THE ROLE OF AFFECTIVE SHIFTING IN POSITIVELY REFRAMING AND COPING WITH NEGATIVE AUTOBIOGRAPHICAL MEMORIES

By

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Abstract

Research suggests that positively reframing past negative experiences is beneficial for coping, but little work has investigated the cognitive abilities underlying this process. Using both experimental and ideographic methodology, this study examined the role of a specific dimension of executive function (EF) – attention shifting – in positively reframing and coping with negative memories. Further, this research compared the roles of affective shifting (shifting between emotionally positive and negative information) and non-affective shifting (shifting attention between non-emotional information). A sample of university students (N = 134) wrote about the three most distressing events that ever happened to them and rated the memories on several qualities (e.g., importance). Then they were randomly assigned to perform a non-affective shifting (NAS), affective shifting (AS), or affective non-shifting (Control) task. Finally, participants were asked to positively reframe the memories. Ratings of mood states were collected at several points and reframing narratives were coded for several indices of positive reframing. Participants in the AS group wrote more about self-growth than the other two groups, but only among those who reported their memories to be highly important. Moreover, faster responding to the two shifting tasks were linked with indicators of better reframing. More resolutions, but not other indicator of reframing, predicted more increase in positive mood after reframing. Shifting was not directly linked with mood changes. Finally, better reframing was predicted by several individual difference factors such as female, worse feelings after memory retrieval and memories of less severe events. Implications for reframing, coping and models of EF are discussed.

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The Role of Affective Shifting in Positively Reframing and Coping with Negative Autobiographical Memories

Multiple lines of work have suggested that remembering negative life experiences in positive ways is associated with greater emotional adjustment and well-being (e.g., Pals, 2006; Pennebaker; Mayne, & Francis, 1997). Unfortunately, positively reframing negative experiences can be extremely difficult in some situations and for certain individuals. It is thus important to identify the factors that affect this ability and understand the mechanisms underlying the process of memory reframing. Evidence from the autobiographical memory (AM) and meaning making literatures suggests that executive function (EF) may play a part in remembering and processing past negative events. Further, it appears that a specific aspect of EF – attention shifting – may be particularly crucial, but no studies have examined this possibility.

Research on children's EF development has started to emphasize a distinction between emotion-related ("hot") and non-emotional ("cool") EF, and has suggested that these two types of EF may have overlapping yet different neurocognitive networks (e.g., Zelazo & Müller, 2002). Consistent with this notion, findings on both adults and children have suggested that measures that presumably tap hot EF have stronger associations with emotional functioning than measures of cool EF (e.g., Malooly, Genet, & Siemer, 2013; Prencipe & Zelazo, 2005). Therefore, it is possible that attention shifting between emotionally significant information (to be referred to as "affective shifting") may play a more important role in memory reframing and the associated emotion regulatory processes than shifting between non-emotional information (to be referred to as "non-affective shifting"). However, to date, there have been no experimental tests of the impact of EF on emotion regulation, and it is unknown whether cool and hot EF contribute equally.

This study was designed to address these unanswered questions, with an attempt to bridge the traditionally separate areas of work on EF, AM and emotion regulation. Specifically, this study used an experimental paradigm to directly test whether attention shifting impacts one's reframing of negative AMs and emotion after reframing; and whether affective and non-affective shifting exert different influences. Moreover, this research assessed whether variations in peoples' shifting abilities were predictive of individual differences in reframing and emotion after reframing. Finally, this study explored other individual difference factors that contributed to differences in memory reframing.

Memory Reframing and Coping

Coping with memories of negative life experiences is important for our well-being, and failure to do so could lead to severe psychological consequences (e.g., posttraumatic stress disorder, or PTSD; Watkins, Moulds, & Mackintosh, 2005). People cope with past experiences using a variety of strategies, as reflected in their autobiographical memory narratives about such experiences. Autobiographical memory (AM), by definition, is a knowledge base of personal information that contains both specific memories of past events and conceptual, self-related information (Conway & Pleydell-Pearce, 2000). When asked to write about a negative AM, people often make meaning in the narratives. For example, one may state that his or her life was changed or a lesson was learned because of the event (e.g., Greenhoot, Sun, Bunnell, & Lindboe, 2013; King, Scollon, Ramsey, & Williams, 2000). References to such meaning have been proposed to reflect past or current attempts to cope with the negative feelings associated with the memories (Park, 2010).

Researchers are interested in identifying adaptive ways of meaning making and have found that meaning that involves reframing past negative events in positive ways (referred to as

"memory reframing" or "positive reframing" for short in this manuscript) is generally associated with better psychological outcomes (Bauer & McAdams, 2004; Davis, Nolen-Hoeksema, & Larson, 1998; Lepore, Fernandez-Berrocal, Ragan, & Ramos, 2004; Lilgendahl & McAdams, 2011; McAdams, Reynolds, Lewis, Patten, & Bowman, 2001; Pals, 2006; Pennebaker; Mayne, & Francis, 1997). For example, Pals (2006) reported that memory narratives about difficult life experiences that contained themes of positive self-transformation predicted more satisfaction with life and physical healthy almost ten years later. Similarly, Lilgendahl and McAdams (2011) found that the degree to which negative life events were perceived as causing personal growth in life story narratives of mid-life adults was associated with better psychological health.

These results suggest that positive reframing may be an effective way of emotionally coping with memories of difficult life experiences. Nonetheless, a few recent studies have revealed negative correlations between positive reframing and psychological well-being (e.g., Greenhoot, et al., 2013; Sales, Merrill, & Fivush, 2013). For example, Greenhoot et al. (2013) reported that resolutions in memory narratives about traumatic events (e.g., 'Things got better in the end') were linked with more psychological symptoms, particularly for people with abuse histories. Although a possible interpretation was that resolutions are maladaptive, another (perhaps more likely) explanation was that individuals with more symptoms tended to write about resolutions as a way to reduce negative feelings associated with the memories. However, it is difficult to address this possibility in the extant literature because most research has focused on the links between positive reframing and *concurrent* mental health measures. No one has tracked participants' emotional responses before and after memory reframing to directly examine the emotional impact. Thus, in this study I collected participants' mood states before and after positive reframing to later determine whether there was a noticeable increase in positive mood

and decrease in negative mood.

