach & Goschke, 2004; Friedman & Förster, 2005). On the other hand, sadness leads to more of a focus on the details and minutia of events rather than the big picture (Clore, Schwarz, &

Conway, 1994). Therefore, emotion can direct the object of attention and what is attended to, still allowing for the processing of information and new learning to occur during these emotional states unless there is interference (e.g., rumination) or a previous history of psychopathology. For instance, appraisal and expectations of emotional experiences, regardless of the actual emotion experienced at the time the event happened, can influence retrospective recall (Mitchell, Thompson, Peterson, & Cronk, 1997; Areni & Burger, 2008). There is a greater likelihood to remember survival-themes more so than non-survival themes (Nairne, Thompson, & Pandeirada, 2007). Additionally, the activation of self-relevant, negative self-schemas while depressed can impact the level of memory retrieval (such as Dreben, Fiske, & Hastie, 1979; Skowronski & Carlston, 1987; Dalgleish & Watts, 1990). Avoidance of negative emotions, through the form of rumination, thus changes the memory retrieval level.

Chronic, Habitual Negative Arousal and Dysregulated, Pathological Emotional Responding

The presence of chronic, negative emotional arousal, as in most psychopathology, will impact memory specificity retrieval (Philippot, Schaefer, & Herbette, 2003; Williams, Stiles, & Shapiro, 1999). This functions to protect the self from experiencing acute emotion associated with a specific memory by avoiding information that may disconfirm current working models of the self. However, processing emotional information at a specific memory level during an emotion induction was related to experiencing less emotional arousal than at an OGM-process level (standard emotional scripts were used as emotional stimuli; Schaefer & Philippot, 2005). This can be applied

to bereaved samples. Loss-related memory recall that is more specific occurs because of this negative emotional avoidance process. Avoiding negative emotions chronically creates more specific recall over time, paradoxically causing the loss-related information to be more readily accessed without deliberate, generative memory searches. Instead, direct memory retrieval of loss-related memories occurs similarly to an intrusive thought, especially for those experiencing more negative emotion states characterized by rumination and maladaptive social-cognitive processing efforts (Lepore & Revenson, 2007).

Emotion-Memory-Thinking Habits in PGD

Emotion and thinking interact reciprocally so that one can instigate the other (Genet & Siemer, 2012). The kind of thinking engaged in when a negative emotion is experienced, will depend upon whether memory retrieval is overgeneral and/or abstract, which can create an inward focus and increased negative affective arousal (Moberly & Watkins, 2008). Emotion and thinking processes interact to change thought temporality and memory retrieval, which will direct attention and goal-pursuit. The reciprocal relationship between emotion and thought can become narrowed and habitual, leading to a mood-state bias of expecting to feel more negative emotion in the future (Watkins, Grafton, Weinstein, & MacLeod, 2015). This emotional extrapolation can cause more negative, abstract, "why" thinking patterns which focus on the consequences of, and protecting oneself from, negative outcomes or negative emotions--narrowing behavior and diminishing engagement with social support due to these expectations.

The chronicity of these habitual repertoires appears to be at the heart of the issue. For instance, negative emotion and rumination reduced positive future thinking for depressed, hopeless adults who had developed a maladaptive response habit, compared to non-depressed, less hopeless adults (Lavender & Watkins, 2004). This suggests a cognitive vulnerability to developing mood disorders, such as depression (see MacLeod & Matthews, 2005). The relationship between mood and cognition changes with the development of more habitual cognitive-affective patterns. This cognitive vulnerability has been found for depression—mood and cognition relationships change due to the previous experience of depressive episodes (see MacLeod & Matthews, 2005). An entropic pattern--and unstable or inconsistent pattern of the relationship between negative mood and rumination--was explored in a daily diary study (Koster, Fang, Marchetti, Ebner-Priemer, Kirsch, Huffziger, & Kuehner, 2015). Entropy was related to negative mood and rumination elevations for those with previous depressive episodes. This effect occurred outside of current MDD diagnostic status, only when also accounting for diagnostic history. At a six-month follow-up, entropy predicted the brooding sub-type of rumination (versus the reflection subtype of rumination), in both the control group (never-depressed) and the remitted-depressed group (Koster et al, 2015).

This maladaptive response style in relation to negative emotions may also occur in the context of prolonged grief. A tendency toward dysphoria and difficulty attending to positive memories may likely cause protracted grief responses. Maccallum and Bryant (2011b) found that increased memory specificity recall in response to positive cue words were related to PGD symptom reduction after successful Cognitive Behavioral Therapy

(CBT) treatment. This was only the case for positive cue word-memory retrieval change after treatment; baseline memories did not predict treatment outcome nor symptom reduction. This suggests that failing to include emotion in experimental autobiographical memory studies is a serious oversight, particularly when attempting to understand how OGM functions after the loss of a loved one, as we see how positive and negative emotions impacts the valence of thinking, goal pursuit, and memory recall. Indeed, positive appraisals of self-identity information predicted future goals and self-oriented goals which then predicted psychological well-being for bereaved caregivers even 12 months after a loss. Alternately, a focus on the lost partner, and shorter-term life plans were related to negative appraisals and negative states of mind, which was related to depression (Maccallum & Bryant, 2008; Stein, Folkman, Trabasso, & Richards, 1997).

This pattern appears to hold when experiencing a loss of a loved one. Grief itself is a mixture of positive and negative emotions, and PGD diagnostic criteria include both positive and negative emotionally-laden symptoms (e.g., intense longing or yearning can be positive or negatively laden, as can frequent, occupying thoughts of the deceased; Prigerson et al., 2009). Thereby, it makes sense that findings have been mixed, especially when emotion has been excluded from empirical consideration until this point despite ABM's purported emotion regulating function. In a bereaved sample, individuals without PGD were less likely to experience negative emotions and engage with more benefit-finding repetitive thinking (Maccallum & Bryant, 2008). Those with PGD demonstrated biased recall of self-defining memories that had been linked to the lost loved one. Unhelpful yearning evoked by these memories increased this self-focused, identity-

searching process. Maccallum and colleagues theorized that dysphoric mood responses result in subsequent dysphoria when recalling memories of the deceased, creating more yearning for the lost comfort that used to be derived from the lost attachment relationship. Maccallum and Bryant (2013) proposed a cognitive attachment model for the development of psychopathology post-loss. Central to this model is the emphasis on identity. The authors described an imbalance between yearning and focusing on memories of the lost loved one over memories of the self.

Emotions as Predictor: Differentially Impacting Attention, Memory, Thoughts, Motivation and Behavior

Affect can act as both a stimulus and a response. In the framework, "affect as information" (Schwarz & Clore, 1983; Clore, Gasper, & Garvin, 2001), our affect is hypothesized to change how information is processed and how memories are accessed (Clore & Storbeck, 2006). The type of emotion connected to a memory will impact memory retrieval levels. For example, positive events tend to be more readily accessed and available than negative memories, generally (Bernstsen & Rubin, 2002; Levine & Bluck, 2004 for a review). However, some theorists suggest that negative emotion directs our attention to important stimuli to prevent loss in order to prevent goals from failing (e.g., Carver, 2004). Avoidance of negative emotions, or expected negative emotions such as those connected with rumination efforts, can change which level of memory is accessed (Buchanan, 2007 for a review). One's current emotional state can impact how a memory is retrieved, and emotions can occur as a result of retrieving a memory. There

are unique differences in between the attentional focus and motivational drivers, which act distinctly for each emotional state (see Levine & Pizarro, 2004).

Emotions differentially activate distinct parts of our brain and processing. Hence, the type of emotion connected to the memory can impact memory retrieval. Positive affect works at the top-down, heuristic, relational, level, recalling contextually rich, detailed levels of memory retrieval, and activating the hippocampus. Negative affect activates the amygdala, causing bottom-up processing that focuses on affectively rich, internal information such as emotions and rumination (Sharot, Delgado & Phelps, 2004). With positive emotions, there is no threat to attend to in the environment or internally, one's goals are obtained/unhindered, and one's role/identity is maintained. This allows for top-down assimilation of new information with existing mental representations of the world. Conversely, negative emotions signal a failure to achieve a goal or the experience of a loss, causing bottom-up processing to attend to the details of failure in order to avoid future failures (depending whether it's on loss, threat, or obstacle will differentially impact which details/memories are recalled; Levine & Pizarro, 2004). The amygdala is activated during negative emotion experiences, which suggests that a habitual avoidance of negative emotion would create a strongly valenced memory of emotion for an event (LeDoux, 1995).

For instance, happier memories were associated with reports of many peripheral, contextually rich details compared to a narrowing of attentional focus toward important, negative information when recalling negative memories (Berntsen, 2002). Each specific emotion adaptively influences the ease of retrieval and accessibility of information

associated with that emotion (i.e., sadness is due to a loss or goal failure, focusing on the consequences of the goal failure; anger occurs in regard to an obstacle in the way of achieving one's goals, focus shifts to the goal and the person impeding goal pursuit; see review by Levine & Pizzaro, 2004). For instance, anger has been associated with higher likelihood estimates of others intentionally causing harm, while sadness was associated with higher likelihood estimates of losses (DeSteno, Petty, Wegener, & Rucker, 2000). Additionally, Levine and Burgess (1997) found greater goal-related memories were evoked by angry emotions, while a focus on event outcomes occurred for sad emotions. OGM recall in depression has been associated with avoidance of intrusive memories to deaths or losses (Brewin, Watson, McCarthy, Hyman, & Dayson, 1998; Healy & Williams, 1999). Differential emotional coding, processing, and retrieval would evolutionarily be adaptive in responding to various emotion-eliciting situations. Psychopathology develops because avoidance changes the responding focus from emotional stimuli in the environment to an alternate, maladaptive focus on repeated emotional avoidance goals, which ironically keeps losses and past threats pre-potent on the mind (Behar, Zuellig & Borkovec, 2005). In PGD, direct retrieval of loss stimuli may maintain a focus on no-longer-relevant goal information related to the lost person. The decontextualized focus on the loss inhibits the accommodation and the encoding of new self-representation memory pathways related to new, post-loss life circumstances. Direct memory retrieval has been hypothesized to be less prone to conscious control efforts, inhibiting encoding of new information, inhibiting new or future goal pursuit, and

inhibiting accommodation of the loss into a new identity (Conway, Loveday, & Cole, 2016).

Emotions Differentially Impact Individuals Experiencing Psychopathology Symptoms

Only when emotion-based memory retrieval is obstructed by rumination is when there is a tendency toward drawing conclusions based on overgeneralized expectations because our memory is "captured" at an overgeneral level from rumination. If emotion, memory, past learning history, and rumination create truncated avoidance processes, impeding more fruitful coping efforts. Such as coping with thoughts and emotions that are occurring in real time, in the present moment, allowing reflection and adaptive processing of, and coping with, this new information. Instead, rumination has the effect of enhancing negative emotion related to memory cues, leading to increased avoidance of this enhanced negative emotions, through avoidance of these negative memory cues which overgeneralizes information about the self and the world, inhibiting adaptive coping (see Holland & Kensinger, 2012). We tend to remember things better that are more congruent with how we feel in the moment, for example the concept of state-dependent memory (see Laird, Wagener, Halal & Szegda, 1982). This can become a negative, decontextualized cycle of avoidance that can deter effective coping and maintain negative arousal.

Certain characteristics of thinking patterns in PGD, particularly rumination and worry, are more likely to create negative, unconstructive affect-regulation habits which may increase the likelihood of maladaptive memory retrieval habits. For example,

counterfactual thinking was studied in bereaved family members after the loss of a loved one for a sudden, unexpected motor vehicle accident or after Sudden Infant Death Syndrome. Counterfactual thinking about what could have been done differently to change the outcome, occurred for a range from shortly after the loss to up to 7 years later. Participants who reported more frequent counterfactual thinking to try to "undo" the traumatic event reported experiencing more distress, even when controlling for other ruminative thoughts (Davis & Lehman, 1995). The amount of engagement with counterfactual thinking can be a sign of non-acceptance of emotions, or getting stuck in disordered thinking habits, making recall of the loss more prepotent in those engaging in negative rumination habits. One's ability to socially-cognitively process the loss with social supporters is helpful in recovery. When stifled by disordered thought or memory loss, creates a greater likelihood to maintain negative affective habits. For example, in a sample of 44 bereaved adults, those who engaged in more frequent rumination, two years after a loss of a loved one, was related to social support ratings of potential supporters who wanted to avoid the bereaved person rather than comfort them (Capps & Bonanno, 2000). This was linked with protracted distress. Further, bereaved participants who experienced the co-occurrence of frequent, negative thoughts and feelings, with decreased self-agency were more likely to experience persistent grief symptoms two years later (Capps & Bonanno, 2000).

The grief literature is conflicted regarding whether the bereaved need to avoid or confront the loss for successful grief resolution. Traditional psychoanalytic and attachment theories suggest that we should not avoid thoughts and emotions related to the

loss. Instead, we need to engage actively with "grief work"--working through the loss--by expressing reactions to the death and experiences from before and after loss. Talking about the loss, however, is only one out of several ways to work through the loss, with the ultimate goal to extinguish continued attachment with the deceased and move on (Freud 1917/1954; Bowlby, 1980; Stroebe & Schut, 1999). From a trauma perspective, cognitive processing is necessary to accommodate and integrate the loss into new meaning structures (Horowitz, Wilner & Alvarez, 1979; Pennebaker, 1997; Greenberg, Wortman, & Stone, 1996). Instead of confronting the loss and doing the psychic work so that the griever cuts ties with the deceased in order to move on (i.e. "grief work"), the cognitive processing perspective suggests that verbal disclosure helps process the loss and restructure difficult or unhelpful thoughts about the loss.

Memories tied to the loss are less likely to be avoided in pathological responses to bereavement (Boelen, Huntjens, van Duersen, & van den Hout, 2010). This is contrary to other accounts that purport that loss-related stimuli and memories are avoided in PGD (Maccallum & Bryant, 2008). Pre-retrieval memory specificity did not predict treatment outcome of a 10-week CBT treatment for PGD. There was, however, a significant relationship between increased memory specificity retrieval in response to positive cues and PGD symptom reductions post-treatment (Maccallum & Bryant, 2011b). Delespaux and Zech (2015) found that high ruminators had impaired inhibition for grief-related information versus other negative and positive information/stimuli, which suggests that the OGM discrepancy in PGD may be more related to negative, grief-specific stimuli than just positive versus negative stimuli. In summary, learning history of truncated

avoidance processes and decontextualized responding interact with emotion to impact ABM retrieval, although it is necessary to clarify the relationship between the emotional impact of individuals experiencing higher symptoms.

Recall of negative memories or recall information congruent with negative mood demonstrated strongest amygdala activity in an fMRI memory task for those with a cognitive vulnerability for a depressive relapse (Ramel, Goldin, Eyler, Brown, Gotlib, & McQuaid, 2007). Recalling positive memories to regulate mood and make oneself feel better does not appear to work the same for those with a history of depression. Conversely, positive memory recall increased sad emotions for participants who were depressed, and did not change sad emotions for participants who had been formerly diagnosed with depression and were in remission. This suggests that perseverative recall of negative memories in combination with a history of mental disorder diagnosis, can impair the utilization of positive memory recall as an emotion regulation tool to enhance mood following recovery (Joormann, Siemer, & Gotlib, 2007; see also Josephson, Singer, Salovey, 1996). Negative emotions bias memory retrieval and impede more adaptive memory recall that could help to regulate emotions, but only in those who have a history of mental disorders. Further, in one study, it did not matter whether repetitive thinking was abstract or concrete, no differences in memory generalization occurred in students who had low dysphoria (van Lier, Vervliet, Vanbrabant, Lenaert, & Raes, 2014). This emphasizes the need to study mood and memory in relation to PGD symptom levels. Mood can change the function of emotion regulation aspects of memory retrieval, which

become ironical and habitually automatic and maladaptive for those experiencing psychopathology.

The Current Study

In PGD, the findings regarding the occurrence and function of OGM recall have been mixed. Some studies found increased ABM specificity for loss-related memories (Golden, Dalgleish, & Mackintosh, 2007; Boelen, Huntjens, van Duersen, & van den Hout, 2010), while other studies have found increases in OGM recall for loss-specific memories for those with PGD (Maccallum & Bryant, 2010a). These disparate findings are likely due to previous study designs failing to include an emotional context to account for differences across emotions which differentially impacts subsequent emotion regulation efforts such as rumination, functional avoidance, and overgeneral memory recall. If emotion, both positive and negative, can instigate and maintain future thinking (Ong, Bergeman, Bisconti & Wallace, 2006; Rook, 1990), then it is likely that emotional states occurring during grief can be implicated in mood-congruent memory recall. This mood-congruent recall can either enhance or impede functioning, leading either to successful recovery after a loss, or to the protracted rumination-emotion-avoidance patterns found to occur for individuals with PGD. Although ABM studies in PGD have discrepant findings, the literature concludes that either OGM recall works differently for PGD, or the lack of experimentally induced emotions as variable of study interest is likely contributing to these discrepant findings.

The current study will explore the role of emotion and high symptomatology on ABM retrieval in a group of grievers who have been randomly assigned to either a happy,

sad, or neutral video clip emotion induction group. We will utilize the SCEPT and the well-established coding scheme for memory specificity and loss-related versus non-loss related recall (see also Boelen et al., 2010a; Maccallum & Bryant, 2008; Eisma et al., 2015; Raes et al. 2007).

Further, as discussed earlier, the mixed findings in the ABM and grief literature may be due to the type of memory recall task utilized. The most common test, the Autobiographical Memory Task (AMT), may not be specific enough to observe changes in memory specificity in non-clinical populations. Raes et al. (2007, 2008) compared the AMT with the Sentence Completion for Events in the Past (SCEPT) and found that the SCEPT was a more sensitive indicator of memory retrieval than the AMT in non-depressed college students. The SCEPT has the added benefit of allowing for natural memory retrieval, as it would occur in real life.

The purpose of the current study is to explore the interaction between emotion-congruent memory specificity and loss-related memory recall in adjustment to bereavement, given that problems with autobiographical memory retrieval can halt the accommodation of loss into existing meaning and identity structures and interfere with subsequent adjustment. The current study will build on Eisma et al.'s (2015) work and utilize the SCEPT due to its specificity in non-clinical samples. However, the current study is novel in that it was the first to experimentally induce sad, happy, or neutral emotions in grievers to determine the impact of mood-state memory retrieval the ABM specificity and effect on subsequent emotional responses-- observing whether the level of memory recall is related to current PGD symptom severity levels. As emotion has not

been studied in this context before, hypotheses regarding emotion are exploratory in regards to the direction of the relationship hypothesized.

My specific hypotheses are as follows:

H1: Participants with high PGD symptoms:

1. Happy emotion group will evidence reduced specificity compared to neutral when controlling for MDD and PTSD
2. Sad emotion group will evidence an increase in specificity (more specific) compared to neutral when controlling for MDD and PTSD
3. Happy emotion group will evidence a decrease in loss-related memories compared to neutral when controlling for MDD and PTSD
4. Sad emotion group will evidence an increase in loss-related memories compared to neutral when controlling for MDD and PTSD

H2: Participants with low PGD symptoms:

1. Happy emotion group will evidence an increase in specificity (more specific) compared to neutral when controlling for MDD and PTSD
2. Sad emotion group will evidence reduced specificity (OGM) compared to neutral when controlling for MDD and PTSD
3. Happy emotion group will evidence an increase in loss-related memories compared to neutral when controlling for MDD & PTSD
4. Sad emotion group will evidence a decrease in loss-related memories compared to neutral when controlling for MDD & PTSD

Study Implications

Bereavement researchers are still uncertain as to which reactions after bereavement will predict the development of PGD. Treatments that have been created for PGD do not have a clear, or uniform mechanism of change. Cognitive restructuring (Boelen, van den Bout, van den Hout, 2006), existential meaning making (Neimeyer & Eisendrath, 2015), interpersonal processes (Shear et al, 2007), prolonged exposure (Shear et al., 2007; Boelen et al., 2007), changing negative meta-cognitions (Wenn, O'Connor, Breen, Kane, Rees, 2015) written emotional expression (Wagner, Knaevelsrud, & Maercker, 2006), and behavioral activation (Papa et al., 2013) treatments have been

proposed to treat PGD. These treatments appear to commonly target cognitive, emotional, social, and avoidance dysfunctions related to the loss and to re-engagement with meaningful identity-defining activities. To date, researchers are not clear regarding which treatment modality is most beneficial for a griever who is experiencing loss-related psychopathology. More clarity is needed, regarding how and why these treatments work (i.e., what exactly is targeted/changed), specifically for maladaptive grief reactions. Given the lack of consensus for a gold standard treatment for PGD, the need for effective treatments is essential. One thing that *is* clear is that we do not yet know enough about which reactions early after a loss lead to dysfunction. The commonalities of proposed treatments thematically center around interpretations of emotions, social behavior and perceptions, and the thoughts/appraisals about the loss the self. If the aims of the proposed study are achieved, our understanding of how ABM retrieval specificity functions to initiate, and maintain PGD will add valuable evidence to the literature regarding the origin of maladaptive responses to bereavement, which we can then link to specific treatment targets and moderators. It is imperative to obtain a fuller understanding the complex dynamics and causal processes that underlie PGD.

Methods

Participants

Participants (N = 327) experienced the loss of a loved one in the past 18 months, were at least 18 years old, fluent in English, and U.S. workers from Amazon's Mechanical Turk (MTurk) website. Power analyses for a 3x2 experimental study design with 6 groups, 3 covariates, and moderate effect sizes for linear regression analysis was

325 participants; N = 391 participants were initially collected--after data cleaning, this study had adequate sample size to power this study design, with final sample size of *N* = 327.

Participants were paid $3 to complete an online experimental emotion induction, autobiographical memory test, psychopathology screens, and demographic measures. The whole study took participants no more than 30 minutes to complete. Amazon's MTurk produces comparable responses across behavioral and in-person samples (Casler, Bickel, & Hackett, 2013). MTurk workers log into the Mechanical Turk website, which automatically lists jobs (HITs-Human Intelligence Tasks) that they can do to earn money for their Amazon account. When an MTurk worker chose our survey, she or he was directed to an online Qualtrics survey for data collection. Our survey had forced-choice responses to ensure minimal missing data. Participants could close her or his browser at any point to end the study. MTurk workers tend to be slightly younger and more educated in similar comparisons to the United States. For instance, in a study of grief commonalities across three different loss contexts conducted via MTurk, our mean sample demographics were comprised of an average age of 33 to 35 across samples, where 68-80% self-identified as Caucasian, and participants with bachelors educational level and above comprised 41 to 45% of our samples (Papa, Lancaster, & Kahler, 2014). These demographics were comparable to the current study's findings, see Table 1 for comparisons of sample characteristics.

Design

Once participants were screened and met study criteria, they were randomly assigned via the online survey system, Qualtrics, to either a happy, sad, or neutral, emotion induction condition. After psychopathology screens participants watched a short emotional film clip, then completed the Sentence Completion for Events in the Past (SCEPT; Raes et al., 2008) after the emotion induction. After the SCEPT memory task, participants were asked about their demographics and post-emotion ratings.

Procedure

Pre-manipulation. Amazon Mturk workers who met study criteria and consented to participate filled out psychopathology screens. Then, Qualtrics randomly assigned the bereaved participant to one of three emotion induction conditions: happy, sad, and neutral, balancing an equal number of cases across each condition.

Experimental Manipulation. The participants in the sad emotion condition received a sad emotion prime via an empirically validated approximately 3-minute film clip from *The Champ* (Gabert-Quillen, Bartolini, Abravanel Sanislow, 2015). During the empirical validation process, this film evoked sadness due to a death scene which produced a blend of emotions, but mostly sadness. Participants in the happy condition received a happy prime via an empirically validated 3-minute film clip from *When Harry Met Sally*, the "I'll have what she's having" scene. This clip was chosen due to successful elicitation of happy emotions in both men and women (Gabert-Quillen et al., 2015; Bartolini, 2011). Participants in the neutral control condition received a neutral emotion prime film clip that is frequently used and validated in several studies, *Alaska's Wild Denali*, narrated nature scenes of the national park (Schaefer, Nils, Sanchez, Philippot,

2010; Gross & Levenson, 1995; Rottenberg, Ray, & Gross, 2007). Instructions were provided and participants watched their randomly assigned film clip, all three of which are similar in emotion intensity ratings and length (Gabert-Quillen et al., 2015; Schaefer et al., 2010; Ellard, Farchione, & Barlow, 2012).

Post-manipulation. After the film clip was finished, participants took the SCEPT autobiographical memory test. Then, they were asked for demographics and given an emotion ratings scale as a manipulation check for emotion induction. Participants were thanked and compensated $3 for their time upon completion.

Measures

Outcome Measures. The two outcome variables are: 1) autobiographical memory specificity level (% of specific memories recalled), and 2) the number of memories that were related to the loss (% of loss-related memories recalled). These were derived by coding responses to the *Sentence Completion for Past Events Scale* (SCEPT; Raes et al., 2007). It is comprised of 11 sentence stems referring to events in the past for the participants to fill-in with their own memories. Examples of sentence stems are: "I still remember well how/that I….." , "Last year I….." , and "I can still picture how…." . The SCEPT involves having participants complete 11 sentence stems without repeating any memories.

Memory specificity was coded from these responses (D. Hermans et al., 2008). The first author and an advanced bachelors-level research assistant individually coded all responses into four memory categories: *Specific* is a particular event that took place on a particular(specific) day; *categoric* is a series of repeated events; and *extended* is an event

that lasts more than 1 day (Maccallum & Bryant, 2010b; Boelen et al., 2010; Eisma et al 2015), semantic associates (a verbal response that does not contain a memory) and omissions (no response; see Raes et al., 2007; Schoofs, Pabst, Brand, & Wolf, 2013; see the Appendix for the SCEPT and examples of each category of memory). The percentage of *specific* memories recalled was used as an outcome variable.

Similar to past ABM studies in bereavement, we also coded for whether the memories retrieved were *loss-related* and *non-loss related,* using the techniques defined in Boelen et al., (2010) and Eisma et al. (2015). *Loss-related* was defined as memories or events associated with the death, or the deceased, or an aspect of the grief experience, and *non-loss* memories were all remaining memories which do not refer to the loss. This coding system is the same or very similar to other ABM studies in bereavement. The percentage of *loss-related* memories recalled was used as the second outcome variable.

Predictor Measures. There are two predictor conditions. Random assignment to emotion group (happy, sad, neutral), and grief symptom severity levels.

Manipulation Check: Pre-emotion ratings. Participants filled out an emotions adjective checklist after the autobiographical memory SCEPT task at the end of the study. This served as a manipulation check for the emotion-induction, utilizing the positive/negative emotion rating list that is often used in experimental bereavement studies (see Bonanno, Papa, O'Neill, Westphal, & Coifman, 2004; Westphal, Seifert, & Bonanno, 2010). Participants rated how much they experienced negative emotion (sadness, anger, grief, distress, and disgust/revulsion) on a Likert-type scale from 1 (*no emotion*) to 7 (*extreme emotion*); and how much they experienced positive emotion

(happiness, amusement, joy, interest, and excitement) on a Likert-type scale from 1 (*no emotion*) to 7 (*extreme emotion*). Emotion ratings total scale demonstrated a fair alpha for the current study sample (α = .63; 10 items; *M* = 23.96, *SD* = 8.29). The items were spilt into two subscales, a positive emotion subscale, which demonstrated strong internal consistency (α = .92; 5 items; *M* = 12.92, *SD* = 7.37) and a negative emotion subscale which demonstrated good internal consistency (α = .90; 5 items; *M* = 10.99, *SD* = 7.36).

Psychopathology Symptoms: Grief symptom severity is another predictor variable, which was measured utilizing the Prolonged Grief Disorder inventory, PG-13, (Prigerson, Vanderwerker, Maciejewski, 2007) which consists of 13 items that use a 5-point scale (1= *not at all* to 5= *several times a day/overwhelmingly*) to assess for pathological grief responses (i.e., "In the past month, have you felt yourself longing or yearning for the person you lost?; "Have you had trouble accepting the loss?"). It has demonstrated good internal consistency (α=.85). Psychometric validity is similar to Persistent Complex Bereavement Disorder measures and will be used as the criteria for *Prolonged Grief Disorder* in the upcoming ICD-11 (See Maciejewski, Maercker, Boelen, & Prigerson, 2016). The PG-13 demonstrated strong internal consistency in the current sample (α =.94; 11 items, *M* = 28.52, *SD* = 10.53). According to findings in Papa et al. (2014), factor scores for PGD, PTSD, and MDD were created using the confirmatory factor analysis loadings, separating the distinct symptoms of the PG-13, PCL-S, and PHQ-9 (see below), parsing out the items that were unique and non-overlapping for each measure across the three loss samples. The grief factor from Papa et al. (2014) included items: 1) Intense longing or yearning for deceased, 2) Intense feelings of emotional pain,

sorrow, or pangs of grief, 3) Feeling stunned, shocked, numb or dazed by the loss, and 4) difficulty accepting the loss. The grief factor for this study sample demonstrated strong internal consistency of (α = .90; 4 items; *M* = 11.47, *SD* = 4.08). Grief symptom severity was measured by the presence of high and low grief symptoms, utilizing a robust analysis of grief parsings, given the lack of standardized way to measure grief (Smid & Boelen, 2016). See the data analysis strategy section below.

Covariates. *PTSD symptoms*: PTSD checklist for a Specific event, the PCL-S, has been shown to have comparable psychometric properties to other PTSD scales, and internally consistent and reliable, and valid, even in non-clinical samples (Weathers, Huska & Keane, 1991; Weathers, Litz, Herman, Huska & Keane, 1993; Ruggiero, Del Ben, Scotti, & Rabalais, 2003; Hoge, Riviere, Wilk, Herrell, & Weathers, 2014). The PCL-S demonstrated strong internal consistency in the study sample (α = .95; *M* = 39.69, *SD* = 15.16). The PTSD factor score based on Papa et al. (2014) included items: 1) Acting or feeling as if a stressful experience from the past was happening again, 2) Emotional distress due to reminders of a stressful experience, 3) Having physical reactions to reminders, 4) Avoiding thought and/or feeling associated with a stressful experience, 5) Avoiding activities or situations associated with a stressful experience, 6) Irritability or angry outbursts, and 7) Feeling jumpy or easily startled. (Papa et al., 2014). The PTSD factor items had a strong reliability of (α = .89; 7 items; *M* = 16.57, *SD* = 6.38) in the current sample.

Depressive symptoms: Patient Health Questionnaire-9 (PHQ-9; 9 items; α=.92; Kroenke, Spitzer & Williams, 2001) is a widely-used, brief diagnostic screen of

symptoms of a depressive episode. The PHQ-9 showed strong internal consistency in this study of (α = .91; *M* = 8.09, *SD* = 6.15). The MDD factor score based on Papa et al. (2014) included the following items: 1) Little interest or pleasure, 2) Feeling down, depressed, or hopeless, 3) Trouble falling or staying asleep, or sleeping too much, 4) Feeling tired or having little energy, 5) Poor appetite or overeating. The PHQ-9 factor score demonstrated a good internal consistency of (α = .89; 5 items; *M* = 5.31, *SD* = 3.75).

Other measures. *Demographics*. After the SCEPT and post-emotion ratings, participants answered basic demographic information regarding age, gender, ethnicity, education, income.

Data Analysis Preparation and Plan

Data preparation. Data was cleaned for analysis. Initial data review involved screening for study inclusion criteria being met, and missing values.

Initial data cleaning. To ensure that those included in the final analysis met the study criteria, cases were reviewed to determine if participants experienced the death of a loved one. Initial data collection had an N = 391. An initial sweep removed two cases for pet death, one for vague "loss of family member," one for "professional-relationship" death. Two cases did not specify whether they had experienced the death of someone and were excluded. Two cases were removed due to bad data (e.g., one-word answers or repeating answers across item-responses) on the outcome autobiographical memory measure, Sentence Completion for Events in the Past (SCEPT). Six cases were removed after review of the index traumatic event that was reported on the PCL-S--cases that

included an unrelated trauma *and* those that did not meet the study criteria of the loss occurring within the past 18 months, were removed. A further 43 cases were removed due to length of time since loss taking place longer than the 18-month inclusion criteria cut-off. From self-reports and manipulation check assessing which video clip participants saw, eight cases were removed because the emotion induction film clip had a technical malfunction and failed to work. A total number of 64 cases were removed initially. The new sample number after cleaning was $N = 327$.

Data Analysis Plan

Descriptive statistics. Descriptive statistics and frequencies were used to compare sample characteristics. SPSS version 24 was used to review sample and study characteristics, as was R version 3.3.3 using the stats package version to run all analyses.

Correlations. Multicollinearity was checked to determine the strength of relationship between psychopathology measures to assess level of correlational overlap.

Outcome measures. All responses to the SCEPT Autobiographical memory test were coded by the first author (JK), and a research assistant (TH). We completed consensus coding for any items that differed for the categories of OGM versus specific memories, and loss-related versus non-related memories. These coding outcomes were quantified and calculated, producing a percentage of specific memories, percentage of OGM memories, percentage of loss-related memories, and percentage of non-loss related memories. Omissions and invalid responses were excluded from these calculations. There was strong agreement between raters, with an inter-rater reliability of $\kappa = .92$. Any items where there were disagreement were reexamined together and a consensus was talked

through and agreed upon, with final agreement at 100%. *Specific* and *loss-related* memories are the two outcome variables included in the regression models. Preliminary analyses of memory recall percentages suggested the inverse of specific memories were the same as OGM memories, hence we replicated the trend in the literature and used *specific* memories and *loss-related* memories as our two outcome variables (Eisma et al., 2015).

The s*pecific* outcome variable was normally distributed and hence was analyzed using sequential, multiple linear regression analyses. However, the *loss-related* outcome variable was bimodal. This required parsing this dependent variable into a dichotomous variable to account for the two groups identified by the bimodal distribution. Due to having a dichotomous dependent variable, logistic regression was used to analyze the *loss-related* outcome variable. Binary logistic regression was used for membership prediction of categorical outcomes (Field, 2013, p.313). We initially split this variable at 10% loss-related recall and 90% loss-related recall, however the number of participants in each cell were too low, which lead to violating the assumption of no separation in logistic regression and hence compromising the integrity of the model. Thus, we used 50% loss-related memories categorization designation grouping in our final model (which a visual inspection indicated was the midpoint between the two distributions/modes).

Emotion manipulation. Regression analyses were run for emotion manipulation checks, using the positive and negative emotion scale self-report ratings. An ANOVA was run to assess the main effects of emotion condition for the Specific outcome variable, all terms were included in the model.

Predictor measures. Given the lack of consensus on how to parse grief symptomatology, this study's results required a systematic treatment of the data in order to better understand whether the data analysis will provide robust effects depending on the manner in which the *high* and *low grief* variable is defined. To avoid errors in interpreting results, a rigorous treatment of the main predictor variables required further exploration than initially planned. Originally, the preliminary data analysis plan for the main hypotheses was to group the predictor variable, PGD symptoms, into two dichotomous groups of high grief and low grief, dummy coded into high grief = 1, low grief = 0.

However, upon further examination of the bereavement literature, no consistent definition or statistical rule regarding this dichotomization arose (see Smid & Boelen, 2016). As such, a systematic exploration of the previously unanswered question of high versus low grief groupings must be answered, as it is an inherent research question posed by this study design. Hence, the data analytic plan consisted of parsing the grief severity predictor variable four different ways, to determine whether there is a difference in the ABM outcome variables depending on the type of grief symptom predictor variable grouping. First, we used PGD as a summed continuous variable from the PG-13 scale, mean centered. Second, we used the Papa et al. (2014) PGD factor items, summed and mean centered. Third, this study sample's PG-13 scores were used to create a clinical cut-off. Using the histogram of the PG-13 for our sample, we added the *SD* to the mean in order to create a clinical cut-off; the cut-off for our sample was 39. Finally, using PGD

diagnostic criteria, we grouped those who meet diagnostic criteria versus those who do not meet criteria.

Emotion group predictor condition. A second predictor variable was included in the analyses, emotion group. Emotion induction group assignment was dummy coded with neutral as the reference group which was included in the main effect step of the regression model. During the manipulation check, we found that the *sad emotion group* was significantly different than neutral, but the *happy emotion group* was not significantly different than neutral. Hence, we created a separate variable, comparing the sad emotion group with the happy emotion group as the reference group. Analyses were run with the sad versus neutral and happy versus neutral variables; the sad versus happy variable was included in some analyses instead. Findings from both types of emotion variable groupings are reported in the results section below.

Covariates. We explored the question of whether grief and emotion condition predict memory recall after controlling for MDD and PTSD impact the findings by analyzing these symptoms in four different ways. First, we summed and mean-centered the PHQ-9 and PCL-S scales to include in the regression models. However, prior research has noted that the PG-13, PHQ-9, and PCL-S scale scores highly overlap (Papa et al., 2014). Again, we utilized Papa et al.'s (2014) findings which separate the unique symptoms for each diagnosis that do not overlap with each other in prolonged grief, depression, and posttraumatic symptoms. Third, MDD and PTSD was dichotomized into high and low symptoms using cut-offs from the literature. The PHQ-9 cut-off of 10 and above classified as moderate clinical depression (coded as 1 for whether and individual

meets cut-off indicating the presence of MDD with a score greater than or equal to 10; a score of 9 or below is coded as 0 for does not meet MDD cut-off). The PCL-S cut-off is 50 and above classified as moderate clinical PTSD (coded as 1 for whether and individual meets cut-off indicating the presence of PTSD with a score greater than or equal to 50; a score of 49 or below is coded as 0, for does not meet PTSD cut-off). Finally, for whether a participant meets PTSD and MDD diagnostic criteria for those meeting time period criteria, severity levels, and disruptions in functioning, we used the scale-specific diagnostic instructions to determine whether a participant met diagnostic criterion, resulting in a variable comparing those who meet diagnostic criteria for PTSD or MDD (coded yes=1), and those who do not meet diagnostic criteria for PTSD or MDD (coded no=0).

Excluding MDD. During preliminary analyses, MDD did not significantly add to any model and did not have any significant findings for the specific memory models. MDD was removed from some analyses, in order to allow more predictive power to detect differences in the model. MDD was included in the loss-related analysis, however, as it tended to show an effect for loss-related recall.

Loss Group. Descriptive statistics indicated that from the different types of losses, a pattern emerged grouping the losses into more immediate family with more intimate relationships (i.e., a partner, child, parent, or sibling) versus those with extended family losses with less intimate relationships (i.e., a grandparent, cousin or an extended family member, or friend). Creation of a *loss group* variable with these two groups were included in regression analyses to determine whether loss type had a significant impact

on findings. Those who lost a parent, child, sibling, spouse, girlfriend, boyfriend, or fiancé were coded as 1, while those who reported losing a grandparent, friend, or extended family member were coded as 0. An independent, two sample t-test analysis suggested there was a significant difference by loss group for loss-relatedness memories outcome variable (t = -2.7, df = 320, p < .01). Separate regression analyses were conducted on each loss group to determine if results would differ dependent on loss type. Ultimately, the loss type was included in models for both the specific regression analysis and the loss-related logistic regression analysis but did not impact the results and were not included in final models for either dependent variable.

Other measures. An emotion checklist from Bonnano et al. (2004) was used at the end of the survey as a manipulation check. Subscales of positive and negative emotions were created and used to determine if our emotion manipulation was successful for inducing negative emotions in the sad group and positive emotions in the happy group.

Regression Analysis Hypothesis Testing

Sequential multiple linear regression models were analyzed to test the hypothesis that grief symptom levels and emotion condition (happy and sad) interact to impact memory retrieval specificity. Sequential logistic regression models were analyzed to test the hypothesis that PGD symptom levels and emotion condition interact to impact loss-related memory recall.

First, preliminary analyses were conducted to determine the most appropriate parsing of the high/low grief predictor variable. Finally, emotion groupings were

explored with both neutral as the reference group, and by eliminating the neutral group completely and exploring happy as the reference group compared to sad group. All of these analyses will be reported for both the specific and loss-related outcome variables below.

In each regression model MDD and PTSD (and loss group) were included on Step 1 to control for the variance accounted for by these predictors. Step 2 included the main effects of PGD symptomatology and emotion induction conditions (happy versus neutral and sad versus neutral; or sad versus happy) and Step 3 included the interaction terms between grief symptom levels and emotion. Continuous predictor/covariates were mean centered for ease of interpretation of a meaningful zero and to minimize multicollinearity with moderation analysis (Aiken & West, 1991).

Assumptions were tested for each model. Normality of residuals was tested by examining the histograms, q-q plots, and skew values of the residuals for each model. Homogeneity of variance was tested by examining the spread-level plots and non-constant variance tests for each model. Multicollinearity was assessed to ensure there were no VIF values greater than 5, with the condition index of less than 30.

Outliers were removed following recommendations by Tabachnick and Fidell (2007), with outliers with a high Cook's distance, and removal of all outliers which heavily influenced results from the final model used for analysis. Scatterplots of the residuals and predicted values were visually assessed for whether there was a standardized residual value beyond +/-3, and Cook's distance. Each model was tested

with and without the case if a potential outlier was suspected, to ensure retention of the case unless it was influencing the results and required removal.

Any significant interactions were analyzed with simple slope analyses (Aiken & West, 1991; Preacher, Curran, & Bauer, 2006; Seery, Holman, & Silver, 2010).

Power Analysis. Power analysis was run using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) based on a sequential multiple linear regression model. There will be 9 predictors (3 main effects for emotion condition (sad vs. neutral; happy vs. neutral; high vs. low grief), 4 interactions: high x sad; high x happy; low x sad; low x happy); and 2 covariates (MDD and PTSD). With medium effect sizes (measured with Cohen's *f^2* = .15), *N* = 325. The final *N* of 327 provided excellent power for the model to test study hypotheses, with post-hoc G*Power analysis with a power of .99 to test the study's hypotheses.

Results

Descriptives

In the sample of 327 bereaved participants, 49.1% were female, and 50.9% were male. The mean age of our sample was 34.75 (*SD* = 9.77) years of age, ranging from 20 to 73- years- old. The demographics of the current study are similar to the sample characteristics in the Papa et al. (2014) study (see Table 1 for a comparison of participant demographics). Ethnicity of participants was predominately Caucasian (78.5%), followed by those who self-identified as black/African American (8.3%), then Latino/Hispanic (5.8%), and Asian/Pacific Islander (4.3%). Two people (.6%) identified as multiracial, yet 15 people (4.6%) checked multiple-ethnicity categories, suggesting multi-racial

status, and one person (.3%) declined to answer. Income of the participants ranged from $20,000 or less to $150,000 or more, with 33% of the sample reporting an income of $40,000 to 69,000. Over half of our sample endorsed obtaining post-secondary education, with 50.3% reporting obtainment of a college degree or higher. Demographics of the current study are comparable to previous studies conducted with bereaved samples on MTurk (Papa et al., 2014). Study demographics are shown in Table 1.

Table 1

Sample Characteristics

	Papa, Lancaster, Kahler (2014) (*N* = 151)	Full Sample (*N* = 327)		Immediate Family Loss Group (*n* = 216)		Extended Family Loss Group (*n* = 111)	
Variable	% of *N*	*N*	% of *N*	*n*	% of *N*	*n*	% of *N*
Age	*M* = 34.84, *SD* = 12.44, Range = 18-71	*M* = 34.75, *SD* = 9.77, Range = 20-73		*M* = 36.83, *SD* = 10.29, Range = 21-73		*M* = 30.62, *SD* = 7.31, Range = 20-60	
% Female	58.9%	161	49.2%	114	52.8%	47	42.3%
Ethnicity/Race							
White/Caucasian	68.10%	270	78%	176	81.5%	79	71.2%
Black/African American	7.98%	29	8.3%	13	6%	14	12.6%
Latino/Hispanic	4.29%	21	5.8%	11	5.1%	8	7.2%
Asian/Pacific Islander	4.91%	17	4.9%	11	5.1%	5	4.5%
Native American/Indian	2.45%	6	1.8%	4	1.9%	2	1.8%
Multiracial	4.91%	15	4.6%	10	3.5%	5	1.9%
Not identified	7.36%	1	0.3%	0	.0%	1	.3%
Education (U.S. percentages[a])							
Some high school (8.58%)	0.62%	0	0% GED=1.2%	0	0% GED=.9%	0	0% GED=1.8%
High school diploma (30.01%)	13.20%	31	9.5%	21	9.7%	10	9.0%
Some college (19.46%)	28.30%	61	24.8%	48	22.2%	33	29.7%
Associate's degree (18.44%)	16.98%	49	15%	32	14.8%	17	15.3%
4-yearcollegedegree	30.82%	127	38.8%	93	43.1%	34	30.6%
Master's/professional degree (16.63%)	8.81%	31	9.5%	18	8.3%	13	11.7%
Doctoral degree (2.68%)	1.26%	4	1.2%	2	.9%	2	1.8%
Symptoms							
PG symptoms PG-13 total score (*SD*)	29.85(11.06)	28.52(10.53) Range: 11-55		30.23(10.36) Range:11-55		25.20(10.09) Range:11-51	

Probable number that meet PGD dx criteria	26 (15.95%)	52	15.9%	43	19.9%	9	8.1%
GRIEF factor total score (*SD*)	12.65(4.53)	11.47(4.08) Range:4-20		12.29(3.98) Range:4-20		9.87(3.79) Range:4-19	
PTSD symptoms PCL-S total score (*SD*)	38.61(16.98)	39.69(15.16) Range: 17-79		41.11(15.36) Range: 17-79		36.91(14.42) Range:17-70	
Number over PSTD clinical cut-off of 50	42(28%)	90	28%	64	29.6%	26	23.4%
Probable number that meet PTSD dx criteria	52(31.9%)	132	40%	95	44%	37	33.3%
PTSD factor total score (*SD*)	11.32(5.17)	16.57(6.38) Range:7-32		17.12(6.27) Range:7-32		15.50(6.47) Range:7-32	
Depression symptoms PHQ-9 total score (*SD*)	9.13(7.08)	8.09(6.15) Range:0-26		17.12(6.27) Range:0-26		7.33(6.02) Range:0-23	
Probable number that meet MDD diagnostic criteria cut-off of 10	39 (23.9%)	122	37%	83	38.4%	39	35.1%
MDD factor total score (*SD*)	4.52(3.40)	5.31(3.75) Range: 0-15		5.56(3.77) Range:0-15		4.80(3.67) Range: 0-15	

Note. [a]U.S. Census Bureau, Current Population Survey, 2012 Annual Social and Economic Supplement. A. Papa et al., *Journal of Affective Disorders 161*(2014)136–143. *Loss groupings:* Immediate loss group consists of loss of parent, child, sibling, or significant other. Extended family loss group consists of grandparent, cousin, aunts/uncles, or friend.