It is worth mentioning that positive reframing has been evaluated in several ways in the literature. Some researchers have asked people to report whether they found self-growth or other benefits in past negative events (e.g., Alea & Bluck, 2013; Park, 2010), whereas others looked for evidence of reframing in people's memory narratives (e.g., Banks & Salmon, 2013; Dunlop & Tracy, 2013; Lilgendahl, McLean & Mansfield, 2013; McLean & Thorne, 2003). A recent study reported little overlap between these two types of measures, and found that global indicators derived from memory narratives were better predictors of well-being measures (e.g., Alea & Bluck, 2013; Banks & Salmon, 2013; Dunlop & Tracy, 2013; Greenhoot et al., 2013; Lilgendahl, McLean & Mansfield, 2013; Waters, Shallcross, & Fivush, 2013). In comparison, there have been mixed findings regarding whether self-report of positive reframing is associated with better well-being. For example, several studies have reported inconsistent results regarding whether stress-related growth, defined as positive change in one's perspectives and behaviors as a result of a traumatic event, is associated with better psychological adjustment following trauma (Helgeson, Reynolds, & Tomich, 2006; Linley & Joseph, 2005; Tedeschi & Calhoun, 2004; Waters, Shallcross, & Fivush, 2013). Therefore, in the proposed study, I measured positive reframing based on what participants said in their reframing narratives instead of self-reports, and directly tested how variations in indices of positive reframing were associated with participants' emotional responses after reframing.

There are many different ways in which people positively reframe past negative events. For example, one may focus on resolutions (e.g., "We talked and everything was fine in the end"), feel grateful that things were not worse (e.g., "I am thankful that I was not seriously hurt."), or find benefits as results of bad experiences including practical or externally oriented

(e.g., “We became closer friends because of that event”) and self-focused benefits (e.g., “I became a stronger person” “I learned that you should never take life for granted”). These common types of positive meaning (to be referred to as *Resolution*, *Gratitude*, *External Benefit* and *Self-Growth* in this article) have all been assessed in prior studies (e.g., Greenhoot et al., 2013; McLean, 2008), but *Self-Growth* has received the most attention.

It has been proposed that there are several types of *Self-Growth* varying in sophistication and thus requiring different levels of cognitive effort. For example, McLean (2008) identified three levels of self-related meaning in terms of cognitive effort required: *Traits* (Level 1), *Beliefs* and *Outlook Connections* (Level two; e.g., attitudes and perspectives about the world), and *Personal Growth* (Level 3; e.g., development of maturity and strength). Converging with this study, findings from several other studies also suggest that the most effortful kinds of *Self-Growth* involve *Personal Growth* (Bauer, McAdams, & Sakeda, 2005; King et al., 2000; McLean, 2008; Pals, 2006). However, no one has compared *Self-Growth* (regardless of its subtypes) with the other common types of positive reframing as mentioned above (i.e., *Resolution*, Gratitude and *External Benefit*) in terms of sophistication. Accumulating evidence has suggested that various types of reframing have different mental health implications (e.g., Bonanno, 2013; Pasupathi, 2013); and thus in the present study, we coded participants’ reframing narratives for all four categories of positive reframing, and assessed their associations with the emotional state measures after completing the reframing narratives.

Given the common belief that positively reframing negative experiences is beneficial for coping, it is important to identify the factors that affect this process. Although no previous research has directly examined this question, findings from the AM literature suggest that executive function (EF) may play a critical role. In the next section, I will provide a brief review

of this work.

Executive Function and Memory Reframing

Executive function. Executive function (EF) is an umbrella term for a variety of higher cognitive processes that control and regulate lower level processes (e.g., perception, semantic memory) to effortfully guide behavior toward a goal, especially in non-routine situations (e.g., Alvarez & Emory, 2006; Banich, 2009). Like other psychological constructs (e.g., memory), EF is multidimensional and has several separable yet interrelated subfunctions, such as working memory, information updating, inhibitory control and shifting.

Working memory is broadly defined as the cognitive system responsible for temporarily storing information required to support ongoing processes. Therefore, working memory is commonly involved in other EF subfunctions (e.g., Hazy, Frank, & O'Reilly, 2012; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). A simple and widely used working memory test is the digit span task, in which participants are represented with a series of digits and need to immediately repeat them back. More complex working memory tasks require participants to perform a secondary task while holding some information in working memory (Barrett, Tugade, & Engle, 2004).

An EF dimension that is closely related to working memory is information updating - the ability to monitor and update working memory according to a goal. Information updating allows us to code incoming information for relevance to the task at hand and then replace old, no longer useful items held in working memory with newer, more relevant information (Lehto, 1996; Morris & Jones, 1900). A commonly used task to assess this ability is the keep track task (Yntema & Schulman, 1967), in which individuals are shown a number of words, one by one, and are asked to remember the last word in two or more categories.

Inhibition is another important aspect of EF, which refers to the ability to deliberately inhibit dominant or proponent responses in order to achieve a goal. Example tasks used to assess inhibition include the color-word Stroop task (Stroop, 1935) and the antisaccade task, both requiring participants to stop a response that is relatively automatic. For instance, the color-word Stroop task involves showing participants a series of color words that are written in colors (e.g., a word ‘green’ written in blue), and asking them to identify the color in which the words are written while suppressing the tendency to name the color words.

Finally, shifting or task switching taps the ability to flexibly shift focus between multiple tasks or operations (Norman & Shallice, 1986; Monsell, 1996; Miyake et al., 2000). Commonly used tests of this ability include the plus-minus task (Jersild, 1927), the number-letter task (Rogers & Monsell, 1995) and the local-global task, all of which require one to shift between different rules or goals. For example, in a typical local-global task, participants are presented with letter shapes that are made up by smaller letters. On some trials, participants are cued to identify the larger letter (global figure), whereas on others they need to tell what the smaller letter is (local figure). Performing this task requires one to flexibly shift between identifying global and local figures. Longer shift cost, measured as the difference in response time between switch and non-switch (repeat) trials, is used to indicate poorer shifting.

It should be noted that although EF has been decomposed into several subfunctions, most researchers agree that EF is a hierarchical and dynamic system with shared attributes (e.g., working memory capacity, selective attention) among subfunctions (Alvarez & Emory, 2006; Miyake et al., 2000; Roberts, Robbins, & Weiskrantz, 1998; Royall et al., 2002; Stuss & Alexander, 2000; Zelazo & Cunningham, 2007). Because EF is essential to goal-directed behavior, it has been shown to relate to a wide range of complex functioning such as

multitasking, reasoning, decision-making and problem solving. Although no one has looked at the link between EF and AM reframing, some evidence suggests that EF is linked to several dimensions of autobiographical memory such as specificity and coherence.