Loss characteristics of participants are displayed in Table 2. A pattern emerged suggesting that from all of the different loss types there were two main loss groups. The first loss group, with 66% of participant loss characterized by immediate family relationships of a close loved one, such as a romantic partner, parent, child, or sibling; with the second loss type, with 34% of participant loss characterized by extended family relationships, such as a grandparent, a cousin, an aunt or uncle, or a friend. For overall loss type, the loss of a parent was the most common loss type (53%), followed by grandparent (17.4%), extended family member (8.9%), and significant other (7%).

Table 2

Loss Characteristics

Type of Loss	***N***	**% of *N***
Parent	172	53%
Child	9	3%
Sibling	12	3.7%
Grandparent	57	17.4%
Spouse/Partner	17	5.2%

Boyfriend/Girlfriend	6	1.8%
Extended Family member	29	8.9%
Friend	25	7.6%
Loss Group	***N***	**% of *N***
Immediate Family Loss Group: Parent; Child; Sibling; Spouse/Boyfriend/Girlfriend	216	66%
Extended Family Loss Group: Grandparent; Extended family member; Friend	111	34%

Most deaths were reported as unexpected yet non-violent, with daily to weekly contact with the deceased before the loss. Participants reported that for the expectedness of the death, 60.9% of the losses were unexpected (37% reported the death as expected), with 77.4% reporting a non-violent death, the most common death being due to an illness (45.2%), then an accident (18.3%), then natural causes (16.5%). Most losses occurred within the past six to 11 months, with 7% of participants endorsing a loss that occurred 12 to 18 months ago. A third of participants endorsed interacting with the deceased daily (33.9%), followed by a couple of times a week (26.1%). Symptoms by loss characteristics are displayed in Table 3.

Table 3

Symptoms and Loss Characteristics

	Full Sample (*N* = 327)		Immediate Family Loss Group (*n* = 216)		Extended Family Loss Group (*n* = 111)	
Variable	*N*	% of *N*	*n*	% of *N*	*n*	% of *N*
Diagnostic Criteria						
Above PGD cut-off	68	20.8%	57	26.4%	11	9.9%
Below PGD Cut-off	259	79.2%	159	73.6%	100	90.1%
Meets PGD Diagnosis Criteria	52	15.9%	43	19.9%	9	8.1%
Does Not meet PGD Diagnosis	275	84.1%	173	80.1%	102	91.9%
Meets PTSD criteria	132	40%	95	44%	37	33.3%
Does Not meet PTSD criteria	195	60%	121	56%	74	66.7%
Above PTSD cut-off	90	28%	64	29.6%	26	23.4%
Below PSTD cut-off	237	72%	152	70.4%	85	76.6%
Meets MDD criteria	65	20%	47	21.8%	18	16.2%
Does Not meet MDD criteria	262	80.1%	169	78.2%	93	43.1%
Above MDD cut-off	122	37%	83	38.4%	39	35.1%

Below MDD cut-off	205	63%	133	61.6%	72	64.9%
Death Characteristics						
Death Illness greater than 1 month	145	44%	99	45.8%	46	41.4%
Death Illness less than 1 month	86	26%	53	24.5%	33	29.7%
Death Not Illness related	96	29%	64	29.6%	32	28.8%
Violent Death	69	21%	41	19%	28	25.2%
Non-Violent Death	256	78%	174	80.6%	82	73.9%
Expected Death	121	37%	73	33.8%	48	43.2%
Unexpected Death	206	63%	143	66.2%	63	56.8%
Length Since Loss						
6 to 11 months	297	91%	201	93%	96	86.5%
12 to 18 months	30	9%	15	6.9%	15	13.5%
Nature of Death						
Accident	5	16%	33	15.3%	20	18%
Illness	140	43%	96	44.4%	44	39.6%
Suicide	4	1%	6	2.8%	6	5.4%
Homicide	69	21%	2	.9%	2	1.8%
Natural Causes	29	9%	56	25.9%	13	11.7%
Old Age	20	6%	8	3.7%	21	18.9%
Other	53	16%	15	6.9%	5	4.5%
Contact before Death						
Daily	122	37%	104	48.1%	18	16.2%
Couple times a week	89	27%	54	25%	35	31.5%
Weekly	47	14%	30	13.9%	17	15.3%
Couple times a month	33	10%	13	6%	20	18%
Once a month	12	4%	4	1.9%	8	7.2%
Couple times a year	.24	7%	11	5.1%	13	11.7%
Level of Education						
High School Diploma	31	9.5%	21	9.7%	10	9.0%
GED	4	1.2%	2	.9%	2	1.8%
Some College	81	24.8%	48	22.2%	33	29.7%
Associate's Degree	49	15%	32	14.8%	17	15.3%
4-year College	127	38.8%	93	43.1%	34	30.6%
Master's Degree	31	9.5%	18	8.3%	13	11.7%
Doctoral Degree	4	1.2%	2	.9%	2	1.8%
	Full Sample *N* = 327		**Immediate Loss *n* = 216**		**Extended Loss *n* = 111**	
	N	% of *N*	*n*	% of *N*	*n*	% of *N*
Income						
$20k and less	48	13.7%	28	13%	20	18%
$21k to $39k	80	24.5%	49	22.7%	31	27.9%
$40k to $69k	109	33.3%	73	33.8%	36	32.4%
$70k to $99k	62	19%	48	22.2%	14	12.6%
$100k to $150k	19	5.8%	12	5.6%	7	6.3%
$150k and greater	9	2.8%	6	2.8%	3	2.7%
Gender						
Female	161	42%	114	52.8%	47	42.3%
Male	166	58%	102	47.2%	64	57.7%
Ethnicity						
Asian/Pacific Islander	17	4.9%	11	5.1%	5	4.5%
Black	29	8.3%	13	6%	14	12.6%
Latino Hispanic	21	5.8%	11	5.1%	8	7.2%
Native American	6	1.8%	4	1.9%	2	1.8%
White	270	78%	176	81.5%	79	71.2%
Multiracial	15	4.6%	1	.5%	1	.9%

			(10 marked multiple ethnicities)		(5 marked multiple ethnicities)	
Other	1	.9%	0	0%	1	.9%
Did not respond	1	.9%	0	0%	1	.9%
Emotion Condition						
HAPPY Condition	115	35.2%	75	34.7%	40	36%
SAD Condition	107	32.7%	68	31.5%	39	35.1%
NEUTRAL Condition	105	32.1%	73	33.8%	32	28.8%

Study variables' means and standard deviations are displayed in Table 4. The continuous symptom variables were highly correlated with each other. With regards to symptomatology, a total number of 52 participants endorsed PGD symptomatology that met diagnostic criteria (15.9%), consistent with previous studies (Papa et al., 2014 with 15.95%). When utilizing the cut-off criteria grouping, there were more participants who met the PGD cut-off criteria than diagnostic criteria, with 68 (20.8%) participants meeting or exceeding our sample-specific cut-off of 39 on the PG-13 scale.

Table 4

Means and Standard Deviations of Study Variables

Measures	Mean	SD	# items	α	Range
PG-13	28.52	10.53	11	.94	11 - 55
Grief_factor (Papa et al., 2014 items)	11.47	4.08	4	.90	4 - 20
PCL-S	39.69	15.16	17	.95	17 - 79
PTSD_factor (Papa et al., 2014 items)	16.57	6.38	7	.89	7 - 32
PHQ-9	8.09	6.15	9	.91	0 - 26
MDD_factor (Papa et al., 2014 items)	5.31	3.75	5	.89	0 - 15
Positive Emotion Ratings	2.60	1.49	5	.92	0 - 7

Negative Emotion Ratings	2.22	1.48	5	.90	0 - 7

Note. PG-13 = Prolonged Grief – 13 scale; PCL-S = Posttraumatic Stress Disorder Checklist – Specific Event; PHQ-9 = Patient Health Questionnaire-9. # items = the number of items used from the scale in analysis. α = alpha of the scale for the current study's sample.

Randomization to emotion induction condition was successful, and occurred evenly across the three happy, sad, and neutral conditions. The sample was evenly distributed into thirds, for each of the three emotion inductions. In the happy emotion condition, there were 35.2% participants, 32.7% in the sad emotion condition, and 32.1% in the neutral emotion condition. Those who met PGD diagnostic criteria were 17% in the happy condition, 14% in the sad condition, and 17% in the neutral condition. A chi-square test revealed no significant difference in PGD classification by condition, $\chi^2(2,324) = .45$, $p = .80$. For those who met the PGD cut-off criteria, there were 21% in the happy condition, 19% in the sad condition, and 23% in the neutral condition. A chi-square test revealed no significant difference in PGD classification by condition, $\chi^2(2,324) = .56$, $p = .76$. See Table 5 for the descriptive statistics by each emotion induction category.

Table 5

Descriptives for each Emotion Condition

	Happy Condition (*n* = 115) 35%		**Sad Condition (*n* = 107) 33%**		**Neutral Condition (*n* = 105) 32%**	
Variable	***n***	**% of *N***	***n***	**% of *N***	***n***	**% of *N***
Diagnostic Criteria						
Above PGD cut-off	24	20.9%	20	18.7%	24	22.9%
Below PGD Cut-off	91	79.1%	87	81.3%	81	77.1%
Meets PGD Diagnosis Criteria	19	16.5%	15	14%	18	17.1%
Does Not meet PGD Diagnosis	96	83.5%	92	86%	87	82.9%
Meets PTSD criteria	52	45.2%	40	37.4%	40	38.1%
Does not Meet PTSD criteria	63	54.8%	67	62.6%	65	61.9%
Above PTSD cut-off	36	31.3%	26	24.3%	28	26.7%
Below PSTD cut-off	79	68.7%	81	75.7%	77	73.3%
Above MDD cut-off	47	40.9%	34	31.8%	41	39%
Below MDD cut-off	68	59.1%	73	68.2%	64	61%

Death Characteristics						
Death Illness longer than 1 month	31	27%	45	42.1%	47	44.8%
Death Illness shorter than 1 month	53	46.1%	31	29%	24	22.9%
Death Not Illness related	31	27%	31	29%	34	32.4%
Violent Death	25	21.7%	22	20.6%	22	21%
Non-Violent Death	89	77.4%	85	79.4%	82	78.1%
Expected Death	45	39.1%	41	38.3%	35	33.3%
Unexpected Death	70	60.9%	66	61.7%	70	66.7%
Length Since Loss						
6 to 11 months	157	93.1%	94	87.8%	96	91.5%
12 to 18 months	8	7%	13	12.1%	9	8.6%
Relationship with deceased						
Parent	60	52.2%	56	52.3%	56	53.3%
Child	2	1.7%	4	3.7%	3	2.9%
Sibling	2	1.7%	6	5.6%	4	3.8%
Grandparent	21	18.3%	16	15%	20	19%
Spouse/Partner	8	7%	2	1.9%	7	6.7%
Boyfriend/Girlfriend	3	2.6%	0	20%	3	2.9%
Extended Family	12	10.4%	8	7.5%	9	8.6%
Friend	7	6.1%	15	14%	3	2.9%
Loss grouping:						
Parent/Child/Sibling/Partner	75	65.2%	68	63.6%	73	69.5%
Grandparent/Friend/extended family member	40	34.8%	39	36.4%	32	30.5%
Nature of Death						
Accident	21	18.3%	17	15.9%	15	14.3%
Illness	52	45.2%	47	43.9%	41	39%
Suicide	2	1.7%	5	4.7%	5	4.8%
Homicide	2	1.7%	0	0%	2	
Natural Causes	19	16.5%	25	23.4%	25	23.8%
Old Age	11	9.6%	9	8.4%	9	8.6%
Other	8	7%	4	3.7%	8	7.6%
Contact before Death						
Daily	39	33.9%	38	35.5%	45	42.9%
Couple times a week	30	26.1%	37	34.6%	22	21%
Weekly	22	19.1%	13	12.1%	12	11.4%
Couple times a month	9	7.8%	9	8.4%	15	14.3%
Once a month	4	3.5%	4	3.7%	4	3.8%
Couple times a year	11	9.6%	6	5.6%	7	6.7%
Level of Education						
High School Diploma	13	11.3%	10	9.3%	8	7.6%
GED	1	.9%	2	1.9%	1	1%
Some College	32	27.8%	23	21.5%	26	24.8%
Associate's Degree	15	13%	22	20.6%	12	11.4%
4-year College	43	37.4%	42	39.3%	42	40%
Master's Degree	11	9.6%	7	6.5%	13	12.4%
Doctoral Degree	0	0%	1	.9%	3	2.9%
Education Categories						
College Degree or higher	61	53%	57	53.3%	58	55.2%
Associates Degree or below	54	47%	50	46.7%	47	44.8%
Income						
$20k or less	20	17.4%	12	11.2%	15	14.3%
$21-39K	25	21.7%	1	.9%	24	22.9%
$40-69K	42	36.5%	31	29.%	31	29.5%
$70-99K	20	17.4%	36	33.6%	22	21%
$100-150K	4	3.5%	5	4.7%	10	9.5%

$150K+	4	3.5%	2	1.9%	3	2.9%
Gender						
Female	56	48.7%	50	46.7%	55	52.4%
Male	59	51.3%	57	53.3%	50	47.6%
Ethnicity						
Asian/Pacific Islander	4	3.5%	7	6.5%	5	4.8%
Black	7	6.1%	8	7.5%	12	11.4%
Latino Hispanic	7	6.1%	6	5.6%	6	5.7%
Native American	2	1.7%	2	1.9%	2	1.9%
White	94	81.7%	83	77.6%	78	74.3%
Multiracial	1 (6 marked multiple ethnicities)	.9%	0 (5 marked multiple ethnicities)	0%	1 (4 marked multiple ethnicities)	1%
Other	0	0%	0	0%	1	1%

Participants tended to recall more overgeneral memories on average with the mean levels of OGM recall percentages of M = 71.62, SD = 17.10, than specific memory recall percentages of M = 28.39, SD = 17.07, $t(330) = 23.00$, $p < .001$. Most other studies have found that participants generally recall more overgeneral memories than specific memories (e.g., Robinaugh & McNally, 2013). Memories recalled where approximately half were loss-related, M = 45.44, SD = 31.08, with greater average recall of non-loss related memories, M = 54.21, SD = 31.18, $t(330) = -2.5$, $p = .01$. Post-hoc calculations indicated that specific memories that were also loss-related comprised M = 10.92, SD = 12.75 with greater recall of specific memories that were also non-loss related with M = 17.35, SD = 16.99, $t(330) = -4.7$, $p < .001$. See Table 6 for average percentages of autobiographical memory recall. Those who met criteria for PGD followed similar patterns of recall, except participants who met criteria for PGD recalled, on average, more loss-related memories, M = 54.77, SD= 30.14, than non-loss-related memories, M = 44.86, SD = 30.64; however, this was not a significant difference, $t(51) = 1.2$, $p = .2$. See Table 7 for average of autobiographical memory recall by loss type. Individuals reporting the loss of a boyfriend/girlfriend reported recalling more loss-related memories on

average, with $M = 68$, $SD = 37$, for loss of a spouse/partner and $M = 63$, $SD = 31$, followed by child loss recalling $M = 55$, $SD = 30$ loss-related memories. An analysis of variance revealed no significant difference in loss-related memories by loss type, $F(1,325) = 1.24$, $p = .27$.

Table 6

Autobiographical Memory Recall (%) Means and Standard Deviations

	Full Sample (N = 327)	Immediate Family Loss Group (n = 216)	Extended Family Loss Group (n = 111)	Meets PGD Diagnostic Criteria (n = 52)
Variable	*M*(*SD*)	*M*(*SD*)	*M*(*SD*)	*M*(*SD*)
Specific	28.44 (17.04)	28.33(17.00)	28.65(17.19)	30.14(17.64)
OGM	71.56 (17.10)	71.72(17.01)	71.26(17.25)	69.86(17.64)
Loss -related	45.74(31.08)	48.98(29.80)	39.42(32.65)	54.77(30.14)
Non-loss related	54.21 (31.18)	50.98(30.00)	60.49(32.58)	44.86(30.64)
Specific-Loss	10.92(12.75)	11.40(12.93)	10.02(12.41)	11.80(13.11)
Specific-Non-Loss	17.35(16.99)	17.06(16.90)	17.92 (17.21)	16.82(17.75)

Note. Autobiographical memory recall was collected using the Sentence Completion for Events in the Past (SCEPT), which consists of 11 items of sentence stems. Responses were coded as Specific, OGM (overgeneral memories), Loss-related, and Non-loss related. Hand calculations created percentages of memories recalled. Specific, loss-related memories and Specific, non-loss related memories were calculated post-hoc for memories that were specific and loss-related and those that were specific and non-loss related. Immediate family loss consists of those who reported losing a parent, child, sibling, or significant other. Extended family loss consists of individuals who reported losing a grandparent, cousin, aunt/uncle, or friend.

Table 7

Autobiographical Memory Recall (%) by Loss Type

	Specific Memories M = 28(17)	Loss-related Memories M = 46(31)
Variable	***M*(*SD*)**	***M*(*SD*)**
Parent	29(17)	49(30)
Child	26(16)	55(21)
Sibling	21(13)	41(23)
Grandparent	58(17)	40(34)

Spouse/Partner	26(17)	63(31)
Boyfriend/Girlfriend	34(12)	68(37)
Extended Family Member	33(18)	40(30)
Friend	25(17)	38(34)

Note. Responses to the Sentence Completion for Events from the Past (SCEPT) autobiographical memory recall task. Responses were coded into the percentage of Specific memories and Loss-related memories recalled. Means and standard deviations by loss type. There does not appear to be one loss type impacting results.

Data Analysis Results Considerations

Comparison of descriptives by loss group. As there were a large amount of people who endorsed the loss of a grandparent, friend, or extended family member (N = 111), compared to an immediate family loss of parent, child, sibling or significant other (N = 216), we compared the two loss groups, immediate family, and extended family. A two-sample t-test found significant differences between loss-group for the loss-related memory retrieval outcome variable ($t(320) = -2.70$, $p < .01$; $M_{extended} = 39.42$, $M_{immediate} = 48.98$). This would make sense given the degree of closeness in one's live to the lost loved one. Given this difference, we conducted analyses with loss group included as a covariate. Another significant difference was found by loss for Age using a Welch's two-sample t-test ($t(290) = -6.30$, $p < .001$; $M_{extended} = 30.62$, $M_{immediate} = 36.83$). Finally, while there were no significant differences by ethnicity, when recoding ethnicity as Caucasian versus all other ethnicities (Caucasian = 1, All Other = 0), there was a marginally significant difference by loss group in the two-sample t-test ($\chi^2(1, N = 327) = 3.60$, $p = .06$). This may be due to the large number in the Caucasian group in the immediate family loss group (N = 185) compared to all other (N = 31), while in the extended family, Caucasians (N = 85) while all other (N = 26).

Loss group analyses. Regression analyses were run with and without loss group. There were no significant findings to report for the specific memory outcome models and will not be included. These were run because descriptive statistics found a significant difference by loss group for the loss-related memories outcome variable. For logistic regression, we included loss group as a covariate. Ultimately, adding loss group in the logistic regression model for loss-related memories did not add anything additional to the predictive power of the model and hence was also not reported.

Effectiveness of the Emotion Induction Prime

Using multiple linear regression, we conducted a manipulation check. Results indicated that ultimately, the sad group was significantly different than neutral but the happy and neutral groups were not significantly different from each other.

Emotion group manipulation check with neutral as reference group (happy versus neutral, and sad versus neutral). After removing 1 case high on Cook's D distance, for positive emotion, the sad group evidenced a significant decrease in positive emotions (R^2 = .24, b = -1.30, t(322) = -7.3, p < .001), and the happy group had an increase in positive emotions, (b = .37, t(322) = 2.1, p < .05). For negative emotion, the sad group had an increase in negative emotion compared to neutral (R^2 = .30, b = 1.55, t(320) = 9.38, p < .001), but the happy group reported fewer negative emotions than the neutral group, but not a significant decrease (b = -.19, t(320) = -1.17, p > .1). The outlier removed did not have an impact on other variables in the models, so it was retained in the model.

Emotion group manipulation check with happy as reference group (sad versus happy, neutral versus happy). Using hierarchical linear regression, positive and negative emotion self-reports were included as predictor, with happy as reference group. Sad versus happy and neutral and happy were included in the model, with happy coded 0, and sad and neutral coded 1, respectively. For positive emotion self-reports, the sad group endorsed significantly fewer positive emotions than the happy group (b = -1.66, t(323) = -9.50, $p < .001$), while the neutral group reported fewer positive emotions than the happy group but this difference was only trending significance (b = -.33, t(323) = -1.85, p = .07). For negative emotion ratings, the sad group endorsed significantly higher negative emotion ratings than the happy group (b = 1.66, t(323) = 9.68, $p < .001$), while the neutral group did not significantly differ from the happy group on negative emotion ratings (b = .15, t(323) = .85, p = .40), which makes sense given a lack of negative stimuli for either happy or neutral condition.

Emotion Induction Condition as the Main Effect Model for the Specific Outcome Variable

Findings indicated that those in the happy condition recalled significantly more specific memories than the neutral condition, and meeting PGD criteria was trending significance for being more likely to recall specific memories. An Analysis of Variance (ANOVA) for the specific outcome variable was conducted to determine the main effect for the emotion condition predictors. The models included MDD and PTSD diagnostic criteria as covariates, and PGD diagnostic criteria as a predictor, with emotion condition groupings with neutral as reference group as the second predictor. After removing two

outliers, the happy versus neutral condition recalled more specific memories than the sad versus neutral condition (R^2 = .05, b = -6.79, t(316) = -2.14, p < .05). Meeting diagnostic criteria for PTSD made it significantly less likely to recall specific memories (b = -7.49, t(316) = -3.29, p < .001), while meeting PGD criteria made it more likely to recall specific memories, but this effect was only trending significance (b = 5.99, t(316) = 1.95, p = .052). **There were no significant interactions between PGD diagnosis and emotion group comparisons (b = -6.20, *t*(316) = -.98, *p* = .58), however.**

Are MDD and PTSD Covariates Better as Moderators?

No. A question arose as to whether MDD and PTSD might be moderators for the specific outcome variable. When utilizing MDD and PTSD as continuous, mean centered predictor variables in a linear regression analysis, with all other variables in the model on one step with the exclusion of PGD, there were no main effects or interaction effects for either MDD (R^2 = .02, F(5, 321) = 1.22, p = .30) or PTSD (R^2 = .02, F(5, 321) = 1.26, p = .28), supporting their use as covariates in subsequent models (rather than as moderators or predictors).

Systematic Testing to Determine the Best Regression Model to Use

Given questions surrounding how to parse prolonged grief, depression, and PTSD symptoms in order to make meaningful interpretations from the findings, this section will provide the findings of the robust analysis of the data. First, the *specific* memory outcome variable findings will be presented. This will include the hierarchical regression model with prolonged grief, depression and PTSD parsed: 1) summed continuous variable; 2) the factor items from Papa et al. (2014); 3) a clinical cut-off score; and 4) whether meets

diagnostic criteria or not. Emotion condition grouping results will include first the results reported with neutral as the reference group against happy and against sad. In some models, we included a second emotion condition grouping, with happy as the reference group (coded as 0) compared to the sad emotion condition (coded as 1). This excluded a large portion of participants from the neutral condition. Overall, when considering just sad versus happy, it did not add predictive power to the model. Happy versus neutral and sad versus neutral emotion condition groupings were used in all final models. See Table 9 for results of robust linear regression model testing.

Second, the *loss-related* memory outcome variable results will be presented. Given that the loss-related memory variable was bimodal, binary logistic regression was run when parsed at 50% loss-related memory recall. All analyses will also be repeated for loss-related memories outcome variable in the same format as the specific outcome variable. See Table 10 for results of the sequential logistic regression model testing.

Analyses

Hypothesis 1. *Grief symptom severity levels and emotional film clip condition will predict autobiographical memory recall specificity when controlling for MDD and PTSD.* Our main hypothesis asked whether pre-existing PGD symptom severity and emotion induction will influence autobiographical memory recall specificity, when controlling for MDD and PTSD symptoms. Individuals with higher levels of endorsed PGD symptoms will have higher specific recall; those in the sad group will have more specific memory recall while the happy group will have less specific memory recall. We tested this hypothesis with equation for linear regression:

ABM Specificity = b_0 + b_1*Depression + b_2*PTSD + b_3*PGD level + b_4*HappyCondition + b_5*SadCondition + b_6*HappyCondition x PGD level + b_7*HappyCondition x PGD level.

Symptom severity as continuous variable, summed and mean centered. Due to high multicollinearity and high correlations between continuous symptom measures, and Variance Inflation Factor (VIF) of 5 on the PGD continuous variable, such a strong interrelationship can cause problems with interpretations, hence we chose to disregard these continuous measure models and use a more parsimonious set of items with the other regression models. Results of the continuous symptom scale models would not be interpretable and regression models will not be reported. See Table 8 for correlation matrix of symptom levels and specific memory recall.

Symptom factor variables from Papa et al. (2014), summed and mean centered. These analyses tested whether pre-validated disorder-specific factor items (Papa et al., 2014) will result in significant findings. Higher scores indicate higher reported distress (PGD highest scores of 55; MDD highest score of 26, PTSD highest score of 79); mean-centered to provide meaningful zero for ease of interpretation. Covariates were entered into Step 1, main effects (PGD symptom level and emotion group condition) into Step 2, and interactions into Step 3. An outlier analysis review of the regression

Table 8

Correlations of Study Variables

		1	2	3	4
1	Depression	--			
2	PTSD	.79**	--		
3	PGD	.70**	.82	--	
4	Specific memory (%)	-.07	-.09^{+}	-.10^{+}	--

Note. PGD = PG-13 = Prolonged Grief – 13 scale; PTSD = PCL-S = Posttraumatic Stress Disorder Checklist – Specific Event; Depression PHQ-9 = Patient Health Questionnaire-9. $^{+}p \leq .10$, $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

model resulted in removal of 0 outliers.

The omnibus test for the model was not significant, $R^2 = .02$, $F(7, 319) = .71$, $p = .66$. In Step 1, $\Delta R^2 = .02$, $p = .37$, and removing the highest outliers did not impact the model. This suggests that using the diagnostic factor items from Papa et al. (2014) does not predict Specific memory recall. Even when exchanging the emotion conditions instead to explore the effects of sad versus happy, for whether using happy as the reference group impacted results, the omnibus test for the model was not significant, $R^2 = .01$, $F(2, 214) = 1.40$, $p = .25$, even after removing 5 outliers (and 105 observations missing from removal of the neutral group). When the sad versus happy emotion condition was included in the model, it did not have any significant findings nor add predictive power for the specific memory recall model.

Excluding MDD; Sad versus happy. For these analyses, we excluded MDD factor score from the regression model. This is because the factor items for PTSD and PGD already control for MDD, it was not included. A hierarchical approach was taken but instead with two levels: 1) main effects of PTSD factor and PGD factor and Sad versus happy, and 2) interaction terms on step two with PGD factor by Sad versus happy.

Outlier analysis suggested that after removing 5 outliers, the main effect model accounts for additional variance above and beyond the intercept only model. The model was significant ($R^2 = .04$, $F(3, 213) = 2.67$, $p \leq .05$), with the sad emotion condition recalling fewer specific memories compared to the happy emotion condition. Removing 4 outliers made the PTSD factor trend significance for recalling fewer specific memories ($b = -.50$, $t(214) = -1.94$, $p = .054$) and Sad versus happy was significant--the sad group had

reduced memory specificity(b = -4.60, $t(214)$ = -2.07, $p < .05$). Using the symptom factor items from Papa et al.'s (2014) factor analysis suggested that removing the neutral condition in exchange for a sad versus happy condition does not add any additional variance. When removing MDD from the model, the sad condition (versus happy condition) demonstrated significantly less specific memory recall.

Cut-off score. These analyses tested whether the sample-specific cut-off for: the PG-13 scale cut-off of 39; a cut-off of 10 for the PHQ-9; and a cut-off of 50 for the PCL-S scales, will provide significant findings. Meeting cut-off criteria was coded as 1, and below cut-off criteria was coded as 0. Covariates were entered into Step 1, main effects (PGD symptom level and emotion group condition) into Step 2, and interactions into Step 3. An outlier analysis review of the regression model resulted in removal of 0 outliers. The omnibus test for the model was not significant, $R^2 = .03$, $F(7, 319) = 1.27$, $p = .27$. Even after removing the highest three outliers, using the diagnostic cut-off score does not predict any significant changes in specific Memory recall.

Meeting diagnostic criteria. Given the question of whether disorders are meaningful taxonomies, we used instructions provided by the measures and created diagnostic variables, indicating whether a participant currently endorses symptoms that would meet diagnostic criteria for PGD, MDD, and PTSD. Meeting criteria was coded as 1, and not meeting criteria was coded as 0. Covariates were entered into Step 1, main effects (PGD diagnosis and emotion group condition) into Step 2, and interactions into Step 3. An outlier analysis review of the regression model resulted in removal of 4 outliers.

Our main hypotheses were partially supported, with those meeting diagnostic criteria for PTSD and PGD significantly predicted specific memory recall. Those with PTSD recalled less specific memories while those with PGD had the converse, recalling more specific memories. There were no emotion condition effects, nor interaction effects.

The omnibus test for the model was significant, $R^2 = .03$, $F(2, 320) = 4.92$, $p < .01$. On Step 2, $\Delta R^2 = .06$, $p = .02$, PTSD diagnosis significantly predicted less specific memory recall ($b = -7.81$, $t(317) = -3.51$, $p \leq .001$), suggesting those who meet criteria for PTSD diagnosis were less likely to recall specific memories. The opposite was true for those who endorsed meeting criteria for PGD diagnosis: those with PGD were significantly more likely to recall specific memories than those who did not meet PGD criteria ($b = 7.09$, $t(317) = 2.31$, $p < .05$). On Step 3, $\Delta R^2 = .04$, $p = .89$, the interactions model was not significant.

Sad versus happy. When considering the emotion conditions sad versus happy, 106 cases were excluded due to removing the neutral condition from analyses. Happy was the reference condition, coded as 0, with the sad condition coded as 1. For those who meet diagnostic criteria was coded as 1, and does not meet diagnostic criteria was coded as 0. After removing 2 outliers, the main effects model was no longer significant $R^2 = .03$, $F(2, 216) = 2.84$, $p = .06$, suggesting that adding sad versus happy to the model does not add any predictive power.

Excluding MDD; Sad versus happy. For these analyses, MDD was excluded as covariate from the regression model. MDD has not been significant in previous analyses and may be washing out the predictive power of the other predictors. A hierarchical

approach was taken but instead with two levels: 1) main effects of PTSD diagnosis and PGD factor and Sad versus happy, and 2) interaction terms on step two with PGD diagnosis by Sad versus happy.

The exclusion of MDD and considering sad versus happy emotion grouping, allowed for PTSD to recall fewer specific memories, and the sad condition less likely to recall specific memories than the happy condition. When removing 2 outliers, the omnibus test of the model was significant, $R^2 = .05$, $F(3, 216) = 3.95$, $p < .01$, PTSD diagnosis was significant ($b = -7.51$, $t(216) = -2.95$, $p < .01$), suggesting that those meeting PTSD diagnostic criteria had reduced memory recall specificity. However, PGD diagnosis ($b = 5.67$, $t(216) = 1.60$, $p = .11$) was not significant. Sad versus happy was significant ($b = -4.31$, $t(216) = -1.98$, $p < .05$), suggesting the sad group was less likely to recall specific memories than the happy group. The interaction model on Step 3, $\Delta R^2 = .05$, $p = .58$ was not significant.

Table 9

Summary of Multiple Regression Analyses of the 2-Way Interaction of Emotion Condition by PGD Symptom Level Predicting Specific Memory Retrieval

Variable	Specific Memory *B*
Continuous Symptom Severity Model	
Step 1:	$R^2 = .02$, F(2, 321) = 3.46*
Depression	- .13
PTSD	- .12
Step 2:	$\Delta R^2 = .03$, $F(5,318) = 2.08$
Step 3:	$\Delta R^2 = .04$, $F(7, 316) = 1.69$
Variable	Specific Memory *B*
Papa et al., (2014) Symptom Factor Model	
	$R^2 = .02$, F(7, 319) = .71

Step 1:	
Variable	Specific Memory *B*
Papa et al., (2014) Symptom Factor Model (Sad vs. Happy Condition, no neutral)	
Step 1:	R^2 = .01, F(2, 214) = 1.40
Depression	- .29
PTSD	- .17
Step 2:	ΔR^2 = .03, F(4, 212) = 1.63
Depression	-.35
PTSD	-.25
PGD	.15
Sad vs. Happy	-4.26^{+}
Step 3	ΔR^2 = .03, F(5, 211) = 1.34
Depression	-.35
PTSD	-.25
PGD	.02
Sad vs. Happy	-4.19
PGD x Sad vs. Happy	.24
Variable	Specific Memory *B*
Papa et al., (2014) Symptom Factor Model (Excluding Depression; Sad vs. Happy Condition)	
Step 1:	R^2 = .04, F(3, 214) = 2.81*
Step 2:	ΔR^2 = .04, F(4,213) = 2.11*
PTSD	-.50^{+}
PGD	.27
Sad vs. Happy	-4.60*
Step 3	ΔR^2 = .04, F(2, 212) = 1.99
PTSD	-.50
PGD	.21
Sad vs. Happy	-4.58*
PGD x Sad vs. Happy	.10
Variable	Specific Memory *B*
Symptom Cut-off Criteria Model	
Step 1:	R^2 = .03, F(7, 319) = 1.27
Variable	Specific Memory *B*
Diagnostic Criteria Model	
Step 1:	R^2 = .03, F(2, 320) = 4.92**
Depression	- .71
PTSD	- 5.57**
Step 2:	ΔR^2 = .06, F(5, 317) = 3.96**
Depression	-2.47
PTSD	-7.81***
PGD	7.09**
Happy vs. Neutral	2.04

Sad vs. Neutral	-2.57
Step 3	ΔR^2 = .04, F(7, 315) = 2.85
Variable	Specific Memory *B*
Diagnostic Criteria Model (Sad vs. Happy Condition)	
Step 1:	R^2 = .03, F(2, 216) = 2.84^{+}
Depression	-1 .52
PTSD	- 4.76^{+}
Step 2:	ΔR^2 = .05, F(4, 214) = 3.08*
Depression	-2.28
PTSD	-7.05**
PGD	6.18^{+}
Sad vs. Happy	-4.13^{+}
Step 3	ΔR^2 = .06, F(5, 213) = 2.52
Depression	-2.32
PTSD	-7.00**
PGD	7.78^{+}
Sad vs. Happy	-3.61
PGD x Sad vs. Happy	-3.64
Variable	Specific Memory *B*
Diagnostic Criteria Model (Excluding Depression; Sad vs. Happy Condition)	
Step 1:	R^2 = .05, F(3, 216) = 3.95**
PTSD	-7.51**
PGD	5.67
Sad vs. Happy	-4.31*
Step 3	ΔR^2 = .05, F(4, 215) = 3.03
PTSD	-7.47*
PGD	7.17
Sad vs. Happy	-3.81
PGD x Sad vs. Happy	-3.43

Note. Depression = PHQ-9 scale; PTSD = PCL-Specific; PGD = PG-13 scale; Happy vs. Neutral = the Happy emotion induction group coded as 1, with the neutral group as reference, coded as 0. Sad vs. Neutral = the Sad emotion induction group as 1, with the neutral group as reference, coded as 0. Sad vs. Happy = The Sad emotion induction group was coded as 1, with Happy as the reference group, coded as 0, the neutral group was excluded. $^{+}p \leq .10$, $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

Hypothesis 2. *Grief symptom severity levels and emotional film clip condition will predict autobiographical loss-related memory recall when controlling for MDD and PTSD.*

Logistic regression was utilized due to our bimodal, dichotomous outcome variable split at 50% loss-related memory recall in addition to the continuous and dichotomous symptom levels and dichotomous emotion condition predictor variables. Our main hypothesis explored whether pre-existing PGD symptom severity and emotion induction will influence loss-related memory recall, when controlling for MDD and PTSD symptoms. Individuals with higher levels of endorsed PGD symptoms will have increased loss-related recall, especially in the sad emotion group.

$$Log(\text{Loss-relatedness}) = b_0 + b_1*\text{Depression} + b_2*\text{PTSD} + b_3*\text{PGD level} + b_4*\text{HappyCondition} + b_5*\text{SadCondition} + b_6*\text{HappyCondition x PGD level} + b_7*\text{HappyCondition x PGD level.}$$

Logistic regression is similar to hierarchical linear regression however it considers odds ratios for group membership likelihood (see 2nd edition by Hosmer & Lemeshow, 2000). Since the loss-related outcome variable was dichotomized at 50% recall, logistic regression was the appropriate analysis when both predictor and outcome variables are dichotomous (compared to a continuous outcome variable and dichotomous predictor in linear regression. Logistic regression assesses the fit of the model specified, or the likelihood of group membership predictions. Coefficients for logistic regression provide the unit change for log odds of loss-related memory recall for every one unit increase in the predictor variables of PGD and emotion conditions. All assumptions were met and outlier analyses conducted as specified under the analysis plan section above, unless otherwise specified in the results below.

Logistic regression model. In our analyses, a hierarchical or nested model comparison approach was used with an intercept model, covariate model (MDD and PTSD), a main effect model (PGD and emotion conditions: Sad versus neutral and happy versus neutral), and an interaction model (PGD by emotion condition of sad versus neutral and PGD by happy versus neutral).

Changes for Logistic analyses: Emotion, loss group, and retaining MDD. Differences from what was conducted for linear regression are reviewed.

Emotion. Because the emotion condition did not yield much additional predictive power to the model when including the sad versus happy condition grouping, instead the original emotion condition groupings-- which include the neutral control condition-- will be used in the logistic regression: Sad versus neutral and happy versus neutral.

Loss group. Loss group was included as a covariate because descriptive statistics tests indicated a significant difference for the loss-related memory recall by loss group membership (immediate versus extended). This group difference was not found in the analyses for the specific memory recall outcome variable, a likely reason for why our findings were not impacted when loss group was included in analyses for the loss-related memory recall outcome variable. In initial exploratory analyses, the loss group variable was included in the models and had some significant results, but it ultimately did not add any extra predictive power to the model by including it. Like the specific memory recall outcome variable, loss group models will not be included in this report for the loss-related outcome variable.

Retaining MDD. Because MDD tended to demonstrate significant findings in the loss-related model, it was retained as a covariate in all logistic regression analyses.

Bimodal loss-related variables. The loss-related memory recall outcome variable was bimodal, suggesting response variance consisting of two different groups, which required bifurcation of this outcome variable. Initially, the analysis was planned to split the variable at 10%, 90% and 50%. However, after running analyses with the 10% and 90% models, there were separation effect errors due to too few cases in some cells, which is an assumption violation in logistic regression. Therefore, the 50% loss related memory recall was used at the bifurcation point and these results will be reported below.

Symptom severity as continuous variable, summed and mean centered. These analyses tested whether parsing symptom levels as a continuous scale variable, will result in significant findings. Higher scores indicate higher reported distress (PGD highest score of 55; MDD highest score of 26, PTSD highest score of 79); mean-centered to provide meaningful zero for ease of interpretation. As with the previous regression models, in the logistic regression models, covariates were entered into Step 1, main effects (PGD symptom level and emotion group condition) into Step 2, and interactions into Step 3. An outlier analysis review resulted in removal of 5 outliers. On Step 2, $\Delta\chi^2(3, 316) = 14.20$, $p < .05$, PGD continuous symptoms severity was significant ($b = .05$, $z(316) = 2.36$, $p < .05$, $OR = 1.10$), suggesting that higher PGD symptom levels were related to higher loss-related recall. Happy versus neutral was significant ($b = -.71$, $z(316)= -2.38$, $p= .02$, $OR = .54$), suggesting the Happy condition was less likely to recall loss-related memories than

the neutral condition. On Step 3, $\Delta\chi^2(2, 314) = .09$, $p = .96$, the interaction model was not significant.

Symptom factor variables from Papa et al. (2014), summed and mean centered. These analyses are testing whether pre-validated disorder-specific factor items (Papa et al., 2014) will result in significant findings. Higher scores indicate higher reported distress , as above. An outlier analysis review of the logistic regression model resulted in removal of 0 outliers. On Step 1, $\Delta\chi^2(2, 324) = 12.88$, $p < .05$, MDD factor was trending significance ($b = .07$, $z(324) = 1.68$, $p = .09$, $OR = 1.07$). Similar to the whole-scale continuous symptom measures reported above, PGD factor was significant ($b = .10$, $z(321) = 2.21$, $p < .05$, $OR = 1.10$), suggesting greater likelihood of loss-recall for those who endorsed PGD factor item symptoms. Additionally, the happy condition was less likely to recall loss-related memories than the neutral condition ($b = -.63$, $z(321) = -2.14$, $p < .05$, $OR = .54$). The confidence intervals for the happy versus neutral condition are large in range (lower bound $CI = .3000$, upper bound $CI = .946$), suggesting less confidence in the exact estimate, but still had significant main effect findings. There were no significant interaction effects.

Cut-off score. These analyses tested whether the sample-specific cut-off for: the PG-13 scale cut-off of 39; a cut-off of 10 for the PHQ-9; and a cut-off of 50 for the PCL-S scales, will provide significant findings. Meeting or exceeding cut-off criteria was coded as 1, and below the cut-off score was coded as 0. An outlier analysis review of the logistic regression model resulted in removal of 5 outliers.

On Step 2, $\Delta\chi^2(3, 316) = 16.38$, $p \leq .001$, meeting MDD cut-off significantly predicted higher likelihood of recalling loss-related memories ($b = .58$, $z(316) = 1.96$, $p < .05$, $OR = 1.78$), while PTSD cut-off did not significantly predict loss-related recall ($b = -.35$, $z(316) = -.94$, $p = .35$, $OR = .71$). Further, PGD cut-off significantly predicted greater likelihood of loss-related memory recall for those who met PGD cut-off criteria ($b = .89$, $z(316) = 2.41$, $p < .05$, $OR = 2.44$). Happy condition group membership made it less likely to recall loss-related memories than the neutral condition ($b = -.62$, $z(316)$n$= -2.11$, $p \leq .05$, $OR = .54$). On Step 3, $\Delta\chi^2(2, 314) = 8.90$, $p \leq .01$, the effects for MDD and happy condition lessened when including interaction terms, with MDD cut-off trending significance of predicting greater loss-related recall ($b = .57$, $z(314) = 1.91$, $p = .06$, $OR = 1.78$), while being in the happy condition was trending significance for fewer loss-related memory recall. There was a significant interaction effect for the PGD and sad: for the sad emotion induction condition and those who met PGD cut-off were more likely to recall loss-related memories ($b = 2.63$, $z(314)= 2.26$, $p \leq .05$, $OR = 13.82$). Although results should be interpreted cautiously given the confidence intervals for the odds ratio have a large spread (lower bound $CI = 1.97$, upper bound $CI = 284.84$).