Executive function and memory specificity. When asked to retrieve a specific AM, some individuals have more difficulty than others - instead of specifying an event that occurred at a particular time and place, they tend to give an overgeneral memory (OGM) that is either categorical or extended (e.g., “I was depressed last summer”, “My parents don’t get along”). Individual differences in this tendency are measured with a standard test called the Autobiographical Memory Task (AMT). In this task, participants are given limited time to produce specific AMs in response to a series of cue words. The tendency for OGM on the AMT has been linked with several forms of psychopathology, including major depressive disorder (MDD; e.g., Brittlebank, Scott, Williams, & Ferrier, 1993; Park, Goodyer, & Teasdale, 2002), PTSD (e.g., McNally, Lasko, Macklin, & Pitman, 1995), and acute stress disorder (e.g., Harvey, Bryant, & Dang, 1998). Therefore, researchers are interested in understanding the mechanisms underlying OGM.

It has been proposed that OGM may be explained by several interacting mechanisms (for a review, see Sumner, 2011), and the one that has received most attention is functional avoidance (Williams, 2006). This mechanism considers OGM as a means of coping through avoiding painful specific details of one’s past. As illustrated in the Self-Memory System Model of AM representations (see Figure 1; Conway & Pleydell-Pearce, 2000), our autobiographical memory is organized in a hierarchy of lifetime periods, general events and event-specific knowledge. Top-down searches for specific memories typically begin at one of the lifetime period or general level, which activates of event-specific knowledge, and the retrieval of a specific memory. The

functional avoidance hypothesis proposes that one may abort memory search processes at a non-specific level to avoid accessing potentially aversive specific details, thus remaining at the general event level and producing an OGM. Supporting this account, there is evidence showing that OGM is associated with the tendency to use avoidant coping strategies (e.g., disengagement, thought suppression), in both healthy (e.g., Bunnell & Greenhoot, 2012; Debeer, Raes, Claes, Vrieze, Williams, & Hermans, 2012) and PTSD samples (e.g., Lemogne et al., 2009; Schönfeld, Ehlers, Böllinghaus, & Rief, 2007; but see Moradi et al., 2008).

Another mechanism underlying OGM is capture and rumination. This explanation states that self-relevant information (e.g., negative self-schemas) may activate ruminative responses, which "capture" cognitive resources at the non-specific level (Williams, 2006), ultimately leading to OGM. Consistent with this hypothesis, many researchers reported that individuals tend to produce more OGMs on the AMT in response to words that are judged to be more self-relevant (e.g., Barnhofer, Crane, Spinhoven, & Williams, 2007; Crane, Barnhofer, & Williams, 2007; Spinhoven, Bockting, Kremers, Schene, & Williams, 2007).

Both the functional avoidance and capture-rumination mechanisms may reflect a broader deficit in EF. According to the Self-Memory System Model (Conway & Pleydell-Pearce, 2000), the voluntary retrieval of a specific event is an effortful goal-directed process that involves several phases, including the initial generation of retrieval guidelines, the activation of event-specific information, and the evaluation and revision of activated information according to the guidelines. These phases are believed to rely on several executive control abilities such as working memory and inhibition (Conway & Pleydell-Pearce, 2000; Conway, 2005; Williams, 2006). A great number of studies have shown that AM specificity on the AMT is positively related with EF measured with a variety of tasks, including inhibition, working memory capacity,

information updating and verbal fluency (a broad measure of EF that requires participants to generate words beginning with a certain letter within limited time; Rosen & Engle, 1997) tests, in both clinical (e.g., Dalgleish, Golden, Dunn, & Barnard, 2008; Dalgleish et al., 2007) and healthy samples (e.g., Bunnell & Greenhoot, 2012; Ros, Latorre, & Serrano, 2010; Yanes, Roberts, & Carlos, 2008).

Executive function and memory coherence. Once a specific memory is retrieved, one needs to organize event-specific information in a meaningful way to form a coherent recollection. There is considerable variation in how coherently people can remember past events, especially when the events are traumatic or highly stressful. For example, when asked to provide a narrative for a past traumatic event, some people form a fragmented, incomprehensible, or poorly organized narrative with disconnected thoughts, whereas others are able to create a highly coherent account with everything logically laid out and connected (Foa, Molnar, & Cashman, 1995; Greenhoot et al., 2013; McLean & Pratt, 2006; Pennebaker, Mayne, & Francis, 1997). It is likely that EF plays an important role in this process. Specifically, creating a coherent AM narrative may require one to set up a memory telling structure or guideline (planning), retrieve, select and organize memory information according to this guideline (information updating, working memory), and inhibit interruptive thoughts or irrelevant information during the narrating process (inhibition).

Although little empirical work has examined the relation between AM coherence and EF per se, there is evidence that coherence is impaired in individuals with PTSD, who also tend to suffer from EF deficits (e.g., Falconer et al. 2008; Koso & Hansen, 2006; Polak, Witteveen, Reitsma, & Olff, 2012). Specifically, many studies reported that individuals with PTSD tended to remember the trauma in a more fragmented and less coherent way than those who were

exposed to trauma but not diagnosed with PTSD (e.g., Megías, Ryan, Vaquero, & Frese, 2007; Van der Kolk & Fisler, 1995; but also see Byrne, Hyman, & Scott, 2011; Porter & Birt, 2001; Rubin, Feldman, & Beckham, 2004). Also, PTSD patients tend to show impaired EF as measured with a wide range of tasks (e.g., Go/NoGo, color-word Stroop) compared to healthy individuals (e.g., Cisler et al., 2011; LaGarde, Doyon, & Brunet, 2010; Litz et al., 1996; Shucard, McCabe, & Szymanski, 2008). This indirect evidence, combined with the conceptual analysis of the cognitive steps required to produce a coherent memory, is consistent with the view that EF deficits may at least partly underlie lack of coherence in memories of highly aversive events.

Executive function and memory reframing. The study of EF and AM retrieval is useful for understanding the role of EF in positive reframing. Because in most cases, reframing a past negative event requires one to first recall that event in a specific and coherent way, it is possible that the EF dimensions important for specific and coherent memory retrieval (e.g., working memory, inhibition) are also recruited in positively reframing negative AMs. However, a perhaps more critical EF skill involved in the reframing component of this process is attention shifting. For example, when positively reframing a memory of a car accident, one would need to shift from the negative (e.g., My car was totaled) to positive (e.g., I didn't hurt myself; I learned to be more careful) side of the event. Therefore, in this investigation I focused on examining the role of shifting in the process of positively reframing negative AMs, focusing on its role in the reframing (vs. retrieval) component. To do so, I separated memory retrieval and reframing by asking participants to first write about what happened (the memory generation stage) and then later reframe the memory narratives (memory reframing stage).

It has been suggested that the particular type of shifting – shifting between emotional stimuli vs. non-emotional stimuli – matters in coping with negative information. This suggestion

comes from the traditional literature on EF and emotion regulation, which I now turn to review.