Simple slope analysis for PGD cut-off score by sad versus neutral interaction. Due to the significant interaction term for PGD diagnosis x sad condition, simple slope analysis was used for interpretation of the interactions (Aikens & West, 1991; Cohen, 1988). For simple slope interactions in logistic regression, when there are multiple values in a model, the slope/effect for one variable is when all other variables are held constant, at zero. In this instance, we explored the effect of sadness when grief is high, by making

high levels of grief zero. Results for sadness will be presented for the interaction effect when grief is low/does not meet PGD cut-off is held constant at zero, and the effect for sadness when grief is high/meets PGD cut-off is held at zero, assessing the effect of one value at high and low values of the other interaction term variable.

Effect of sad condition when grief is low. At low levels of grief, when PGD score is below the 39 cut-off score, the sad condition does not increase or decrease the odds of loss-related memory recall compared to neutral (*OR* = .99, *SE* = .32, *95% CI*[.53, 1.85]).

Effect of sad condition when grief is high. At high levels of grief, when PGD score meets or exceeds the 39 cut-off score, the effect for the sad condition is significant. At high levels of grief, sad condition group membership increases the odds of recalling loss-related memories than the neutral condition, but only when PGD cut-off is met (*OR* = 13.72, *SE* = 1.12, 95% *CI*[2.19, 269.81]).

Meeting diagnostic criteria. Given the question of whether disorders are meaningful taxonomies, we created diagnostic variables for whether participant currently endorses symptoms that would meet diagnostic criteria for PGD, MDD, and PTSD. Meeting criteria was coded as 1, and not meeting criteria was coded as 0. An outlier analysis review of the logistic regression model resulted in removal of 8 outliers.

While the overall model was trending significance, $\Delta\chi^2(2, 316) = 5.34$, $p = .07$, two main findings arose: on the main effects model, being in the happy condition was significantly less likely to recall loss-related memories than the neutral condition (b = -.65, $z(313) = -2.21$, $p \leq .05$, OR = .52). This effect for the happy condition was washed out and only trending significance in the interaction model (b = -.54, $z(311) = -1.70$, p =

.09, *OR* = .59), but did not have an interaction effect with PGD diagnosis (*b* = -.77, *z*(311) = -.89, *p* = .37, *OR* = .46). In contrast, the PGD x sad interaction significantly predicted higher likelihood of recalling loss-related memories (*b* = 2.58, *z*(311) = 2.12, *p* < .03, *OR* = 13.21), suggesting that those in the sad condition who also met PGD diagnosis were more likely to recall loss-related memories. Caution should be taken in interpreting results as the confidence intervals are very spread (lower bound *CI* =1.68, upper bound *CI* = 298.28), but is still significant. Simple slope analyses were conducted and reported below.

Simple slope analysis for meeting PGD diagnostic criteria by sad versus neutral interaction. Due to the significant interaction term for PGD diagnosis x sad condition, simple slope analysis was used for interpretation of the interactions (Aikens & West, 1991; Cohen, 1988). For simple slope interactions in logistic regression, when there are multiple values in a model, the slope/effect for one variable when all other variables are held constant, at zero. In this instance, we explored the effect of sadness when grief is high, by making high levels of grief zero.

Effect of sad condition when grief is low. At low levels of grief, when one does not meet PGD diagnostic criteria, being in the sad condition does not increase or decrease the odds of loss-related memory recall (*OR* = 1.04, *SE* = .31, 95% *CI*[.57, 1.89]).

Effect of sad condition when grief is high. At high levels of grief, when an individual meets PGD diagnostic criteria, the effect for the sad condition is significant. This suggests that at high levels of grief, being in the sad condition increased the odds of recalling loss-related memories (*OR* = 13.72, *SE* = 1.12, *95% CI*[2.19, 269.81]).

Table 10

Summary of Logistic Regression Analyses of the 2-Way Interaction of Emotion Condition by PGD Symptom Level Predicting Loss-related Memory Retrieval

Variable	Loss-related Memory Recall		
	B	*z*	*OR*
Continuous Symptom Severity Model			
Step 1:	χ^2 (2, 319) = 9.88**		
Depression	.04	1.21	1.04
PTSD	.01	.82	1.01
Step 2:	$\Delta\chi^2$ (3, 316) = 14.20**		
Depression	.02	.74	1.04
PTSD	-.01	-.73	1.00
PGD	.05*	2.36	1.10
Happy vs. Neutral	-.71*	-2.38	.54
Sad vs. Neutral	.11	.37	1.21
Step 3:	$\Delta\chi^2$ (2, 314) = .09		
Variable	Loss-related Memory Recall		
	B	*z*	*OR*
Papa et al., (2014) Continuous Symptom Factor Model			
Step 1:	χ^2 (2, 324) = 12.88**		
Depression	.07+	1.68	1.07
PTSD	.03	1.17	1.03
Step 2:	$\Delta\chi^2$ (3, 321) = 14.20*		
Depression	.05	1.07	1.04
PTSD	-.00	-.01	1.03
PGD	.10*	2.27	1.10
Happy vs. Neutral	-.72**	-2.43	.54
Sad vs. Neutral	.13	.44	1.21
Step 3	$\Delta\chi^2$ (2, 319) = .24		
Variable	Loss-related Memory Recall		
	B	*z*	*OR*
Symptom Cut-off Score Criteria			
Step 1:	χ^2 (2, 319) = 7.34*		
Depression	.62*	2.18	1.86
PTSD	.03	.09	1.03
Step 2:	$\Delta\chi^2$ (3, 316) = 16.38***		
Depression	.58*	1.96	1.78
PTSD	-.35	-.94	.71
PGD	.89*	2.41	2.44
Happy vs. Neutral	-.62*	-2.11	.54
Sad vs. Neutral	.30	1.04	1.35

Step 3	$\Delta\chi^2$ (2, 314) = 8.90**		
Depression	.57+	1.91	1.78
PTSD	-.38	-1.01	.68
PGD	.44	.85	1.55
Happy vs. Neutral	-.62+	-1.87	.54
Sad vs. Neutral	-.01	-.02	.99
PGD x Happy vs. Neutral	.04	.06	1.04
PGD x Sad vs. Neutral	2.63*	2.26	13.82
Simple Slope for Cut-off Score Criteria	*CI (95%)*	*SE*	*OR*
Effect of Sad Cond when PGD is Low	.53- 1.85	.32	.99
Effect of Sad Cond when PGD is High	2.19- 269.81*	1.12	13.72
Variable	Loss-related Memory Recall		
	B	*z*	*OR*
Diagnostic Criteria			
Step 1:	χ^2 (2, 316) = 5.34+		
Depression	.47	1.46	1.59
PTSD	.24	.90	1.27
Step 2:	$\Delta\chi^2$ (3, 313) = 10.53*		
Depression	.45	1.29	1.57
PTSD	.36	1.24	1.43
PGD	-.11	-.26	.90
Happy vs. Neutral	-.65*	-2.21	.52
Sad vs. Neutral	.25	.40	1.29
Step 3	$\Delta\chi^2$ (2, 311) = 10.54**		
Depression	.57	1.55	1.78
PTSD	.30	1.02	1.34
PGD	-.43	-.71	.65
Happy vs. Neutral	-.54+	-1.70	.59
Sad vs. Neutral	.04	.13	1.04
PGD x Happy vs. Neutral	-.77	-.89	.46
PGD x Sad vs. Neutral	2.58*	2.12	13.21
Simple Slope for Diagnostic Criteria	*CI (95%)*	*SE*	*OR*
Effect of Sad Cond when PGD is met	2.19- 269.81*	1.12	13.72
Effect of Sad Cond when PGD not met	.57- 1.89	.31	1.04

Note. Depression = PHQ-9 scale; PTSD = PCL-Specific; PGD = PG-13 scale; Happy vs. Neutral = the Happy emotion induction group coded as 1, with the neutral group as reference, coded as 0. Sad vs. Neutral = the Sad emotion induction group as 1, with the neutral group as reference, coded as 0. Continuous symptom models were summed and mean centered. *B* = beta, *z* = standardized z-score statistic, *OR* = Odds ratio, *CI* = 95% confidence intervals, *SE* = Standard error of the model. Simple slope = simple analyses (Aiken & West, 1991). $^{+}p \leq .10$, $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

Discussion

The purpose of this study was to explore the unique role of emotion in ABM retrieval in PGD. We tested whether the level of specificity and loss-relatedness of autobiographical memory retrieval can be predicted by either a sad, happy, or neutral emotion induction, and current prolonged grief disorder (PGD) symptomatology. Within the context of emotional arousal, we explored whether the theorized relationship between PGD symptom severity and emotion would predict memory recall. Individuals with high levels of PGD symptoms were hypothesized to recall more specific memories and more loss-related memories. Individuals with high levels of PGD symptoms were hypothesized to recall more specific autobiographical memories in the sad condition and less specific memories in the happy condition. Individuals with high levels of PGD symptoms were hypothesized to recall more loss-related memories in the sad emotion condition and fewer loss-related memories in the happy condition. Simple slope analyses were conducted for interaction effects for the loss-related recall outcome variable.

The Role of Emotion and Symptomatology in ABM Recall

Due to the differential functions of emotions, we predicted that the sad condition would contribute to more specific and more loss-related memory recall, but only for individuals with PGD, while the happy emotion condition would demonstrate opposite findings. Our hypotheses were partially supported. For individuals in the sad emotion condition, only those who met PGD cut-off or PGD diagnostic criteria were more likely to recall loss-related memories. While there were no significant interactions for the happy emotion condition and PGD symptoms, main effects suggested that those in the happy

emotion condition were less likely to recall loss-related memories. These findings suggest that loss-related recall may occur in response to negative mood for those who have higher levels of PGD symptom severity. This finding is consistent with models that suggest preferential retrieval of loss-related memories can impact recovery from loss and lead to the development and maintenance of PGD. Our study added to the literature by demonstrating that loss-related recall in the presence of negative emotions predicted by PGD. Based on these findings, loss-related recall when in a negative mood may be initially functioning as an emotion regulation process to escape painful feelings of grief and negative emotion.

Of note, our findings were similar to Mitchell's (2015) findings—the only other study besides this one that induced emotion for ABM—in that only those who had induced sad mood *and* had current high symptomatology or a history of MDD diagnosis predicted levels of reduced specificity to negative emotion in MDD. If loss-related recall occurs in order to reduce the impact of experiencing negative emotion, it is likely an ineffective emotion regulation technique which paradoxically leads to experiencing greater negative emotion and distress in the long-term. These emotion-regulation parameters would fit within a modified CaRFAX framework (Williams, 2006), where loss-related recall is the level where ABM is "captured" which ultimately leads to a lack of integration of the loss into a new post-loss identity (Maccallum & Bryant, 2013).

In contrast, previous studies have similarly found effects for loss-related recall in response to negative cues in PGD, but have used this as evidence to refute a CaRFAX framework for PGD. An "immunity effect" for loss-related recall posits that loss-related

memories are "immune" to the functional avoidance mechanisms of the CaRFAX model, as the generative memory search is bypassed, and loss-related memories are directly retrieved instead (e.g., Golden et al., 2007). Additionally, another study of the SCEPT in a bereaved sample found mixed support of the CaRFAX model. Grief-related rumination was associated with higher loss-recall and greater symptomatology, but the specificity of loss-recall was unrelated to symptom levels. The authors purported that this finding fit the "rumination" aspect but did not "capture" memory at an overgeneral level as the functional avoidance aspect of the CaRFAX model would suggest. However, their results also indicated that non-loss memories were associated with overgeneral retrieval, suggesting that non-loss related memories may be the source of distress that is avoided when the non-loss memory is "captured" at the OGM recall level (Eisma et al., 2015). Interpreted in this manner and taken together, these findings could be supportive of the CaRFAX model of emotion regulation, but one that would need to be modified to fit the unique regulatory process that distinctly contribute to PGD.

The current study found a sad emotion prime by PGD symptom level interaction significantly predicted loss-related recall. However, our null findings for a happy interaction question the notion that loss-related recall is immune to emotion regulation processes. Our results indicated that while PGD was related to higher loss-related recall, the happy condition evidenced a decreased likelihood for loss-related recall. Positive emotion, when not in the presence of psychopathology, reduced loss-related recall, while bereavement related psychopathology increased loss recall compared to those without PGD. Additionally, when considering level of ABM retrieval specificity, PTSD had

reduced specificity, as would be expected, but the sad condition demonstrated this same reduced specificity effect. Conversely, PGD was more likely to recall specific memories. Taken together, the findings that PGD is related to specific memory recall and to loss-related recall when in a sad mood, make it unclear whether specific recall and loss are both directly retrieved, or if only loss-related memories are; and in what manner this may be related to emotion regulation processes that maintain prolonged grief.

Patterns in the bereavement literature may indicate that OGM recall may be associated with PGD, but only for *non-loss* related memories (Maccallum & Bryant, 2008; Robinaugh & McNally, 2013). This could explain our null interaction effects for memory specificity. While negative mood and PGD predicted loss-related recall, only PGD-- not the interaction of emotion--- predicted greater likelihood for more specific recall. Perhaps individuals with PGD are more likely to recall memories at the specific level to maintain psychopathology, but may be avoiding the distress related to non-loss memories by recalling memories at an overgeneral level if not connected with the loss. A recently published study explored attachment priming effects in response to negative mood and found that recalling memories of the lost attachment figure provided comfort and reduced distress for individuals with PGD (Bryant & Bali, 2018). This could suggest that loss-recall may be soothing while non-loss recall may be distressing as it may be a reminder of the reality of the loss. Memory content predicted symptoms after a recent break-up. Positive memories of the relationship were specifically related to break-up distress and not depression, while negative memories were related to both break-up distress and depression (del Palacio-Gonazalez, Berntsen, & Watson, 2017). Thus, the

valence of the memory, in addition to the content, could be leading to specific symptomatology. Alternately, Robinaugh and McNally (2013) suggested that preferential loss-related recall could be blocking non-loss memories from being accessed and recalled. It is unclear the exact pathway and mechanisms that lead to preferential loss-recall when in a negative mood, and how loss-related recall may impact the recall of non-loss memories.

Emotions and Symptoms Differentially Predicted ABM Recall

Other ABM studies in bereavement have had similar findings to ours, with higher loss-related memory recall for those with PGD, especially in response to negative cues (e.g., Maccallum & Bryant, 2011a; cf. Robinaugh & MacNally 2013). In contrast, other grief and ABM studies have found links between OGM recall to both positive and negative cues for individuals with PGD (Maccallum & Bryant, 2010a), or alternately have not found any relationship between symptomatology and memory specificity in response to cue valence (Maccallum & Bryant, 2010c). While still other studies found a reduced specificity depending upon memory content: higher OGM recall, when imagining the past or future without the deceased (Robinaugh, Lubin, Babic, McNally, 2013); and a relationship between OGM recall for non-loss related memory, but no relationship between loss-related specificity memory and distress levels (Eisma et al., 2015). As such, there is contradictory evidence regarding the relationship between symptom levels and level of ABM recall, especially in relation to positive and negative memory cue valence and their relation to symptomatology and memory recall. The present study induced emotion to clarify the role emotion plays in this process. Past

studies can only speak to the cue valence used to elicit a memory, and cannot speak to the role of induced emotion as the current study was able to. While we cannot speak to causality, our results found differences in ABM recall depending upon emotion condition and sadness interaction effects with PGD to increased loss-related recall. The finding that loss-related recall was more likely in the presence of sad emotion, but only in relation to high PGD symptom levels, suggests that recalling loss-related memories in a negative mood is related to PGD symptomatology and may possibly be functioning as an emotion regulation strategy for sad mood. However, our cross-sectional design precludes the ability to determine causality. Regardless, it appeared that main effects for emotions was functioning as would be expected within an emotion regulation paradigm, where reduced specificity occurred in response to sad emotion and lower loss-related recall in response to happy emotion. These findings are as expected within the emotion literature—it is only when high distress is considered that significant interactions with emotion would occur because naturally occurring responses to emotion only become maladaptive if avoidance occurs over time. After a 10-week, CBT for PGD group treatment study, pre-treatment memory specificity levels were not related to treatment outcome differences in symptoms, post-treatment. However, PGD symptom reduction was instead related with post-treatment increases in specific memory recall *in response to positive cues* (Maccallum & Bryant, 2011b). This would support an interaction effect with emotion and high symptomatology impacting memory recall. The interaction of PGD sad emotion to increase loss-related recall is also supported by the current study findings. We found that those with PGD had more specific recall. As significant interactions were null, we were

unable to determine whether there is an emotion-specific impairment for recalling specific memories that are *positive*, which is contributing to the development or maintenance of PGD, and had been shown to change after symptom reduction from successful treatment of PGD. Impairments in processing rewards and positive reinforcers in the environment, in addition to an inability to disengage from negative, grief-related material, has been empirically associated with PGD symptomatology. This provides some support for a PGD-specific impairment in processing positive emotions or responding to positive in emotion in a disordered way. (Arizmendi et al., 2016; Maccallum & Bryant, 2010a). Yet the current study's results suggested an increased specificity effect for those with PGD—increased specificity occurred for individuals with PGD, regardless of emotion condition. While study design precluded an ability to determine the content of the specific recall that is functioning to maintain PGD, this distinction may not be as useful if increased specificity is not a part of the emotion regulation process as past studies have suggested (Golden et al., 2007). Reconciling this finding with less specific recall in the sad condition suggests that specific memory recall is linked to PGD, regardless of emotional mood state arousal. However, as we did not have interaction effects, we cannot comment on the role of increased specific in PGD in relation to emotion regulation.

Memory Specificity in PGD

As a memory is re-accessed or is highly relevant, it can become more quickly and easily recalled more readily (see Barzykowski & Staugard, 2016 for a review). The memory can bypass the intentional, hierarchical ABM recall process called generative

retrieval and instead can be directly retrieved--also a type of intentional memory retrieval, but it is faster because direct memories tend to be more frequently recalled, are more rehearsed, and are more personally significant. No vagueness or added elaboration is required for direct retrieval of these specific memories, unlike generative retrieval's hierarchical search. However, direct retrieval of specific memories are functionally similar to involuntary specific memory recall (e.g., flashbacks found in PTSD) in that they are both less deliberate and less controllable. For direct and generative voluntary memory searches, impact on mood is reduced because the memory search is voluntarily re-directed before it enters consciousness to help shelter oneself from the negative impact of recalling a specific distressing memory—this protective function occurs even if the search is a direct retrieval. However, involuntary memories are unintentionally recalled and the emotion regulation strategies of avoidance happens after the memory had already made its impact on mood, which is an ineffective emotion regulation strategy compared to generative or direct retrieval of memories (Barzykowski & Staugaard, 2016). Maccallum and Bryant's (2013) cognitive attachment model of PGD suggests that when a griever has poor integration of the loss into ABM, goals related to the deceased become preferentially retrieved. As our study's findings suggest, it is this preferential retrieval for loss-related memories—in response to negative emotions--that is predicted by PGD symptom levels (causality in these relationships is unclear given our cross-sectional design). Direct, loss-related recall may shift attention or coping processes towards maintaining loss-related identity and repairing negative mood in the moment (Boelen,

2011) as negative mood tends to enhance the experience of negative memories (Cahill & McGaugh, 1995; Heur & Reisberg, 1990).

It is unclear whether grievers with PGD engage in the full generative, hierarchical memory search all the way down to the specific, loss-related memory and get stuck there, or whether the memory search process is bypassed altogether and direct retrieval of the specific loss-related memory occurs. Previous studies have suggested that direct, specific, loss-related retrieval is "immune" to the functional avoidance of the CaRFAX theory of emotion regulation (Golden et al., 2007). The current study's findings are supportive of an emotion regulation effect in PGD for loss-related recall, which complicates understanding the mechanism and function by which loss-related recall contributes to PGD. However, throughout the bereavement literature, there is conflict regarding whether loss memories are directly retrieved and are functioning uniquely to regulate emotion in PGD. Barzykowski and Staugaard (2016) outlined other possible explanations besides OGM recall as an emotion regulation process purported by the CaRFAX model. For instance, authors highlighted that memories could be contained within in a pool that the memory search pulls from—specific loss-related memories are more easily pulled from the pool and only the factors that occur during retrieval would be important targets of study (Thomsen & Bernsten, 2009). Alternately, pre-formed associative memory networks lie dormantly until accessed when activated by cues (Uzer, Lee, & Brown, 2012), or it could be that memories that are highly elaborated are more often recalled (Barzykowski & Staugaard, 2016), or it is possible that there could be distinct memory pathways for direct and generative memory recall, (which could potentially be parallel

pathways). There may be nuanced similarities and differences between the less deliberate, less controllable aspects of both voluntary, direct recall, and involuntary recall, in addition, which may complicate the ability to differentiate between generative-versus-direct and direct-versus-involuntary recall, given the overlapping similarities (Brewin, Gregory, Lipton, & Burgess, 2010). The variegated theories explaining how memories are retrieved, add another layer of complexity in understanding our findings.

ABM Recall and Post-Loss Identity

Another explanation could be that specific memories may be more loss-related, and that recalling more specific, loss-related memories, are causing the griever to have difficulty moving on after the loss. The present study was unable to explore that relationship, as we did not specifically asked participants to recall both loss and non-loss related memory in our study design. Another possibility is that those with PGD may avoid reminders of the loss or cues in the environment—a type of meta-avoidance strategy—which may occur before the need to avoid the specific occurs, as a triggering environmental cue would be absent. It could also be possible that emotions themselves become cues triggering memory search processes, but emotions are bottom-up processes that may cause a specific memory to be retrieved. The field needs to find a way to discern between generative and direct retrieval of specific memories to determine pathways to disorder with PGD. Given the lack of interaction effects for specific recall, combined with the finding of an interaction effect for PGD and sadness for loss-related recall, it is unclear how specific memory recall is functioning to maintain PGD. Potential reasons for the discrepancy between more specific recall in PGD *and* more loss-related recall in the

presence of sad emotion in PGD could be in relation to how ABM recall and identity models interact over time.

ABM recall contains and impacts our day-to-day sense of self, and a more stable identity. The loss of a loved one can impact both aspects of self-definition. The current study's findings could be demonstrating this daily working of the self by recalling specific daily to deal with the tasks of learning new roles and moving on. This may somehow block integration of the loss into larger conceptual models of identity, while loss-related recall inhibits the griever from incorporating the loss into a new, post-loss identity. Potentially, there are competing models of the long-term, conceptual self versus short-term, day to day working models of the self in response to emotionally eliciting stimuli, blocking longer-term integration of the loss into conceptual models of the self for identity continuity (Maccalum & Bryant, 2013).

For instance, when asked to describe 3 self-defining memories, grievers with PGD recalled more loss-related, self-defining memories than the non-PGD group. Perhaps if the memories that are specific are self-defining (Maccallum & Bryant, 2008) or maintain an identity still linked with the deceased by repeatedly recalling those specific memoires (Maccallum & Bryant, 2013), then perhaps that is what is maintaining PGD. Individuals with PGD were slower to name death-related emotional words than neutral words, and more likely to report suppression of thoughts of the loved one's death (Maccallum & Bryant, 2008), and emotionally extrapolate past grief intensity immediately after the loss as more severe and worse, even after 4.5 years post-loss (Safer, Bonanno, Field, 2001). This suggests a unique grief-related process. As grief is a mixture

of positive and negative emotions, it would make sense to include grief-specific stimuli in future studies, rather than only happy or sad conditions. Responses to mood states and attentional biases are important to consider due to their broad impact to maintain psychopathology, as social problem solving can be less effective for those with PGD, which can impact one's sense of self-efficacy (Maccallum & Bryant, 2010c).

Future studies should control for elements that occur after loss-related in order to test whether it is the subsequent grief-related rumination that is activated (Shear et al., 2007), subsequent effects on mood and with rumination avoidance patterns related to the consequences of the loss and mood repair goals, and avoidance of non-loss goals (Boelen, 2011). The process that occurs in response to loss recall has been associated with: blocking effective social problem solving (Maccallum & Bryant, 2010c), behavioral avoidance of loss-related stimuli (Boelent, van den Hout & van den Bout, 2006), a lack of integration and accommodation of the loss due to disrupted ABM (Maccallum & Bryant, 2013), avoidance in response to negative social supporters and increased intrusive thoughts of the loss (Nolen-Hoeksema, Parker, & Larson, 1994; Kahler & Papa, in preparation), a disrupted post-loss identity and a need to create new self-definition and reengage in positive emotions and activities without the deceased (Papa et al., 2013; Robinaugh & McNally, 2013); or maintenance of loss-related goals in PGD (Maccallum & Bryant, 2010a). All are important treatment targets and areas of study. However, Eisma et al. (2015) still had inconsistent findings for OGM in PGD vs. non-PGD despite also the SCEPT. One reason for this could be that as new information becomes incorporated and attached to memories over time, the phenomenological knowledge impacts memory recall

and frequency of loss-related intrusive thoughts. This can trigger, or is triggered by, sad emotions, maintaining an unhealthy coping cycle (Watkins & Nolen-Hoeksema, 2014; Weincke & Guiote, 2008); higher rumination to negative emotion, which causes avoidance (Capps & Bonanno, 2002; Desplaux & Zech, 2015; Aldao & Nolen-Hoeksema, 2010) and maladaptive, habitual, pathological responses impairing post-loss recovery (Boelen, de Keijser & Schmid, 2016; Watkins, Moberly & Moulds, 2008; Watkins & Nolen-Hoeksema, 2014). The current study emphasized the need to consider the role of emotion in high symptomatology, as disorders occur from maladaptive response patterns in response to emotions and emotional stimuli.

Future studies will need to explore how loss-related memories make the griever feel (i.e., which memories are distressing to the griever)--specific versus OGM--and determine whether loss-related memories are distressing to griever; whether the memories which do not include the deceased are more distressing to a griever "stuck" on the loss; whether imagining a future without the deceased is more or less distressing than without the deceased (Robinaugh & McNally, 2013), whether identity disturbance (Papa and Lancaster, 2016), loss of role centrality (Epstein, Kahler, Buqo, Papa, in preparation), or social judgements from social supporters are more distressing and lead to withdrawal (Kahler & Papa, in preparation), It is likely a combination of all of those factors that have been shown to contribute to PGD. The causality and order of these maladaptive processes requires elucidation. Importantly, it may be the affective impact – which may be linked to unique emotional valences – that may determine the strength of those processes in impacting the development of PGD

Future Directions and Limitations

Our study had the following methodological limitations. Significant differences for age and loss type on loss-related recall limit the generalizability of our findings and could have contributed to the null interaction effects for PGD and the happy emotion condition for loss-recall. Ricarte et al., (2016) found that brooding, combined with positive or negative memories recalled was related to higher symptomatology, differentially by emotion, depending on age. For younger participants, in addition to brooding, *negative* memories predicted higher symptom levels, while for older participants brooding and *positive* memory recall was related to higher symptom levels. Age and loss type are important to consider in that they add to the complexity of post-loss symptom development. Our sample was young (M = 35), but comparable to other bereavement MTurk samples (i.e., Papa et al., 2014). The significant differences for loss type (whether close, immediate relationship or extended family relationship) loss-related recall could potentially be a proxy for age, as less intimate losses tend to occur when one is younger, compared to loss of a partner in old age. Likely, loss-related recall may occur more frequently for a more intimate relationship that is tied to elements of identity and a lost future that had been planned together (Maccullm & Bryant, 2013), and is likely the reason our loss-related outcome variable was bimodal, rather than normally distributed. While linear and logistic regression analyses were ran for both specific and loss-related memory variables by including loss type in the data analytic model, it did not significantly impact or improve predictive power of models and was not included in final

analyses. It is important to have more diverse samples to help explain potential moderators that could be leading to contradictory findings in ABM recall in PGD.

The generalizability of our highly educated sample (greater than 50% had a college degree or higher) is likely limited, although education levels were similar to Papa et al.'s (2014) study. Our highly educated sample (approximately 50% college educated or above), may have educational or cohort differences compared to other bereavement studies, for instance, how several bereavement studies are taken from the *Changing Lives of Older Couples Study* database (Carr, Nesse, and Wortman, 2005), which is an older, relatively less educated sample. However, our sample's average education level is similar to previous MTurk studies (e.g., Papa et al., 2014), and is likely to be the upcoming cohort trend as younger, more educated, generations age. Additionally, responses to emotional valence may change over the lifespan and vary by age. Ricarte et al., (2016) found that for younger participants brooding and *negative* memories led to higher mood symptoms, while in older adults it was brooding and *positive* memories that was related to higher mood symptoms. Previous bereavement studies have sampled older adult women who lost a spouse (e.g., Eisma et al., 2015; Shear et al., 2007, etc.). Our sample's equal representation of males and females, who presented with diverse types of losses, may limit comparisons to other similar studies of mostly female samples, especially as there have been found to be gender differences in emotional coping after a loss (Carr, 2010).

Two important differences impact the generalizability of our findings to other grief and ABM studies. Foremost, all other ABM studies in bereavement except the

current study and Eisma et al. (2015), used the Autobiographical Memory Test (AMT) which elicits memories within 60 seconds in response to positive cue words and negative cue words (Williams & Broadbent, 1986). Some studies controlled for loss-related recall (Golden et al., 2007; Robinaugh & McNally, 2013), self-defining memories (Maccallum & Bryant, 2008), personal goals (Boelen, 2011), and imagining the past and future with and without the deceased (Golden et al., 2007; Maccallum & Bryant, 2011a; Robinaugh & McNally, 2013). However, only one other study tested the SCEPT in grievers (Eisma et al., 2015). The SCEPT provides sentence stems for more natural, ecologically valid memory recall. However, the SCEPT requires further testing, especially in a bereaved sample, in the future. The next empirical test of the SCEPT should control for either level of specificity or loss-related recall, and should include an emotion induction to clarify the role of loss-related recall as an emotion regulating function in PGD. The current study contributed to the literature by being the first to experimentally induce emotion in bereaved adults using the SCEPT, with an online sample. This provides support of the feasibility of online studies with bereaved participants, a notoriously difficult population to recruit. With only 7-10% of grievers getting stuck in the loss and developing PGD, past studies had few participants who met PGD criteria (5 to 30 participants with PGD, on average) – online studies could be a more feasible way to produce a sample size that's big enough to make meaningful group comparisons for individuals with PGD. It can also produce more diverse samples, providing more evidence for moderators of PGD cross-culturally. Research has found cultural differences in grieving. Cultural differences in continued bonds with the deceased after death have been found to be maladaptive for

grievers in the U.S., yet adaptive for grievers in China. However, this effect disappeared as length since loss increased and continued bonds with the deceased were related to symptomatology, regardless of culture (Bonanno, Papa, Lalande, Zhang, & Noll, 2005). Another study using the AMT and the Velten self-emotion induction method—same as Mitchell (2015), which is the only other study manipulating emotion in ABM—found that attachment priming in response to negative emotions resulted in more specific memory recall than those without the attachment figure prime (Bryant & Bali, 2018). Authors utilized a written emotion induction technique for negative emotion and did not include a control condition or induce other emotions, which should be rectified in future studies, with comparisons of the effectiveness of emotion induction for ABM recall effects. Findings suggest that the attachment prime reduced the distress linked to the ABM, potentially reducing functional avoidance of the loss memory. The SCEPT should be modified to ask about the phenomenological experience of each memory in order to assess the role of functional avoidance.

The second difference between the current study and other in grief and ABM studies, is that we were the only study to use the PG-13 scale to measure grief symptomatology. Other studies used the Inventory of Complicated Grief- Revised (ICG-r; Boelen & Hoitjink, 2009). This could be leading to discrepancies between symptoms and ABM recall, whereas we found significant relationships between ABM and PGD symptoms in our study. *Complicated Grief* (CG), is the previous label for prolonged grief and a diagnostic construct that is assessed using the ICG-r, while PGD as a diagnostic construct is assessed using the PG-13 scale. *Persistent Complex Bereavement Disorder*

(PCBD) is being considered as a diagnostic category for the DSM (American Psychological Association, 2013), another proposed label for prolonged grief. A recent comparison of all three proposed diagnostic categories and found that CG is distinct from PGD, but that PGD and PCBD are the same disorder as each other. The upcoming ICD-11 will include the PGD diagnosis, using PG-13 scale criteria, (Maciejewski et al., 2016). The difference between the current study and past ABM studies in measurement of grief symptomatology, combined with this recent finding of a distinction between CG and PGD, questions the applicability of the present study to past studies of ABM. While findings from the current investigation are similar to what was found in the past, a strong relationship between PGD symptom levels and the main effects of increased memory specificity and increased loss-related recall were found, unlike the wide ranging inconsistencies in past studies to find such as relationship between symptomatology and level of ABM recall specificity. During data analysis, an unexpected question arose as to which symptomatology parsing would provide the most robust results. Initially, we were going to use the score of 31 as a cut-off, as one study proposed this cut-off, but this cut-off has not been validated in the literature (Rosner et al., 2015). However, this cut-off was based on the ICG-r while conversely the PG-13 scale was used in the present study. Past studies either used the continuous total scores from the measure, or used a median-split to create high and low grief groups. However, this seemed arbitrary, and as our results suggest, a continuous total score provided the *least* robust effects and was an ineffective predictor variable. To resolve these conflicts, we created a data analytic plan before we analyzed the data, to robustly analyze the data with four different grief

parsings of the PG-13, PHQ-9, and PCL-S symptom measures, based on these questions from the literature: 1) as a continuous variable, summed and mean centered; 2) the disorder-specific factor items from Papa et al. (2014), continuous, summed and mean centered – based on an EFA and CFA to separate the unique, non-overlapping, symptom-specific questions for each PGD, MDD, and PTSD disorder in order to control for any overlapping symptomatology which could be confounding findings; 3) a clinical cut-off score based on our sample's mean PG-13 scores, with the standard deviation added to it—a cut-off scores or 39 was used in this study; and 4) whether the individual meets diagnostic criteria or not, based on the instructions from the scale authors. By assessing the effects of the various grief parsings, we systematically explored the potential reason why there have been inconsistent links with ABM specificity level and grief symptomatology in the past. Given our findings, the most robust effects were found when using the cut-off score and when using the diagnostic criteria as grouping variables. This suggests that there may be meaningful taxonomy for defining these clinical disorders, and these parsings may provide the most robust findings when studying grief and bereavement in the future (Clark & Watson, 1991; Follette & Houts, 1996; cf. Robinaugh et al., 2014). Future ABM and bereavement studies may benefit from using diagnostic criteria as meaningful grouping variables rather than continuous scale measurements. The type of scale utilized is also important – future studies could give participants both measures and compare which measure is most predictive of ABM specificity levels. Comparisons of future studies should include consideration of this question and carefully explore findings in relation to PGD measurement and diagnostic labelling differences.

Given the cross-sectional nature of the design, it is not clear whether loss-related recall causes PGD or is a result of PGD. In a prospective study, Eisma et al. (2013) found that avoidance early after a loss is useful up until a point where it becomes the main strategy used, causing chronic avoidance and negative arousal cycles which can be contributing to psychopathology. If possible, future prospective studies should be conducted to understand the mechanisms involved in paradoxical avoidance, which over time, can lead to psychopathology (Watkins & Nolen-Hoeksema, 2014 habit-goal-framework). An important factor to consider is the use of clinical versus non-clinical populations in understanding chronic avoidance processes. As the current study's findings indicate, only high symptomatology predicted memory recall in response to sad mood. Non-clinical populations could be providing the conflicting results found in this study and across other ABM studies for bereavement. Matsumoto and Mochizuki (2017) studied a non-clinical population and found those who were dysphoric experienced higher OGM for highly self-relevant, positive cues and lower self-relevant, negative cues. A pattern of chronic avoidance in the face of negative emotions could contribute to PGD. Future studies should explore ABM, avoidance, mood, and rumination across different post-loss time periods to determine relationship to PGD symptom levels over time.

The current study's findings are the first to demonstrate loss-related recall as an emotion regulation techniques in response to sad emotions, but only for those with high PGD. However, given the lack of interaction effects for specific ABM recall or for the happy emotion condition and PGD for loss recall, it is still unclear how positive emotions interact with PGD symptoms, especially since the happy condition demonstrated reduced

loss recall. The role of emotion on level of specificity should be explored further in future studies. It could be possible that our null results are due to ineffectiveness of the emotion induction prime, as positive and negative emotion ratings for our study were lower than other studies using similar stimuli (3.2 vs. 6 on average, but their ratings were on a scale of 8 and our were on a scale of 7; Gabert-Quillen et al., 2015). Additionally, we also gave the emotion rating scale at the end of the study rather than right after the video, which could be underestimating emotion induction effects. We removed participants who did not endorse attending to the video to help control for this. Regardless of the lower ratings, analyses indicated the emotion prime was effective, as sad was significantly different from neutral and happy was significantly different than sad on positive and negative emotion ratings. However, as the study was conducted on MTurk, we were unable to control for environmental stimuli that may have been competing for attention. Previous MTurk studies have been found to be comparable to in-person behavioral outcomes (Casler, Bickel, Hackett, 2013), which provides support for the MTurk format as a viable platform for future studies. Given the link between PGD and grief-related rumination (Eisma et al., 2013; Boelen et al., 2007), high ruminators had impaired inhibition, but specifically for grief-related stimuli compared to negative and positive stimuli only (Desespaux & Zech, 2015). Future studies should add another experimental condition for grief-specific emotional stimuli, which could potentially enhance negative emotion effects and provide more ecological validity to the emotion induction.

Mechanisms of Memory Retrieval in the Development of PGD

While the present findings are supportive of an emotion regulation function of loss-related recall in PGD for sad emotions, it is unclear by which this mechanism occurs to maintain PGD. Future research should control for this by specifically asking for loss-related and non-loss related memories, or asking for daily samplings of memories and emotion processes. However, past studies that have done this have still found inconsistencies for how ABM specificity is functioning for those with higher grief-related distress (Golden et al., 2007; Boelen et al., 2010; Barzykowski & Staugaard, 2016; Maccallum & Bryant, 2011a). For example, Robinaugh and McNally (2013) gave participants 4 different AMT tasks controlling for loss-related memories and imagining the future with and without the deceased. They found no difference in symptoms for level of loss-related specificity, but found that individuals with PGD had higher OGM when recalling the past and imagining the future without the deceased. Controlling for loss recall did not provide additional information regarding symptom levels and ABM, except with regard to OGM recall when trying to imagine a future that did not include the deceased for those with PGD. It could be that this study did not include emotions and that is the reason for discrepant findings.

The Emotion Regulation Function of ABM for PGD

A continued question raised by the present study's findings is the longstanding debate in the bereavement literature as to whether there is a loss, or non-loss focus in avoidance, and what is exactly being avoided. Boelen and colleagues purported that avoidance disrupts integration of autobiographical memories about the loss into existing memories and future panning. In an approach/avoidance task, implicit loss avoidance was

measured via pushing (avoidance) a joy stick away or pulling it closer (approach). Participants with a tendency to ruminate pushed (avoided) loss stimuli away from themselves faster, and pulled (approached) loss stimuli more slowly towards themselves (Eisma et al., 2014). The function and target of avoidance after a loss is unclear in the bereavement literature regarding whether avoidance is avoidance of loss-related stimuli by ruminating on something else besides the loss (Eisma, Schut, Strobe, van den Bout, Stroebe, Bolen, 2014), or whether it's avoidance of engaging with daily life by ruminating on loss stimuli instead of moving on (Boelen, van den Hout & van den Bout, 2006). It is still unclear as to whether avoidance is of loss stimuli-/reminders (Shear 2012; Eisma et al., 2014), or whether it is avoidance/ignoring physiological emotional arousal related to the loss (Bonanno et al., 1995). Robinaugh (2015) did not find deficits in attention or cognitive processing for emotional information in a bereaved sample. Although the production of novel future events contained less perceptually and emotionally rich detail in the pathologically bereaved group. It could be that rumination and avoidance function together to provide breaks from grieving, allowing room to process the loss (Stroebe & Schut, 1999). Or it could function to inhibit future planning and accommodated of the loss into existing self-schemas.

In the bereavement literature, rumination has been described as a passive focus on negative emotions and symptoms. Rather than confronting the loss by thinking about and working though the loss (as in Shear's definition of rumination), rumination itself has been conceptualized as avoidance in a Rumination as Avoidance (RAH) hypothesis (Stroebe, Boelen, van den Hout Stroebe, Salemink, & van den Bout, 2007). Descriptions

of this RAH include deliberate grief avoidance where grievers behaviorally avoid situations, places, and objects that are reminders of the loss, and thought suppression of memories related to the loss or death event in order to cognitively avoid painful reminders of the loss (Boelen, van den Hout, & van den Bout, 2006). The role of ABM recall and rumination requires clarification, especially in the inconclusive role that OGM and rumination play in executive functioning, post-loss.

Potentially, avoidance occurs at the specific recall level or at the loss-related recall level for PGD. It is unclear at this time exactly how avoidance processes occur in relation to memory specificity levels in grievers—although there is strong consensus and empirical support for loss-related recall in relation to PGD. Exploration of how the CaRFAX model functions during bereavement is necessary, as the "capture" and functional avoidance mechanisms do not fit exactly to explain PGD, yet there seem to be emotion regulating aspects of loss-related recall in the maintenance of PGD. However, Eisma's (2015) sample demonstrated very small amount of specific, non-loss recall on average. Specific, non-loss recall was 5% of the memories recalled, compared to our sample's specific, non-loss recall of 18%. Interestingly, however, Eisma et al., (2015) did *not* find a relationship between symptom levels and loss-related specificity – loss related recall was not more specific, only higher symptom levels and non-loss OGM recall were significant, suggesting that loss-related recall may be "immune" to the reduced specificity effect in PGD (Golden et al., 2007). This may indicate that the CaRFAX model is partly playing a role during bereavement for those who develop PGD, but instead of using overgeneral recall to regulate negative emotions related to the distressing loss event, that

OGM recall occurs to protect against the negative emotions associated with a life without the deceased and “captures” rumination and truncated avoidance processes at this level (Eisma et al., 2015).

It is also important to explore which emotions trigger which responses in real time. Providing more information as to how grief-specific stimuli and/or grief-specific pathways can impact working memory and other executive functioning. Out of the 4 studies that tested the executive functioning impairment aspect of the CaRFAX model, only two had quasi-supportive results while the other two found no relationship between OGM and executive functioning. In support of CaRFAX, one study found slower reaction time for death-related words and preferential retrieval for rumination on the loss or the adverse consequences of the loss (Maccallum & Bryant, 2010) and another study found rumination was only related to OGM of non-loss memories, which Maccallum and Bryant (2010) purport is not supportive of CaRFAX, but we would disagree, given the association between difficulty imagining a future without the deceased is linked to PGD. Conversely, no association was found for letter-number-sequencing and ABM specificity in two studies: Maccallum & Bryant 2011a; Maccallum & Bryant, 2010a). Further testing of other executive functioning within PGD and ABM studies are needed to clarify which executive functioning deficits, if any, are impeding successful recovery from loss. Emotion should be considered, due to effects on working memory and psychopathology. Whether there is a relationship between executive functioning, PGD, and ABM could mean potentially impaired inhibition from loss-related stimuli, difficulty activating positive memories to regulate emotions more effectively, or rumination over negative

emotion states. The CaRFAX model has had inconsistent support, especially the "capture" and executive functioning aspects and should be explored further across several psychopathologies to determine the adequacy and applicability of this model, especially in relation to PGD compared to PTSD and MDD. Eisma et al. (2015) found an effect for higher rumination but only for OGM to non-loss memories, which is confusing in relation to the an opposite expectation that OGM would "capture" rumination on distress, loss-related material in the CaRFAX model. Is rumination capturing attention and negative emotion at the OGM level with non-loss memories, or at the specific level with loss-related memories? A potential third factor could be moderating that relationship and requires further testing in the bereavement field.

Conclusion

ABM recall has been implicated in an avoidant emotion regulation process that can lead to the development, maintenance or remission of psychopathology, when truncated avoidance processes habitually occur to provide decontextualized responses to emotions. OGM recall has been theorized to occur in response to distressing memories and distressing emotions in the CaRFAX model (Sumner, 2012). Given the hypothesized role of ABM recall specificity as an *emotion regulation* tactic, the dearth of studies inducing an emotion that is then to be regulated by research participants, is surprising. The current study filled this gap by inducing emotion. Emotion should be prioritized and considered more thoroughly in the emotion regulation literature in the future. The dominant theory of hierarchical ABM recall, especially in regards to emotion regulation and rumination processes in the development of disorder, may not be applicable to

memory recall in PGD. More likely, memory recall and functional avoidance of those memories works differently in PGD – either recall is halted at a specific or a loss-related level, or OGM occurs for non-loss memories, which may be initially more distressing post-loss than loss-related memories, as the lost loved one is still connected to personal meaning making systems and connected to several cognitive-affective-memory systems. We need to determine the pathways of these mechanisms across time to better under the role of valence and other factors which impact the accessibility of memories (Matsumoto & Mochizuki, 2017).