Executive Function and Emotion Regulation

Emotion regulation (ER). ER can occur in a variety of ways. First, people can regulate emotion explicitly or implicitly. Explicit ER requires much awareness and effort, whereas implicit ER operates unconsciously and automatically. For example, in some situations, people may need to explicitly remind themselves to think positively to reduce negative emotion, but in others, they may engage in this regulation unconsciously. ER research has been primarily focused on the explicit forms, and a number of frameworks have been developed to categorize the various strategies that people use to explicitly regulate emotion.

One such framework is the process model (Gross, 1998), which specifies five families of strategies that one can deploy at different times: situation selection, situation modification, attention deployment, cognitive change, and response modulation (see Figure 2). For example, a common attention deployment strategy – distraction – involves redirecting attention from the emotion-eliciting aspect of a situation to a less arousing aspect, or moving attention away from the situation altogether. Another strategy, suppression (an example of response modulation), involves decreasing physiological, experiential, or behavioral responding as directly as possible after emotional response tendencies have been initiated.

The strategy that has received most attention in the literature is reappraisal, and this is the coping strategy with the clearest overlap with positive reframing. As a cognitive change strategy, reappraisal involves a series of cognitive processes that change a negative situation's meaning in a way that reduces its emotional impact. Consistent with the findings from the meaning making literature, emotion regulation research has shown that frequent (vs. infrequent) use of reappraisal is linked with better psychological health (Gross, 1998; Gross & John, 2003; Nezlek & Kuppens,

2008; Stoeber & Janssen, 2011). Further, training individuals to use reappraisal enhanced emotion regulation ability (e.g., Fu, Du, Au, & Lau, 2013; Lau, Belli, & Chopra, 2013). As a matter of fact, cognitive change strategies such as reappraisal are generally more effective than other strategies including attention deployment and response modulation, according to a recent meta-analysis (Webb, Miles, & Sheeran, 2012).

In emotion regulation research, reappraisal is often assessed with a standard task. In this task, participants are typically presented with a series of emotion-eliciting stimuli (e.g., pictures, films) and are cued to decrease emotion through reappraisal for some trials but not for the other trials. Mood ratings after viewing each stimulus are collected, and differences in mood scores between regulation and non-regulation trials are used to index reappraisal ability or effectiveness of using reappraisal. Although reappraisal measured on this task is similar to memory reframing in many regards (e.g., both involve cognitive changes aimed to reduce negative emotion), the memory reframing involves reappraising the memory of a stimulus after the stimulus itself has disappeared. However, no one has evaluated the effectiveness of reappraisal in the context of reframing personal memories. This study filled in this gap by assessing the effectiveness of positive reframing in regulating emotion, indexed by positive mood increase and negative mood decrease from before to after reframing, and evaluated how it is affected by EF.

The role of executive function in emotion regulation. Many theorists believe that ER draws on several aspects of EF. More specifically, in most cases of ER, one needs to plan a strategy to use in advance, inhibit undesired emotional responding, switch focus between multiple perspectives, and constantly monitor the progress of emotion modification (e.g., Banfield, Wyland, Macrae, Münte, & Heatherton, 2004; Barrett et al., 2004; Denckla, 1996; Zelazo & Cunningman, 2007). Despite this belief, the empirical findings regarding the linkage

between EF and ER have been mixed.

First, the linkage has not been consistently found in healthy individuals (e.g., Gyurak, Goodkind, Madan, Kramer, Miller, & Levenson, 2009; McRae, Jacobs, Ray, John, & Gross, 2012). For example, McRae and colleagues (2012) reported that individuals with better reappraisal ability scored higher on working memory (operation SPAN; Conway et al., 2005) and shifting (global/local) tasks but not on other EF tasks (e.g., color-word Stroop). Similarly, although some researchers reported pronounced EF deficits in depressed versus normal samples (e.g., den Hartog, Derix, van Bemmel, Kremer, & Jolles, 2003; Naismith et al., 2003; Porter, Bourke, & Gallagher, 2007), many others failed to find such differences (e.g., Grant, Thase, & Sweeney, 2001; Landro, Stiles, & Sletvold, 2001; Vythilingam et al., 2004). The inconsistent findings may have to do with the tasks used to assess EF, and an emerging trend is that EF abilities measured with emotion-related tasks seem stronger and more consistent predictors of ER than EF assessed in non-emotional contexts.

For instance, difficulty in inhibiting negative information, or negative attention bias, has been well documented in many affective disorders, including depression (Hertel, 1997; Joormann & D'Avanzato, 2010; Joormann & Gotlib, 2010; Levens & Gotlib, 2010; Linville, 1996), general anxiety disorder (GAD; e.g., Amir, Najmi, & Morrison, 2009; Najmi, Hindash, & Amir, 2010), and PTSD (for a review, see Cisler et al., 2011). A typical task used to identify this EF deficit is the emotional Stroop task (adapted from the classic Stroop task; Stroop, 1935), in which participants are asked to name the color of a series of emotional and neutral words. Longer color naming time for negative words compared to neutral words indicates poorer ability to inhibit negative information (e.g., Frings, Wentura, & Holtz, 2007; Goeleven, De Raedt, Baert, & Koster, 2006; Joormann, 2004). Another task that assesses the same ability is the

negative affective priming task (NAP; Joormann, 2004), in which participants are primed to ignore negative information for some trials but need to pay attention to such information in a subsequent trial. The delayed responding due to the priming effect is used to indicate negative attention bias.

Recent clinical work showed that training aimed at improving the ability to disengage from negative information was effective in ameliorating several psychological symptoms, suggesting a causal link between negative information inhibition and coping (e.g., Hofmann, Sawyer, Witt, & Oh, 2010; Najmi et al., 2010; Schmidt, Richey, Buckner, & Timpano, 2009). For example, individuals with GAD who participated in a dot-probe attention modification paradigm, in which they were trained to respond faster to probes presented near threat-related stimuli, showed reduced anxiety symptoms after training (e.g., Amir et al., 2009; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002).

Research on healthy adults also reveals a strong association between EF measured with emotion-related tasks and coping (e.g., Joormann & Gotlib, 2010; Malooly et al., 2013). For example, Malooly et al. (2013) showed that faster shifting between emotional and non-emotional goals was linked with better ability to reduce negative emotion in response to a sad film. Further, several studies showed that training healthy adults to inhibit negative information or pay attention to positive information enhanced coping and emotional well-being (Amir et al., 2009; Dandeneau, Baldwin, Baccus, Sakellaropoulo, & Pruessner, 2007; Johnson, 2009; Schmidt et al., 2009; Wadlinger & Isaacowitz, 2011). In one of these studies, Dandeneau et al. (2007) trained a group of undergraduate students to respond faster to a positive face presented with a number of negative faces for 5 days. The training group reported less negative emotion about an upcoming exam and after completing the exam than the control groups.