The current study is the first test the emotion regulation function of memory recall in PGD by experimentally inducing emotion and being the second study to use the SCEPT to test ABM in grievers. Findings from our study indicate that in a negative mood, grievers with PGD are more likely to recall loss-related memories than grievers without PGD. Loss-related recall contributes to PGD. Further assessment of this relationship, including the need to create an emotion regulation theory specific to PGD than MDD and PTSD, is important, as loss-related recall in the face of negative mood, or enhancing non-loss recall when in a happy mood, could be important treatment targets for the field responding to negative mood by blocking loss-related recall and engaging in activities or shifting attention to recall of specific, positive, non-loss memories (see Papa et al., 2013 for behavioral activation treatment for PGD). Further exploration of the mechanisms by which memory is implicated in maladaptive emotion regulation processes that lead to PGD in order to provide more effective treatment targets is warranted.

References

Addis, D. R., Musicaro, R., Pan, L., & Schacter, D. L. (2010). Episodic simulation of past and future events in older adults: Evidence from an experimental recombination task. *Psychology and Aging*, *25*(2), 369.

Addis, D. R., Wong, A. T., & Schacter, D. L. (2008). Age-related changes in the episodic simulation of future events. *Psychological Science*, *19*(1), 33-41.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications, Inc.

Areni, C. S., & Burger, M. (2008). Memories of "bad" days are more biased than memories of "good" days: Past Saturdays vary, but past Mondays are always blue. *Journal of Applied Social Psychology*, *38*(6), 1395-1415.

Arizmendi, B., Kaszniak, A. W., & O'Connor, M. F. (2016). Disrupted prefrontal activity during emotion processing in complicated grief: an fMRI investigation. *NeuroImage*, *124*, 968-976.

Bartolini, E. E. (2011). *Eliciting emotion with film: Development of a stimulus set* (Doctoral dissertation, Wesleyan University).

Barzykowski, K., & Staugaard, S. R. (2016). Does retrieval intentionality really matter? Similarities and differences between involuntary memories and directly and generatively retrieved voluntary memories. *British Journal of Psychology*, *107*(3), 519-536.

Bauer, J. J., & Bonanno, G. A. (2001). I can, I do, I am: The narrative differentiation of self-efficacy and other self-evaluations while adapting to bereavement. *Journal of Research in Personality*, *35*(4), 424-448.

Bauer, J. J., & Bonanno, G. A. (2001). Doing and being well (for the most part): Adaptive patterns of narrative self-evaluation during bereavement. *Journal of Personality*, *69*(3), 451-482.

Bäuml, K. H., & Kuhbandner, C. (2007). Remembering can cause forgetting—but not in negative moods. *Psychological Science*, *18*(2), 111-115.

Behar, E., Zuellig, A. R., & Borkovec, T. D. (2005). Thought and imaginal activity during worry and trauma recall. *Behavior Therapy*, *36*(2), 157-168.

Berntsen, D. (2002). Tunnel memories for autobiographical events: Central details are remembered more frequently from shocking than from happy experiences. *Memory & Cognition*, *30*(7), 1010-1020.

Berntsen, D., & Rubin, D. C. (2002). Emotionally charged autobiographical memories across the life span: The recall of happy, sad, traumatic and involuntary memories. *Psychology and Aging*, *17*(4), 636-652.

Berntsen, D., & Rubin, D. C. (2006). Emotion and vantage point in autobiographical. *Cognition and Emotion*, *20*(8), 1193-1215.

Boelen, P. A., de Keijser, J., & Smid, G. (2015). Cognitive–behavioral variables mediate the impact of violent loss on post-loss psychopathology. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(4), 382-390.

Boelen, P. A., Huntjens, R. J., van Deursen, D. S., & van den Hout, M. A. (2010). Autobiographical memory specificity and symptoms of complicated grief, depression, and posttraumatic stress disorder following loss. *Journal of Behavior Therapy and Experimental Psychiatry*, *41*(4), 331-337.

Boelen, P. A., de Keijser, J., van den Hout, M. A., & van den Bout, J. (2007). Treatment of complicated grief: a comparison between cognitive-behavioral therapy and supportive counseling. *Journal of Consulting and Clinical Psychology*, *75*(2), 277-284.

Boelen, P. A., van den Bout, J., & van den Hout, M. A. (2006). Negative cognitions and avoidance in emotional problems after bereavement: a prospective study. *Behaviour Research and Therapy*, *44*(11), 1657-1672.

Bohanek, J. G., Fivush, R., & Walker, E. (2005). Memories of positive and negative emotional events. *Applied Cognitive Psychology*, *19*(1), 51-66.

Bonanno, G. A., Papa, A., O'Neill, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science*, *15*, 482-487.

Bonanno, G. A., Wortman, C. B., Lehman, D. R., Tweed, R. G., Haring, M., Sonnega, J., ... & Nesse, R. M. (2002). Resilience to loss and chronic grief: a prospective study from preloss to 18-months postloss. *Journal of Personality and Social Psychology*, *83*(5), 1150-1164.

Bowlby, J. (1980). Attachment and loss: Loss, sadness and depression (Vol. 3). London: Hogarth Press.

Brewer, M. B., & Gardner, W. (1996). Who is this" We"? Levels of collective identity and self representations. *Journal of Personality and Social Psychology*, *71*(1), 83-93.

Brewin, C. R., Gregory, J. D., Lipton, M., & Burgess, N. (2010). Intrusive images in psychological disorders: characteristics, neural mechanisms, and treatment implications. *Psychological review*, *117*(1), 210-232.

Brewin, C. R. (2001). Memory processes in post-traumatic stress disorder. *International Review of Psychiatry*, *13*(3), 159-163.

Brewin, C. R., Watson, M., McCarthy, S., Hyman, P., & Dayson, D. (1998). Memory processes and the course of anxiety and depression in cancer patients. *Psychological Medicine, 28*(01), 219-224.

Brewin, C. R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of posttraumatic stress disorder. *Psychological Review*, *103*(4), 670-686.

Brown, A. D., Root, J. C., Romano, T. A., Chang, L. J., Bryant, R. A., & Hirst, W. (2013). Overgeneralized autobiographical memory and future thinking in combat veterans with posttraumatic stress disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(1), 129-134.

Bohn, A., & Berntsen, D. (2007). Pleasantness bias in flashbulb memories: Positive and negative flashbulb memories of the fall of the Berlin Wall among East and West Germans. *Memory & Cognition*, *35*(3), 565-577.

Buchanan, T. W. (2007). Retrieval of emotional memories. *Psychological bulletin*, *133*(5), 761-779.

Cahill, L., & McGaugh, J. L. (1995). A novel demonstration of enhanced memory associated with emotional arousal. *Consciousness and Cognition*, *4*(4), 410-421.

Capps, L., & Bonanno, G. A. (2000). Narrating bereavement: Thematic and grammatical predictors of adjustment to loss. *Discourse Processes*, *30*(1), 1-25.

Carr, D. S., Nesse, R. M., & Wortman, C. B. (Eds.). (2005). *Spousal bereavement in late life*. New York, NY: Springer Publishing Company Inc.

Carver, C. S. (2004). Negative affects deriving from the behavioral approach system. *Emotion*, *4*(1), 3-22.

Casler, K., Bickel, L., & Hackett, E. (2013). Separate but equal? A comparison of participants and data gathered via Amazon's MTurk, social media, and face-to-face behavioral testing. *Computers in Human Behavior*, *29*(6), 2156-2160.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, *100*(3), 316-336.

Clore, G. L., & Storbeck, J. (2006). Affect as information about liking, efficacy, and importance. In J. P. Forgas (Ed.). *Affect in social thinking and behavior* (pp. 123-141). New York, NY, US: Psychology Press.

Clore, G. L., Gasper, K., & Garvin, E. (2001). Affect as information. *Handbook of Affect and Social Cognition*, 121-144.

Clore, G. L., Schwarz, N., & Conway, M. (1994). Affective causes and consequences of social information processing. Wyer, R.S., Jr., & Srull, T.K. (Eds.). *Handbook of Social Cognition*, *1*, 323-417.

Coifman, K. G., Bonanno, G. A., Ray, R. D., & Gross, J. J. (2007). Does repressive coping promote resilience? Affective-autonomic response discrepancy during bereavement. *Journal of Personality and Social Psychology*, *92*(4), 745.

Conway, M. A., Loveday, C., & Cole, S. N. (2016). The remembering–imagining system. *Memory Studies*, *9*(3), 256-265.

Conway, A. R. (1996). Individual differences in working memory capacity: More evidence for a general capacity theory. *Memory*, *4*(6), 577-590.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, *107*(2), 261-288.

Dalgleish, T., Williams, J. M. G., Golden, A. M. J., Perkins, N., Barrett, L. F., Barnard, P. J., & Watkins, E. (2007). Reduced specificity of autobiographical memory and depression: the role of executive control. *Journal of Experimental Psychology: General*, *136*(1), 23-42.

Dalgleish, T., Taghavi, R., Neshat-Doost, H., Moradi, A., Canterbury, R., & Yule, W. (2003). Patterns of processing bias for emotional information across clinical disorders: A comparison of attention, memory, and prospective cognition in children and adolescents with depression, generalized anxiety, and posttraumatic stress disorder. *Journal of Clinical Child and Adolescent Psychology*, *32*(1), 10-21.

Dalgleish, T., & Watts, F. N. (1990). Biases of attention and memory in disorders of anxiety and depression. *Clinical Psychology Review*, *10*(5), 589-604.

Davis, C. G., Lehman, D. R., Wortman, C. B., Silver, R. C., & Thompson, S. C. (1995). The undoing of traumatic life events. *Personality and Social Psychology Bulletin, 21*(2), 109-124.

Delespaux, E., & Zech, E. (2015). Why do bereaved partners experience interfering rumination?: Evidence for deficits in cognitive inhibition. *Death Studies, 39*(8), 463-472.

Demaree, H. A., Everhart, D. E., Youngstrom, E. A., & Harrison, D. W. (2005). Brain lateralization of emotional processing: historical roots and a future incorporating "dominance". *Behavioral and Cognitive Neuroscience Reviews*, *4*(1), 3-20.

DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: the role of emotion specificity. *Journal of Personality and Social Psychology*, *78*(3), 397-416.

Dreben, E. K., Fiske, S. T., & Hastie, R. (1979). The independence of evaluative and item information: Impression and recall order effects in behavior-based impression formation. *Journal of Personality and Social Psychology, 37*(10), 1758-1768.

Dreisbach, G., & Goschke, T. (2004). How positive affect modulates cognitive control: Reduced perseveration at the cost of increased distractibility. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *30*(2), 343-353.

Eisma, M. C., Schut, H. A., Stroebe, M. S., Voerman, K., Bout, J., Stroebe, W., & Boelen, P. A. (2015). Psychopathology symptoms, rumination and autobiographical memory specificity: Do associations hold after bereavement? *Applied Cognitive Psychology, 29*(3), 478-484.

Eisma, M. C., Stroebe, M. S., Schut, H. A., Van Den Bout, J., Boelen, P. A., & Stroebe, W. (2014). Development and psychometric evaluation of the Utrecht Grief Rumination Scale. *Journal of Psychopathology and Behavioral Assessment*, *36*(1), 165-176.

Eisma, M. C., Stroebe, M. S., Schut, H. A., Stroebe, W., Boelen, P. A., & van den Bout, J. (2013). Avoidance processes mediate the relationship between rumination and symptoms of complicated grief and depression following loss. *Journal of Abnormal Psychology*, *122*(4), 961-970.

Ellard, K. K., Farchione, T. J., & Barlow, D. H. (2012). Relative effectiveness of emotion induction procedures and the role of personal relevance in a clinical sample: A comparison of film, images, and music. *Journal of Psychopathology and Behavioral Assessment*, *34*(2), 232-243.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149-1160.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Thousand Oaks, CA: Sage.

Foa, E. B., & Riggs, D. S. (1993). Post-traumatic stress disorder in rape victims. *American Psychiatric Press Review of Psychiatry*, *12*, 273-303.

Frattaroli, J. (2006). Experimental disclosure and its moderators: a meta-analysis. *Psychological Bulletin*, *132*(6), 823-865.

Freud, A. (1954). The widening scope of indications for psychoanalysis: Discussion. *Journal of the American Psychoanalytic Association, 2*(4), 607-620.

Freud, S. (1917). Mourning and melancholia. *The standard edition of the complete psychological works of Sigmund Freud, 14*, 1914-1916.

Friedman, R. S., & Förster, J. (2005). Effects of motivational cues on perceptual asymmetry: implications for creativity and analytical problem solving. *Journal of Personality and Social Psychology, 88*(2), 263-275.

Gabert-Quillen, C. A., Bartolini, E. E., Abravanel, B. T., & Sanislow, C. A. (2015). Ratings for emotion film clips. *Behavior Research Methods, 47*(3), 773-787.

Genet, J. J., & Siemer, M. (2012). Rumination moderates the effects of daily events on negative mood: Results from a diary study. *Emotion, 12*(6), 1329-1339.

Gibbs, B. R., & Rude, S. S. (2004). Overgeneral autobiographical memory as depression vulnerability. *Cognitive Therapy and Research, 28*(4), 511-526.

Gillies, J., & Neimeyer, R. A. (2006). Loss, grief, and the search for significance: Toward a model of meaning reconstruction in bereavement. *Journal of Constructivist Psychology, 19*(1), 31-65.

Greenberg, M. A., Wortman, C. B., & Stone, A. A. (1996). Emotional expression and physical heath: Revising traumatic memories or fostering self-regulation? *Journal of Personality and Social Psychology, 71*(3), 588-602.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition & Emotion, 9*(1), 87-108.

Golden, A. M., Dalgleish, T., & Mackintosh, B. (2007). Levels of specificity of autobiographical memories and of biographical memories of the deceased in bereaved individuals with and without complicated grief. *Journal of Abnormal Psychology*, *116*(4), 786-795.

Harvey, A. G., Bryant, R. A., & Dang, S. T. (1998). Autobiographical memory in acute stress disorder. *Journal of Consulting and Clinical Psychology*, *66*(3), 500.

Healy, H., & Williams, J. M. G. (1999). Autobiographical memory. Dalgleish, T., & Power, M. (Eds.). *Handbook of Cognition and Emotion*, 229-242.

Heuer, F., & Reisberg, D. (1990). Vivid memories of emotional events: The accuracy of remembered minutiae. *Memory & Cognition*, *18*(5), 496-506.

Hermans, D., Vandromme, H., Debeer, E., Raes, F., Demyttenaere, K., Brunfaut, E., & Williams, J. M. G. (2008). Overgeneral autobiographical memory predicts diagnostic status in depression. *Behaviour Research and Therapy*, *46*(5), 668-677.

Holland, A. C., & Kensinger, E. A. (2012). Younger, middle-aged, and older adults' memories for the 2008 US Presidential Election. *Journal of Applied Research in Memory and Cognition*, *1*(3), 163-170.

Holland, A. C., & Kensinger, E. A. (2010). Emotion and autobiographical memory. *Physics of Life Reviews*, *7*(1), 88-131.

Holland, A. C., Tamir, M., & Kensinger, E. A. (2010). The effect of regulation goals on emotional event-specific knowledge. *Memory*, *18*(5), 504-521.

Holtmann, M., Bölte, S., & Poustka, F. (2007). Attention deficit hyperactivity disorder symptoms in pervasive developmental disorders: association with autistic

behavior domains and coexisting psychopathology. *Psychopathology*, *40*(3), 172-177.

Hoge, C. W., Riviere, L. A., Wilk, J. E., Herrell, R. K., & Weathers, F. W. (2014). The prevalence of post-traumatic stress disorder (PTSD) in US combat soldiers: a head-to-head comparison of DSM-5 versus DSM-IV-TR symptom criteria with the PTSD checklist. *The Lancet Psychiatry*, *1*(4), 269-277.

Horowitz, M. J. (1986). Stress-response syndromes: A review of posttraumatic and adjustment disorders. *Psychiatric Services*, *37*(3), 241-249.

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of Event Scale: a measure of subjective stress. *Psychosomatic Medicine*, *41*(3), 209-218.

Hosmer, D., & Lemeshow, S. Applied Logistic Regression 2nd edition, 2000. *New York: John Wiley & Sons*, *3*, 70.

Johnson, M. K., Kim, J. K., & Risse, G. (1985). Do alcoholic Korsakoff's syndrome patients acquire affective reactions? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*(1), 22-36.

Joormann, J., Siemer, M., & Gotlib, I. H. (2007). Mood regulation in depression: Differential effects of distraction and recall of happy memories on sad mood. *Journal of Abnormal Psychology*, *116*(3), 484-490.

Josephson, B. R. Singer, JA, & Salovey, P.(1996). Mood regulation and memory: Repairing sad moods with happy memories. *Cognition and Emotion, 10,* 437-444.

Kensinger, E. A. (2007). Negative emotion enhances memory accuracy behavioral and neuroimaging evidence. *Current Directions in Psychological Science*, *16*(4), 213-218.

Kensinger, E. A., & Schacter, D. L. (2006). When the Red Sox shocked the Yankees: Comparing negative and positive memories. *Psychonomic Bulletin & Review*, *13*(5), 757-763.

Kleim, B., & Ehlers, A. (2008). Reduced autobiographical memory specificity predicts depression and posttraumatic stress disorder after recent trauma. *Journal of Consulting and Clinical Psychology*, *76*(2), 231-242.

Koster, E. H., Fang, L., Marchetti, I., Ebner-Priemer, U., Kirsch, P., Huffziger, S., & Kuehner, C. (2015). Examining the relation between mood and rumination in remitted depressed individuals: A dynamic systems analysis. *Clinical Psychological Science*, *3*(4), 619-627.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9. *Journal of General Internal Medicine*, *16*(9), 606-613.

Laird, J.D., Wagener, J.J., Halal, M. & Szegda, M. (1982). Remembering what you feel: Effects of emotion on memory. *Journal of Personality and Social Psychology*, *42*(4), 646-657.

Lavender, A., & Watkins, E. (2004). Rumination and future thinking in depression. *British Journal of Clinical Psychology*, *43*(2), 129-142.

LeDoux, J. E. (1995). Emotion: Clues from the brain. *Annual Review of Psychology*, *46*, 209-235.

Lepore, S. J., & Revenson, T. A. (2006). Resilience and Posttraumatic Growth: Recovery, Resistance, and Reconfiguration. In L. G. Calhoun & R. G. Tedeschi (Eds.), *Handbook of posttraumatic growth: Research & practice* (pp. 24-46). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Levine, L. J., & Edelstein, R. S. (2009). Emotion and memory narrowing: A review and goal-relevance approach. *Cognition and Emotion*, *23*(5), 833-875.

Levine, L. J., & Pizarro, D. A. (2004). Emotion and memory research: A grumpy overview. *Social Cognition*, *22*(5), 530-554.

Levine, L., & Bluck, S. (2004). Painting with broad strokes: Happiness and the malleability of event memory. *Cognition and Emotion*, *18*(4), 559-574.

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: Dissociating episodic from semantic retrieval. *Psychology and Aging*, *17*(4), 677-689.

Levine, L. J., & Burgess, S. L. (1997). Beyond general arousal: Effects of specific emotions on memory. *Social Cognition*, *15*(3), 157-181.

Liotti, M., & Tucker, D. M. (1995). Emotion in asymmetric corticolimbic networks. In R. J. Davidson & K. Hugdahl (Eds.), *Brain asymmetry* (pp. 389-423). Cambridge, MA, US: The MIT Press.

Lyubomirsky, S., Caldwell, N. D., & Nolen-Hoeksema, S. (1998). Effects of ruminative and distracting responses to depressed mood on retrieval of autobiographical memories. *Journal of Personality and Social Psychology*, *75*(1), 166-177.

Maccallum, F., & Bryant, R. A. (2013). A cognitive attachment model of prolonged grief: Integrating attachments, memory, and identity. *Clinical Psychology Review*, *33*(6), 713-727.

Maccallum, F., & Bryant, R. A. (2011a). Imagining the future in complicated grief. *Depression and Anxiety*, *28*(8), 658-665.

Maccallum, F., & Bryant, R. A. (2011b). Autobiographical memory following cognitive behaviour therapy for complicated grief. *Journal of Behavior Therapy and Experimental Psychiatry*, *42*(1), 26-31.

Maccallum, F., & Bryant, R. A. (2010c). Social problem solving in complicated grief. *British Journal of Clinical Psychology*, *49*(4), 577-590.

Maccallum, F., & Bryant, R. A. (2010b). Attentional bias in complicated grief. *Journal of Affective Disorders*, *125*(1), 316-322.

Maccallum, F., & Bryant, R. A. (2010a). Impaired autobiographical memory in complicated grief. *Behaviour Research and Therapy*, *48*(4), 328-334.

Maccallum, F., & Bryant, R. A. (2008). Self-defining memories in complicated grief. *Behaviour Research and Therapy*, *46*(12), 1311-1315.

Maciejewski, P. K., Maercker, A., Boelen, P. A., & Prigerson, H. G. (2016). "Prolonged grief disorder" and "persistent complex bereavement disorder", but not "complicated grief", are one and the same diagnostic entity: An analysis of data from the Yale Bereavement Study. *World Psychiatry*, *15*(3), 266-275.

MacLeod, A. K. (2016). Prospection, well-being and memory. *Memory Studies*, *9*(3), 266-274.

Mancini, A. D., Sinan, B., & Bonanno, G. A. (2015). Predictors of prolonged grief, resilience, and recovery among bereaved spouses. *Journal of Clinical Psychology*, *71*(12), 1245-1258.

Matthews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, *1*, 167-195.

Matsumoto, N., & Mochizuki, S. (2017). Effects of self-relevant cues and cue valence on autobiographical memory specificity in dysphoria. *Cognition and Emotion*, *31*(3), 607-615.

McKinnon, M. C., Palombo, D. J., Nazarov, A., Kumar, N., Khuu, W., & Levine, B. (2014). Threat of death and autobiographical memory: A study of passengers from flight AT236. *Clinical Psychological Science*, *3*(4), 487-502.

McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy*, *49*(3), 186-193.

McFarland, C., & Buehler, R. (1998). The impact of negative affect on autobiographical memory: the role of self-focused attention to moods. *Journal of Personality and Social Psychology*, *75*(6), 1424-1440.

McNally, R. J., & Robinaugh, D. J. (2015). 12 Difficulties remembering the past and envisioning the future in people with trauma histories or complicated grief. Watson, L.A., & Berntsen, D. (Eds.). *Clinical Perspectives on Autobiographical Memory*, 242-266.

McNally, R. J., Lasko, N. B., Macklin, M. L., & Pitman, R. K. (1995). Autobiographical memory disturbance in combat-related posttraumatic stress disorder. *Behaviour Research and Therapy, 33*(6), 619-630.