The pattern that EF measured on emotion-related and non-emotional tasks are differently associated with coping is consistent with the emerging evidence that these two types of EF measures are dissociated. For example, there are cases in which patients who suffered from orbital (relative to lateral) frontal cortex lesions showed severely impaired social and emotional functioning but preserved ability to perform non-emotional EF tasks (e.g. Bechara & Martin, 2004; Dias, Robbins, & Roberts, 1996; Hauser, 1999; Miller & Cohen, 2001; Rolls, 2004). Moreover, neuroimaging evidence reveals different neural networks involved in performing non-emotional and emotion-related EF tasks. Specifically, although certain brain areas such as DLPFC (dorsolateral prefrontal cortex) are commonly involved, emotion-related tasks (e.g., emotional Stroop task) depends more on OFC (orbitofrontal cortex) and the coupling between PFC (prefrontal cortex) and the amygdala (e.g., Compton et al., 2003; Goldin, McRae, Ramel, & Gross, 2008; Joormann & Gotlib, 2010; Kanske, Heissler, Schönfelder, Bonger, & Wessa, 2011; Lee, Heller, van Reekum, Nelson, & Davidson, 2012; Mohanty et al., 2007; Zelazo & Cunningham, 2007). The developmental literature suggests this dissociation as well – young children seem to struggle more with problems that require emotion control than similar problems set in less emotionally significant contexts (Carlson, Davis, & Leach, 2005; Prencipe et al., 2011; Zelazo, Qu, & Kesek, 2010). For example, Prencipe and Zelazo (2005) found that 3-year-old children were more likely to choose a larger, delayed reward over a smaller, immediate one when asked which reward the experimenter should choose, but were more likely to fail this test when asked to choose for themselves.

One theoretical explanation for the differences between EF measured in emotional and non-emotional contexts is the cool-hot EF model proposed by Zelazo and his colleagues (e.g., Zelazo & Müller, 2002). According to this model, EF-dependent experiences varying in

emotional significance elicit somewhat different neurocognitive mechanisms within the complex EF system. In particular, most traditional measures of EF (e.g., Color-Word Stroop Task, Digit Span Task) are associated with "cool" EF mechanisms, which rely primarily on the lateral PFC. In comparison, EF measured in emotionally significant contexts (e.g., Emotional Stroop Task, Delay of Gratification Task) tends to activate "hot" EF, which draws upon not only on lateral PFC but also the ventral parts of PFC that connects several parts of PFC with lower affective systems such as the amygdala (e.g., Rolls, 2004). Figure 3 is a simplified illustration of the relation between cool and hot EF.

It should be emphasized here that within this model, cool and hot EF are considered overlapping rather than independent dimensions. Supporting this notion, a number of factor analysis studies of self-regulation in young children have revealed that self-regulatory tasks are best described by two distinct but correlated latent factors that appear to reflect cool and hot EF (e.g. Willoughby, Kupersmidt, Voegler-Lee, & Bryant, 2011). For example, Willoughby et al. (2011) measured self-regulation with a range of tasks (Preschool Self-Regulation Assessment; Smith-Donald et al., 2007) in a sample of children aged 3–5 years old. Using Structural Equation Modeling (SEM) methods, they found that performance on self-regulatory tasks was best described by two positively correlated ($\varphi = .47$, $p < .001$) latent factors representing hot and cool regulation, χ^2 (3) = 7.5, $p = .058$, CFI = .99, RMSEA = .04, SRMR = .01. In addition, Zelazo and his colleagues argue that cool and hot EF often alternate to work together in the process of solving emotionally relevant problems (Zelazo & Carlson, 2012). For instance, a common strategy that individuals use in solving emotionally significant problems is to step back and consider them in the abstract (i.e., engage in cool EF processes; Zelazo & Cunningham, 2007). However, how cool and hot EF alternate with each other in various problem-solving experiences

has not been clearly specified, and need to be explored in future research.

According to the cool-hot EF model, traditional EF measures (e.g., color-word Stroop, digit span) are more related to cool EF, whereas EF measured in emotional contexts (e.g., emotional Stroop, delay of gratification), as well as ER measures, are more associated with hot EF. This explains why conventional EF tasks are only weakly associated with ER measures (e.g., McRae et al., 2012), whereas tasks like the emotional Stroop are more consistently linked with emotion regulation in both clinical and health samples.

The conceptual distinction between cool and hot EF is useful in making predictions about the role of attention shifting in memory reframing because it suggests the type of shifting may make a difference. Therefore, in this research I aimed to assess and manipulate shifting in two contexts: “non-affective shifting”, defined as the ability to switch between non-emotional information, and “affective shifting”, defined as the ability to shift attention between emotionally positive and negative information. Because no task has been developed to specifically assess affective shifting, I adapted the traditional shifting paradigm (non-emotional). Specifically, in the non-affective shifting condition, participants saw pairs of neutral faces with opposite eye gaze directions and were cued to switch attention between the two gaze directions; whereas in the affective-shifting context, subjects saw pairs of emotional faces (all with direct gaze) and were cued to switch attention between happy and sad faces. For each task, average response time across all trials, and shift cost in terms of response time difference between switch and non-switch trials, were calculated to index shifting ability.

Viewed from the cool-hot EF perspective, the affective shifting should be related more with hot EF, particularly in terms of avoiding rumination over negative information, and quickly switching attention from negative to positive information. In contrast, the non-affective shifting

task should be more associated with cool EF in terms of maintaining the goal of switching between non-emotional cues in working memory and directing attention to work toward the goal. Therefore, I expect affective shifting to be strongly related to positive reframing, which also requires shifting between emotionally positive and negative information. However, because cool and hot EF are proposed to overlap and related with each other, non-affective shifting presumably could contribute to memory reframing as well, but more weakly than affective shifting. No one has compared the predictive values of emotional and non-emotional EF measures for ER in the same study, and this investigation was the first to examine this question.

To summarize, based on the literature on memory reframing, executive function and emotion regulation, it is predicted that attention shifting, especially affective shifting, plays an important role in positively reframing and coping with memories of negative experiences. To experimentally test this, I randomly assigned young adults to perform an affective shifting, non-affective shifting or non-shifting control (but affective) task, and then compared their memory reframing and changes in emotional responses after. The rationale of this manipulation was that having participants practice shifting might prime them to be in a state of attention switching, which could possibly facilitate memory reframing and lead to more increased positive mood and decreased negative mood from before to after reframing. Similar paradigms were used in a few recent studies that showed single-session attention training, aimed to alter attentional bias toward negative information, lead to reduced negative emotion in response to laboratory stressors after training (e.g., Dandeneau, Baldwin, Baccus, Sakellaropoulo, & Pruessner, 2007; Johnson, 2009; MacLeod et al., 2002; Wadlinger & Isaacowitz, 2011).

For example, in one study (MacLeod et al., 2002), college students were randomly assigned to two training groups: in the “attend neutral training condition”, participants performed

a dot-probe task designed to induce attentional bias away from negative and toward neutral stimuli; whereas in the “attend negative training condition”, participants practiced a dot-probe task used to induce an attentional bias away from neutral and toward negative stimuli. Following the attentional training phase, all participants were exposed to an anagram-based stress task, in which participants had to complete difficult problems under timed and videotaped conditions and with failure feedback. The results showed that participants trained to disengage from emotionally negative information subsequently demonstrated less elevated negative mood state in response to the stress task, compared to those trained to display attentional orientation toward negative information.

Our predictions were based on a synthesis of findings from multiple literatures, including the work on the meaning making, autobiographical memory narratives, executive function and emotion regulation. I extended these areas of research in several important ways. First, although evidence from separate lines of work suggests that EF may play a role in positively reframing negative memories, no work has examined this relation. In this study, I tested whether attention shifting has any specific effects on AM reframing, using both experimental and ideographic methods. Second, although EF has been linked with the ability to use reappraisal strategy to regulate emotion elicited by laboratory stimuli (e.g., pictures), the role of EF in regulating emotion associated with personal memories through positive reframing has not been examined yet. In the current research, I observed the impact of attention shifting on changes in participants’ emotional states from before to after memory reframing. Third, although both developmental and adult literatures suggest that emotion-related and non-emotional EF abilities have different implications for affective functioning, little research has directly compared tasks that differentially tape these abilities as predictors of emotion regulation. In the present study, I

assessed attention shifting in both cool (non-emotional) and hot (emotional) contexts to determine whether they have different influences on positive reframing and emotional responses to reframing. Finally, although positive reframing of negative AMs have been linked with concurrent measures of well-being, no one has directly examined how memory reframing affected emotional states. In this study, I tracked participants' mood states from before to after reframing to determine whether positively reframing negative AMs would actually reduce negative emotion and increase positive emotion, and evaluated how individual differences in reframing were associated with the mood changes.

Aims of this Research

This study was designed to examine the role of executive function in positively reframing and coping with memories of negative experiences. The more specific goal was to test whether attention shifting, especially affective shifting (shifting between emotionally positive and negative information), has an impact on positively reframing negative memories in order to regulate emotion associated with the memories. To achieve this goal, we asked participants to first write about the three most distressing events that they experienced in the past, and then engage in one of three cognitive tasks – non-affective shifting, affective shifting, and non-shifting (but affective) control tasks. After that, we prompted participants to positively reframe the memories that they wrote earlier. Positive and negative mood states were collected at four times: before and after memory generation, and before and after memory reframing. Reframing narratives were coded for quality on several dimensions. The main analysis was determining whether having participants practice affective and non-affective shifting affected reframing and mood changes from before to after reframing. Because we expected considerable variations in positive reframing, I also evaluated the associations of reframing with shifting and other

individual difference variables within groups.

Specific Hypotheses

The design of this research was expected to reveal the following major effects:

Hypothesis 1: Impact of shifting on memory reframing. It was hypothesized that attention shifting, especially affective shifting, would play a critical role in positive reframing. Performing these tasks might prime participants to be in a state of attention switching that could facilitate subsequent memory reframing and emotion regulatory processes. Therefore, I expected participants in the two shifting groups to score higher on indicators of positive reframing in their reframing narratives than those in the non-shifting control group; and between the two shifting conditions, affective shifting should show stronger or more consistent effects.

Hypothesis 2: Individual differences in shifting and memory reframing. I expected that individual differences in shifting and positive reframing would be correlated. More specifically, participants who showed shorter shift costs (i.e., faster shifting) and who generally responded faster on the shifting tasks should have higher positive reframing scores.

Hypothesis 3: Contributions of shifting to post-reframing mood. I assumed that better reframing would lead to more increase in positive mood and decrease in negative mood from before to after reframing; and because shifting was hypothesized to promote reframing, I further predicted that participants in the shifting conditions (especially the affective shifting group) would show greater mood changes.

Hypothesis 4: Other factors that contribute to variations in memory reframing. In addition to shifting abilities, individual differences in concurrent conditions, including mood states after memory generation and characteristics of memories (e.g., severity of reported events), as well as participant characteristics (gender, age, mental health and coping tendencies),

might also contribute to the variations in positive reframing. For example, participants who felt worse after memory generation were expected to have more difficulty reframing the memories. Moreover, individuals with higher depression scores might exhibit less positive reframing and associated mood changes.

METHOD

Participants

A total of 135 participants (age 18 – 38 years; *M* = 19.93 years, SD = 2.68) were recruited from the university's introductory psychology research pool, and were randomly assigned to three experimental conditions (*n* = 45 in each condition). One participant in the control group failed to complete experimental procedures in appropriate order, and thus was excluded from the data. Among the remaining 134 participants, 49 were males and 85 were females, all speaking English as their primary language. Most (84%) of the participants were white, 8% were African-American, 3% were Asian American, and 5% reported other or multiple ethnicities. There were no differences of age and gender between groups.

A power analysis was conducted to determine the required sample size for this study. The reference data were drawn from Nazarian and Smyth (2013), a study that reported the effects of writing instructions on narratives about past distressing experiences and emotion, and Calkins et al., (2011), a study that reported the effects of performing cognitive tasks on emotional reactions to emotional events. Using 80% power as a criterion and the proc glmpower procedure in SAS, the analysis indicated that 132 participants were needed. Thus, our sample size appeared to be appropriated for the proposed analyses.

Procedure and Measures

Overview. Each participant took part in one data collection session, which took between 60 and 90 minutes to complete. Following the collection of informed consent, participants filled out several questionnaires and completed a few tasks on a computer. First they completed three mental health questionnaires. Then they were instructed to write about three most distressing experiences that happened to them in the past, and rate each memory on several characteristics. Following the memory generation phase, participants performed a non-affective shifting task (NAS condition), affective shifting task (the AS group) or affective non-shifting control task (Control condition) according to group assignment. Then they were instructed to positively reframe the three negative memories. Finally, participants completed a coping questionnaire and a demographic and background questionnaire. Ratings on mood states were collected at four times throughout the study. Figure 3 summarizes the experimental procedures and measures.