Minnen, A., Wessel, I., Verhaak, C., & Smeenk, J. (2005). The relationship between autobiographical memory specificity and depressed mood following a stressful life event: A prospective study. *British Journal of Clinical Psychology*, *44*(3), 405-415.

Mitchell, A. E. P. (2015). Autobiographical memory response to a negative mood in those with/without a history of depression. *Studia Psychologica, 57*(3), 229-241.

Mitchell, T. R., Thompson, L., Peterson, E., & Cronk, R. (1997). Temporal adjustments in the evaluation of events: The "rosy view". *Journal of Experimental Social Psychology*, *33*(4), 421-448.

Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus and negative affect: an experience sampling study. *Journal of Abnormal Psychology, 117*(2), 314-323.

Moore, S. A., & Zoellner, L. A. (2007). Overgeneral autobiographical memory and traumatic events: An evaluative review. *Psychological Bulletin, 133*(3), 419-437.

Nairne, J. S., Thompson, S. R., & Pandeirada, J. N. (2007). Adaptive memory: survival processing enhances retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(2), 263-273.

Norrholm, S. D., Jovanovic, T., Olin, I. W., Sands, L. A., Bradley, B., & Ressler, K. J. (2011). Fear extinction in traumatized civilians with posttraumatic stress disorder: relation to symptom severity. *Biological Psychiatry, 69*(6), 556-563.

Ong, A. D., Bergeman, C. S., Bisconti, T. L., & Wallace, K. A. (2006). Psychological resilience, positive emotions, and successful adaptation to stress in later life. *Journal of Personality and Social Psychology, 91*(4), 730-749.

Papa, A., Lancaster, N. G., & Kahler, J. (2014). Commonalities in grief responding across bereavement and non-bereavement losses. *Journal of Affective Disorders, 161*, 136-143.

Papa, A., Sewell, M. T., Garrison-Diehn, C., & Rummel, C. (2013). A randomized open trial assessing the feasibility of behavioral activation for pathological grief responding. *Behavior Therapy*, *44*(4), 639-650.

Pennebaker, J. W. (1997). Writing about emotional experiences as a therapeutic process. *Psychological Science, 8*(3), 162-166.

Philippot, P., Schaefer, A., & Herbette, G. (2003). Consequences of specific processing of emotional information: Impact of general versus specific autobiographical memory priming on emotion elicitation. *Emotion, 3*(3), 270-283.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*(4), 437-448.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers, 36*(4), 717-731.

Prigerson, H. G., Horowitz, M. J., Jacobs, S. C., Parkes, C. M., Aslan, M., Goodkin, K., ... & Bonanno, G. (2009). Prolonged grief disorder: Psychometric validation of criteria proposed for DSM-V and ICD-11. *PLoS medicine*, *6*(8), e1000121.

Prigerson, H. G., Vanderwerker, L. C., & Maciejewski, P. K. (2007). A Case for the Inclusion of Prolonged Grief Disorder n in DSM-V. Pp. 165-186, Chapter 8 in *Handbook of Bereavement Research and Practice: 21st Century Perspectives*. Stroebe, M., Hansson, R., Schut, H., & Stroebe, W. (Eds.). Washington, D.C.: American Psychological Association Press.

Boelen, P. A., & Hoijtink, H. (2009). An item response theory analysis of a measure of complicated grief. *Death Studies*, *33*(2), 101-129.

Raes, F., Watkins, E. R., Williams, J. M. G., & Hermans, D. (2008). Non-ruminative processing reduces overgeneral autobiographical memory retrieval in students. *Behaviour Research and Therapy*, *46*(6), 748-756.

Raes, F., Hermans, D., Williams, J. M. G., & Eelen, P. (2007). A sentence completion procedure as an alternative to the Autobiographical Memory Test for assessing overgeneral memory in non-clinical populations. *Memory*, *15*(5), 495-507.

Raes, F., Hermans, D., de Decker, A., Eelen, P., & Williams, J. M. G. (2003). Autobiographical memory specificity and affect regulation: an experimental approach. *Emotion*, *3*(2), 201-206.

Ramel, W., Goldin, P. R., Eyler, L. T., Brown, G. G., Gotlib, I. H., & McQuaid, J. R. (2007). Amygdala reactivity and mood-congruent memory in individuals at risk for depressive relapse. *Biological Psychiatry*, *61*(2), 231-239.

Ricarte, J., Ros, L., Serrano, J. P., Martínez-Lorca, M., & Latorre, J. M. (2016). Age differences in rumination and autobiographical retrieval. *Aging & Mental Health*, *20*(10), 1063-1069.

Robinaugh, D. J. (2015). *Examining cognitive impairments in bereaved adults with and without complicated grief* (Doctoral dissertation).

Robinaugh, D. J., & McNally, R. J. (2013). Remembering the past and envisioning the future in bereaved adults with and without complicated grief. *Clinical Psychological Science*, *1*(3), 290-300.

Robinaugh, D. J., Lubin, R. E., Babic, L., & McNally, R. J. (2013). Are habitual overgeneral recollection and prospection maladaptive? *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(2), 227-230.

Rook, K. S. (1990). Parallels in the study of social support and social strain. *Journal of Social and Clinical Psychology*, *9*(1), 118-132.

Rosner, R. (2015). Prolonged grief: Setting the research agenda. *European Journal of Psychotraumatology*, *6*(1), 1-6.

Rottenberg, J., Ray, R. D., & Gross, J. J. (2007). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment* (pp. 9–28). New York: Oxford University Press.

Rottenberg, J., Salomon, K., Gross, J. J., & Gotlib, I. H. (2005). Vagal withdrawal to a sad film predicts subsequent recovery from depression. *Psychophysiology, 42,* 277–281.

Rubin, D. C. (2006). The basic-systems model of episodic memory. *Perspectives on Psychological Science*, *1*(4), 277-311.

Ruggiero, K. J., Del Ben, K., Scotti, J. R., & Rabalais, A. E. (2003). Psychometric properties of the PTSD Checklist—Civilian version. *Journal of Traumatic Stress*, *16*(5), 495-502.

Safer, M. A., Bonanno, G. A., & Field, N. P. (2001). " It was never that bad": Biased recall of grief and long-term adjustment to the death of a spouse. *Memory*, *9*(3), 195-203.

Schacter, D. L., Norman, K. A., & Koutstaal, W. (1998). The cognitive neuroscience of constructive memory. *Annual Review of Psychology*, *49*(1), 289-318.

Schaefer, A., Nils, F., Sanchez, X., & Philippot, P. (2010). Assessing the effectiveness of a large database of emotion-eliciting films: A new tool for emotion researchers. *Cognition and Emotion*, *24*(7), 1153-1172.

Schaefer, A., & Philippot, P. (2005). Selective effects of emotion on the phenomenal characteristics of autobiographical memories. *Memory*, *13*(2), 148-160.

Schoofs, D., Pabst, S., Brand, M., & Wolf, O. T. (2013). Working memory is differentially affected by stress in men and women. *Behavioural Brain Research*, *241*, 144-153.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*(3), 513-523.

Seery, M. D., Holman, E. A., & Silver, R. C. (2010). Whatever does not kill us: cumulative lifetime adversity, vulnerability, and resilience. *Journal of Personality and Social Psychology*, *99*(6), 1025-1041.

Segerstrom, S. C., Schipper, L. J., & Greenberg, R. N. (2008). Caregiving, repetitive thought, and immune response to vaccination in older adults. *Brain, Behavior, and Immunity*, *22*(5), 744-752.

Segerstrom, S. C., Stanton, A. L., Alden, L. E., & Shortridge, B. E. (2003). A multidimensional structure for repetitive thought: What's on your mind, and how, and how much? *Journal of Personality and Social Psychology*, *85*(5), 909-921.

Sharot, T., Delgado, M. R., & Phelps, E. A. (2004). How emotion enhances the feeling of remembering. *Nature Neuroscience*, *7*(12), 1376-1380.

Shear, K., Monk, T., Houck, P., Melhem, N., Frank, E., Reynolds, C., & Sillowash, R. (2007). An attachment-based model of complicated grief including the role of avoidance. *European Archives of Psychiatry and Clinical Neuroscience*, *257*(8), 453-461.

Silove, D., Steel, Z., McGorry, P., & Mohan, P. (1998). Psychiatric symptoms and living difficulties in Tamil asylum seekers: comparisons with refugees and immigrants. *Acta Psychiatrica Scandinavica*, *97*(3), 175-81.

Skowronski, J. J., & Carlston, D. E. (1987). Social judgment and social memory: The role of cue diagnosticity in negativity, positivity, and extremity biases. *Journal of Personality and Social Psychology*, *52*(4), 689-699.

Smets, J., Griffith, J. W., Wessel, I., Walschaerts, D., & Raes, F. (2013). Depressive symptoms moderate the effects of a self-discrepancy induction on overgeneral autobiographical memory. *Memory*, *21*(6), 751-761.

Smid, G. E., & Boelen, P. A. (2016). Performance of complicated grief criteria. *American Journal of Psychiatry*, *173*(11), 1149.

Stein, N., Folkman, S., Trabasso, T., & Richards, T. A. (1997). Appraisal and goal processes as predictors of psychological well-being in bereaved caregivers. *Journal of Personality and Social Psychology*, *72*(4), 872-884.

Stroebe, W., Schut, H., & Stroebe, M. S. (2005). Grief work, disclosure and counseling: Do they help the bereaved? *Clinical Psychology Review*, *25*(4), 395-414.

Stroebe, M. S. & Schut, H. (1999). The dual process model of coping with bereavement: Rationale and description. *Death Studies*, *23*(3), 197-224.

Sumner, J. A. (2012). The mechanisms underlying overgeneral autobiographical memory: An evaluative review of evidence for the CaR-FA-X model. *Clinical Psychology Review*, *32*(1), 34-48.

Sumner, J. A., Griffith, J. W., & Mineka, S. (2010). Overgeneral autobiographical memory as a predictor of the course of depression: A meta-analysis. *Behaviour Research and Therapy*, *48*(7), 614-625.

Sutherland, K., & Bryant, R. A. (2007). Autobiographical memory in posttraumatic stress disorder before and after treatment. *Behaviour Research and Therapy*, *45*(12), 2915-2923.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Allyn & Bacon/Pearson Education.

Talarico, J. M., Berntsen, D., & Rubin, D. C. (2009). Positive emotions enhance recall of peripheral details. *Cognition and Emotion*, *23*(2), 380-398.

Teasdale, J. D. (1988). Cognitive vulnerability to persistent depression. *Cognition & Emotion, 2*(3), 247-274.

Thomsen, D. K., & Berntsen, D. (2009). The long-term impact of emotionally stressful events on memory characteristics and life story. *Applied Cognitive Psychology, 23*(4), 579-598.

Tranel, D., & Damasio, A. R. (1993). The covert learning of affective valence does not require structures in hippocampal system or amygdala. *Journal of Cognitive Neuroscience*, *5*(1), 79-88.

Tulving, E. (1985). How many memory systems are there? *American psychologist*, *40*(4), 385-398.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology/Psychologie Canadienne, 26*(1), 1-12.

Tulving, E. (1984). Précis of elements of episodic memory. *Behavioral and Brain Sciences, 7*(2), 223-238.

Uzer, T., Lee, P. J., & Brown, N. R. (2012). On the prevalence of directly retrieved autobiographical memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 38*(5), 1296-1308.

van Lier, J., Vervliet, B., Vanbrabant, K., Lenaert, B., & Raes, F. (2014). Abstract thinking about negative events in dysphoric students leads to negative generalization. *Journal of Experimental Psychopathology*, *5*(3), 314-328.

van Vreeswijk, M. F., & de Wilde, E. J. (2004). Autobiographical memory specificity, psychopathology, depressed mood and the use of the Autobiographical Memory Test: A meta-analysis. *Behaviour Research and Therapy*, *42*(6), 731-743.

Velten, E. (1968). A laboratory task for induction of mood states. *Behaviour Research and Therapy*, *6*, 473-482.

Wagner, B., Knaevelsrud, C., & Maercker, A. (2006). Internet-based cognitive-behavioral therapy for complicated grief: a randomized controlled trial. *Death Studies*, *30*(5), 429-453.

Watkins, E., Grafton, B., Weinstein, S. M., & MacLeod, C. (2015). For ruminators, the emotional future is bound to the emotional past heightened ruminative disposition is characterized by increased emotional extrapolation. *Clinical Psychological Science*, *3*(4), 648-658.

Watkins, E. R., & Nolen-Hoeksema, S. (2014). A habit-goal framework of depressive rumination. *Journal of Abnormal Psychology*, *123*(1), 24-34.

Watkins, E., Moberly, N. J., & Moulds, M. L. (2008). Processing mode causally influences emotional reactivity: distinct effects of abstract versus concrete construal on emotional response. *Emotion*, *8*(3), 364-378.

Weick, M., & Guinote, A. (2008). When subjective experiences matter: power increases reliance on the ease of retrieval. *Journal of Personality and Social Psychology, 94*(6), 956-970.

Wenn, J., O'Connor, M., Breen, L. J., Kane, R. T., & Rees, C. S. (2015). Efficacy of metacognitive therapy for prolonged grief disorder: protocol for a randomised controlled trial. *BMJ open, 5*(12), e007221.

Westphal, M., Seifert, N., & Bonanno, G.A. (2010). Expressive Flexibility. *Emotion, 10*, 92-100.

Williams, J. M. G., Barnhofer, T., Crane, C., Herman, D., Raes, F., Watkins, E., & Dalgleish, T. (2007). Autobiographical memory specificity and emotional disorder. *Psychological Bulletin*, *133*(1), 122-148.

Williams, J. M. G. (2006). Ca pture and r umination, f unctional a voidance, and executive control (CaRFAX): Three processes that underlie overgeneral memory. *Cognition and Emotion*, *20*(3-4), 548-568.

Williams, J. M. G., Stiles, W. B., & Shapiro, D. A. (1999). Cognitive mechanisms in the avoidance of painful and dangerous thoughts: Elaborating the assimilation model. *Cognitive Therapy and Research, 23*(3), 285-306.

Williams, J. M., & Broadbent, K. (1986). Autobiographical memory in suicide attempters. *Journal of Abnormal Psychology, 95*(2), 144-149.

Appendix A: Study Measures

FROM Raes et al. 2007: SCEPT

Sentence Completion for Events from the Past Test (SCEPT)

Instructions

Sentence completion task

Below you will find eleven sentences. Actually these are only parts of sentences, because only the beginning of each of the sentences is provided. The purpose of the task is for you to complete each of the sentences. You can complete the sentences anyway you want, just as long as what you write corresponds to the provided stem. Also make sure that each of the sentences is on a different topic.

Items

1. I still remember well how . . .
2. I still recall how/that I . . .
3. Last year . . .
4. In the past . . .
5. Last week I . . .
6. I can still picture how . . .
7. When I think back to/of . . .
8. I will never forget . . .
9. The most important thing that I have ever . . .
10. Last year I . . .
11. At the time when I . . .

Sample responses for different coding categories for the Sentence Completion for Events from the Past Test (SCEPT) Examples taken from Raes et al. (2007):

''Specific memory''

I still remember well how . . . sad I was the day my grandfather died.
I will never forget . . . that a friend threw me a surprise party when I turned sixteen.
Last week . . . I held my baby nephew in my arms for the very first time.

''Categoric memory''

I can still picture how . . . my grandmother used to play games with me when I was little.
Last year . . . I went to school by bike everyday.
In the past . . . I used to avoid other people at social gatherings.

''Extended memory''

When I think back to/of . . . my time in junior high, I feel happy.
Last year I . . . went on scout camp for a week as a cook.
I still recall that I . . . was ill for two weeks in a row last year.

''Semantic associate''

In the past . . . I was a very shy person.
The most important thing that I have ever . . . had and have, is my family.
In the past . . . I had short hair.

PROLONGED GRIEF SCALE 13

Please tell me how much each statement describes how you have been feeling over the past month.

PART I: INSTRUCTIONS. FOR EACH ITEM, PLACE A CHECK MARK TO INDICATE YOUR ANSWER.	**Not at all**	**At least once**	**At least once a week**	**At least once a day**	**Several times a day**
1. In the past month, how often have you felt yourself longing or yearning for the person you lost?	1	2	3	4	5
2. In the past month, how often have you had intense feelings of emotional pain, sorrow, or pangs of grief related to the lost relationship?	1	2	3	4	5
3. In the past month, have you had intrusive thoughts about the loss or the person who died? In other words have you had thoughts, images or memories (either positive or negative) that distract you from or interfere with your ability to function at work, at home, or during leisure activities?	1	2	3	4	5
PART II: INSTRUCTIONS. FOR EACH ITEM, PLEASE INDICATE HOW YOU HAVE FELT OR ACTED IN THE PAST MONTH. CIRCLE THE NUMBER TO THE RIGHT TO INDICATE YOUR ANSWER.	**Not at all**	**Slightly**	**Somewhat**	**Quite a bit**	**Overwhelmingly**
4. In the past month, how often have you felt stunned, shocked, or dazed by your loss?	1	2	3	4	5
5 .In the past month, how often have you tried to avoid reminders that the person you lost is gone?	1	2	3	4	5
6. Confusion about your role in life or a diminished sense of self (i.e., feeling that a part of yourself has	1	2	3	4	5

died? Not sure about who you are as a person since the loss?)					
7. Have you had trouble accepting the loss?	1	2	3	4	5
8. Has it been hard for you to trust others since your loss?	1	2	3	4	5
9. Do you feel bitter or angry over your loss?	1	2	3	4	5
10. Do you feel that moving on (e.g., making new friends, pursuing new interests) would be difficult for you now?	1	2	3	4	5
11. Do you feel emotionally numb since your loss?	1	2	3	4	5
12. Do you feel that life is unfulfilling, empty, or meaningless without the person who died?	1	2	3	4	5

PART III: INSTRUCTIONS. FOR EACH ITEM, PLACE A CHECK MARK TO INDICATE YOUR ANSWER.

12. For questions 1-11 above, if you circled a 2-5 for any item, have you had the experience for at least 6 months?

_____ No
_____ Yes

13. Have you experienced a significant reduction in your social, occupational, or other important areas of functioning (e.g., domestic responsibilities)?

_____ No
_____ Yes

PHQ-9 Depression

Over the last 2 weeks, how often have you been bothered by any of the following problems?

(Use "✔" to indicate your answer"

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things.....	0	1	2	3
2. Feeling down, depressed, or hopeless.....	0	1	2	3

3. Trouble falling or staying asleep, or sleeping too much.....	0	1	2	3
4. Feeling tired or having little energy.....	0	1	2	3
5. Poor appetite or overeating.....	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down.....	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television.....	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving .around a lot more than usual.....	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.....	0	1	2	3

Column totals ___ + ___ + ____ + ___

= Total Score _____

From the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ). The PHQ was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues. For research information, contact Dr. Spitzer at rls8@columbia.edu. PRIME-MD® is a trademark of Pfizer Inc.

Scoring notes.

- ***PHQ-9 Depression Severity***

Scores represent**: 0-5 = mild 6-10 = moderate 11-15 = moderately severe 16-20 = severe depression**

PTSD Check List- Specific event (PCL-S)

PCL-S

The event you experienced was on .

(event) (date)

INSTRUCTIONS: Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

		Not at all A little bit Moderately Quite a bit Extremely
1.	Repeated, disturbing *memories, thoughts,* or *images* of the stressful experience?	1 2 3 4 5
2.	Repeated, disturbing *dreams* of the stressful experience?	1 2 3 4 5
3.	Suddenly *acting* or *feeling* as if the stressful experience *were happening again* (as if you were reliving it)?	1 2 3 4 5
4.	Feeling *very upset* when *something reminded you* of the stressful experience?	1 2 3 4 5
5.	Having *physical reactions* (e.g., heart pounding, trouble breathing, sweating) when *something reminded you* of the stressful experience?	1 2 3 4 5
6.	Avoiding *thinking about* or *talking about* the stressful experience or avoiding *having feelings* related to it?	1 2 3 4 5
7.	Avoiding *activities* or *situations* because *they reminded you* of the stressful experience?	1 2 3 4 5
8.	Trouble *remembering important parts* of the stressful experience?	1 2 3 4 5
9.	*Loss of interest* in activities that you used to enjoy?	1 2 3 4 5
10.	Feeling *distant* or *cut off* from other people?	1 2 3 4 5
11.	Feeling *emotionally numb* or being unable to have loving feelings for those close to you?	1 2 3 4 5
12.	Feeling as if your *future* will somehow be *cut short*?	1 2 3 4 5
13.	Trouble *falling* or *staying asleep*?	1 2 3 4 5
14.	Feeling *irritable* or having *angry outbursts*?	1 2 3 4 5
15.	Having *difficulty concentrating*?	1 2 3 4 5
16.	Being *"super-alert"* or watchful or on guard?	1 2 3 4 5
17.	Feeling *jumpy* or easily startled?	1 2 3 4 5

Post-emotion induction film clip ratings

Participants will rate how much they felt negative emotion (e.g., sadness, anger, grief, distress, revulsion) on a Likert-type scale from 1 (*no emotion*) to 7 (*extreme / emotion*); and how much they felt positive emotion (e.g., happiness, amusement, joy, interest) on a Likert-type scale from 1 (*no emotion*) to 7 (*extreme emotion*)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate number from the five-point scale indicating how you feel right now:	***No Emotion***	***A little***	***Some***	***Modderately***	***Quite a Bit***	***A lot***	***Extremely***
Happy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Amusement	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Joy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Interest	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Excited	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Sad	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Anger	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Distressed	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Disgust	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Grief	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Demographics

Please provide the following information

1. Age:_____

2. Gender (Please check one)

- ☐ Female
- ☐ Male

3. What is your ethnic background (Please check all that apply)Asian-American

- ☐ Black or African-American
- ☐ Puerto-Rican
- ☐ Cuban-American
- ☐ Mexican-American
- ☐ Other Hispanic or Latino
- ☐ Hawaiian or Pacific Islander
- ☐ Native American or American Indian
- ☐ Inuit
- ☐ White or Causasian
- ☐ Other:_____

4. What is your approximate household income currently? _____

5. What is the highest level of education you have completed? (Please check one)

- ☐ Some high school
- ☐ High school diploma
- ☐ GED

- ☐ Some college
- ☐ Associate's degree
- ☐ 4-year College Degree
- ☐ Master's degree
- ☐ Doctoral Degree (Ph.D., M.D., D.D.S., etc.)

6. What was your relationship to the deceased? _____

7. When did this person pass away? ____/_____/_____

8. Cause of death: _____

9. Was it expected?

- ☐ Yes
- ☐ No

Study Design