Mental health questionnaires. Three questionnaires (Appendix A) were administered, in random sequence, to measure psychological symptoms and well-being. This information was collected in the beginning of the session to prevent participants' responses from being biased by the emotion-eliciting experimental procedures. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) is calculated as a continuous variable, with higher scores indicating a greater number of depressive symptoms, and scores higher than 15 are thought to index clinically significant depressive symptoms. The Posttraumatic Stress Diagnostic Scale, a 49-item self report of PTSD symptoms (PDS, Foa, 1995), was used to yield a PTSD symptom severity score that ranges from 0 to 51. Finally, the Satisfaction with Life Scale (SWL; Diener, Emmons, Larsen & Griffin, 1985) includes 5 items rated from 1 ("Strongly disagree") to 7 ("Strongly agree"), and a higher mean score on this scale reflects greater life satisfaction. All

three measures have shown good test-retest reliability and internal consistency in the literature (Diener et al., 1985; Foa, 1995; Pavot et al., 1991; Radloff, 1977; Roberts, 1992; Weissman et al., 1977). Not surprisingly, the Pearson correlations revealed a positive relation between PTSD severity and depression (r = .30, p = .0005), and a negative correlation of PTSD and depression with SWL (rs $\geq$ .30, ps $\leq$ .0004).

Memory generation. In this stage, participants were prompted to describe three most distressing events that they had ever experienced. Because the purpose of this activity was to elicit negative emotion to be regulated at a later time (in the memory reframing stage), participants were instructed to focus on describing what happened and their reactions at the time when the events occurred, and were given limited time (5 minutes) for generating each memory in order to suppress spontaneous coping responses. The complete narrative prompt is as follows:

"In this section, we ask you to write about three most traumatic/stressful/upsetting events in your life. The events must be experienced at least one month ago and still make you feel distressed today. Try to remember specific experiences in which you felt extremely negative emotions, such as despair, disillusionment, terror, profound guilt, shame, etc. Even though these memories are unpleasant, we would still appreciate an attempt on your part to be honest and straightforward and to provide us with as much detail as possible, including where you were, whom you were with, what happened, your reaction and the reaction of anyone else involved in the event. Please focus on the time when the event occurred, and DO NOT record your thoughts or feelings or anything occurred after the event. Please date each memory (month/day/year) as accurately as you can, even if you must estimate. If the memory extended over a period of time, please report the middle of the period. You will have 5 minutes to write about each memory."

After typing out each memory narrative on the computer, participants rated several characteristics of the memory on the Autobiographical Memory Questionnaire (AMQ; Rubin et al., 2004). This scale includes 24 questions that assess participants' subjective perspective on several dimensions, such as the salience of emotional and perceptual details (e.g., 'As I remember the event, I feel as though I am reliving the original event') and the quality of narrative structure (e.g., 'This memory is fragmented into details with missing bits'). The AMQ is included in Appendix B.

Cognitive task. After memory generation, participants were instructed to perform one of three cognitive tasks according to the condition that they were assigned to. The stimuli were pictures of 16 people's faces (8 males and 8 females). Participants in the two affective conditions (i.e., AS and Control groups) were presented with emotional faces with direct gaze, whereas those in the non-affective shifting (NAS) group were shown neutral faces with indirect gaze. For each condition, there were 192 trials divided into four 48-trial blocks with breaks between blocks. The order of the four blocks was counterbalanced between subjects. Participants in all three conditions received a short 24-trial training before the actual trials. The three tasks are described in detail below, and example trials were shown in Figure 4.

NAS condition: Non-affective shifting task. A fixation sign was shown in the center of the screen for 500 milliseconds in the beginning of each trial. Then a male face and a female face with neutral expression appeared side by side in the center, with one face looking to the left and the other one looking to the right. At the same time, an arrow was shown above the pictures. The location and gaze direction of each gender were random. The task was to judge the gender of the face looking to the arrow's direction. Participants were instructed to press the "m" and "f" keys on a keyboard to indicate their answers. There were equal numbers of right and left arrows, and

the order of these two types of trials was pseudorandomized so that there were equal numbers of switch and non-switch trials in each block. Each of the 16 people's faces with two gaze directions were presented six times, making for a total of 192 trials. See Figure 4 for an example trial.

*AS condition: Affective shifting task***.** This task was designed to tap the ability to shift between emotionally positive and negative information. In the beginning of each trial, a fixation sign appeared in the center for 500 milliseconds. Next, a male face and a female face were presented side by side in the center, with one face showing a happy expression and the other one showing a sad emotion. The location and expression of each gender were randomized across trials. Along with the two faces, a cue word - either 'happy' or 'sad'- was shown above the pictures. When 'happy' was shown, participants needed to judge the gender of the happy face; and when 'sad' was cued, they should judge the gender of the sad face. There were equal numbers of happy and sad cue trials, and the order of these two types of trials was pseudorandomized to ensure equal numbers of switch and non-switch trials in each block. Each of the 16 people's faces with the two expressions were randomly presented six times, making for a total of 192 trials. An example trial was included in Figure 4.

Control condition: Affective non-shifting task. This task served as a control for the affective shifting condition. Participants were presented with the same set of stimuli used in the affective shifting task and followed the same instruction. However, instead of switching between happy and sad cues, participants responded to one type of trials continuously for half of the block (32 trials) and then responded to the other type of trials. Therefore, shifting attention between the two types of affect was not necessary. The order of the happy and sad trial sections within each block was counterbalanced between blocks for each participant.

A pilot study on four undergraduate students suggested that the three tasks were easy to understand and were not overwhelmingly taxing. Each task took around 10 to 15 minutes to complete. I did not observe consistent declines in performance over time, and in fact participants performed slightly faster in the last block (*M* =1532 ms) than they did in the first block (*M* = 1643 ms).

Memory reframing. After the cognitive task, participants were presented with the three memory narratives that they typed earlier, one at a time, and were prompted to positively reframe each memory, in writing, with no time limit. After reframing participants also completed a short questionnaire (Appendix C) asking about how often they had shared, thought about and reframed the memories prior to the study. The complete instructions were as follows:

"You just recorded your memories of three most distressing events that have affected you negatively. Now we are going to show you the memory narratives that you wrote, one at a time. Please take a few moments to think about each event again, but now in a certain way - try to think about the event in a different light to make it seem more positive. Write down your explanations as to why the event might be positive for you, and any other reflective thoughts or feelings. For each memory narrative, you will have unlimited time to record your response."

Coping and background questionnaires. In the last stage of the session, participants completed the Response to Stress Questionnaire (RSQ; Connor-Smith et al., 2000) that measures participants' tendencies for using various coping strategies (adequate to excellent test-retest validity and acceptable internal consistency), and a Demographic and Background Questionnaire that elicits demographic (e.g., birth date, gender) and other background information including mental health history. These two questionnaires are included in Appendix D.

Measure of emotion. Throughout the procedure, participants' emotional reactions were assessed with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), which has been widely established as a measure of negative and positive mood state. This measure lists positively and negatively valenced adjectives (e.g., sad, angry) and participants rate how applicable each adjective is to their current mood state on a scale of 1 (very slightly or not at all) to 5 (extremely). As illustrated in Figure 3, this scale was administered four times throughout the study: before and after memory generation, and before and after memory reframing. To minimize the carryover effects of repeated ratings, we randomly sampled half of the PANAS items (10 words) each time. The sampling procedure was based on a study of the construct validity of PANAS (Crawford & Henry, 2004), which identified 10 pairs of closely related words (e.g., interested-attentative, irritable-hostile). I randomly chose one word from each pair to create the mood rating set for each time. The full PANAS is included in Appendix E.

Coding of Narratives

First, we evaluated the objective severity of stressful events as reported in the memory narratives using the *Stressful Event Severity* coding (Greenhoot, McLean, Wood & Yoder, 2013). We coded for this dimension because how participants reframed their memories may have to with the severity of the events in the memories. For the reframing narratives, we coded for the four pre-identified types of positive reframing, including *Self-Growth*, *External Benefit*, *Resolution* and *Gratitude*. Most of these codes were adapted from the meaning-making schemes used in previous research (Banks & Salmon, 2012; Greenhoot et al., 2013; Lilgendahl, McLean, & Mansfield, 2013; McLean & Pratt, 2006). Each category was scored on a 0-2 scale except for *Self-Growth* (0-3), with higher scores indicating clearer and more profound evidence for the

specific category of reframing. The full set of coding dimensions and examples are summarized in Table 1.

All coding was completed by a master coder and an additional coder. The master coder scored 20% of the narratives that were scored by the other coder. Due to extremely low frequency of *Gratitude* (80% of the participants mentioned no *Gratitude* at all across all three narratives), we dropped this code from the data. The Intra-Class Correlations (ICCs) between the two coders were .82 for Event Severity, .75 for *Resolution*, and .77 for *External Benefits*, which were all within the acceptable range according to similar studies (e.g., ICCs ranged from .71 to 75 in McLean et al., 2010). In addition, for each narrative we recorded the number of words and the time spent (for reframing narratives only).

RESULTS

Preliminary Analyses

Pre-manipulation differences between groups. Before testing the effects of group on reframing, I checked to see if there were any coincidental group differences that existed before the experimental manipulation (i.e., the administration of the three cognitive tasks), including mental health, memory narrative, and pre-manipulation mood measures. A series of one-way ANOVAs showed that one variable differed among the groups: the decline in positive mood from Time 1 to Time 2, F (2, 132) = 3.68, p = .028. Pairwise comparisons showed that the NAS group had a significantly higher decline in positive affect from Time 1 to Time 2 (M = .74, SD = .62) than the Control (M = .40, SD = .65) group, p = .028. Therefore, this variable was included in all group difference models as covariates. The Tukey method was used for multiple comparison adjustment in this and all the other group analyses.

Cognitive performance differences between groups. Participants' success on the cognitive tasks was measured with accuracy (i.e., mean percent correct responses), their average response time, and, for the two shift conditions only average shift cost. To evaluate the differences in participants' success on the three cognitive tasks, I carried out a series of General Linear Models (GLMs) predicting the three cognitive performance indicators (i.e., accuracy, response time and shift cost) from group, controlling for the one covariate. The model predicting shift cost included only the AS and NAS groups. Table 2 shows the means and standard deviations on the three measures, as well as the adjusted means estimated from the GLMs, by group. The omnibus test showed differences in response time, F (2, 130) = 35.96, $p < .0001$, but not in accuracy, among the three groups. Participants responded fastest to the Control task, followed by the AS task and then the NAS task, ps $\leq .0003$. I also tested whether there was a significant shift cost against 0 for each shifting task. Participants in the AS group responded to non-switch trials faster than switch trials, t (44) = 4.64, $p < .0001$, but those in the NAS condition did not show significant shift cost.

Correlations across narratives. To examine the degree to which participants' narratives had similar qualities across the three memories, I calculated the correlations among the memory and reframing narrative measures across narratives. Except for event severity, memory narrative measures including word count and the AMQ variables (reliving, importance, visceral responses, narrative structure) were highly correlated across narratives (rs $\geq .29$; ps $\leq .0006$). For event severity, only the first and second narratives were significantly correlated ($r = .19$, $p = .032$). With the exception of *External Benefit*, the reframing narrative measures, including word count, time spent on producing the narratives and other reframing codes, were significantly correlated across the three narratives (rs $\geq .17$, ps $\leq .049$). For *External Benefit*, the correlation between the

first two narratives was only marginally significant (r = .15, p = .077), and both narratives were significantly correlated with the third narrative (rs $\geq$ .17, ps $\leq$ .049). Given that most memory and reframing narrative measures were highly correlated across narratives, I used across-narrative mean scores in the remaining analyses.

Interrelations between reframing narrative measures. As shown in Table 3, there were several correlations between the reframing measures. First, average narrative length as indexed by # of words was positively correlated with all the other reframing measures. Moreover, longer time spent on completing the reframing narratives (in second) was generally linked with higher reframing coding scores except for *External Benefit* score. Among the three types of reframing, *External Benefit* was positively correlated with *Resolution*, but negatively correlated with *Self-Growth*. To index overall positive reframing, I calculated a total reframing score by summing the three coding scores. The correlations showed that total reframing score was positively correlated with all three types of reframing.

Mood changes over time. For each time of mood states collection, mean rating across the five positive affect words and across the five negative affect words on the PANAS were used as the positive and negative mood scores for that particular time. The means and standard deviations of positive and negative mood scores across the four times for the whole sample are summarized in Table 4.

Paired t-tests showed that participants felt worse after memory retrieval than they had at the outset of the session (i.e., from Time 1 to Time 2), as indicated by decreased positive mood, t (132) = 9.86, p < .0001, and increased negative mood, t (132) = 6.69, p < .0001. These changes provided some evidence for a successful induction of negative mood. After the cognitive task (i.e., from Time 2 to T3), negative mood declined, t (133) = 9.69, p < .0001, whereas positive

mood stayed the same. The decline of negative mood was not likely because the three cognitive tasks were pleasant to perform (because positive mood did not change), but may be simply a fading effect – participants' negative mood elevated after memory generation faded away with time. From before to after reframing (i.e., from Time 3 to Time 4), participants reported reduced negative mood, t (133) = 2.46, p = .015, and increased positive mood, t (133) = 3.50, p = .0006. This pattern was consistent with our prediction that participants should feel better after completing the reframing narratives. Of course, we cannot completely eliminate the possibility that the reports of mood states were influenced by some demand characteristics or the simple passage of time.

The Contributions of Shifting to Positive Reframing

To understand the role of attention shifting in positive reframing, I conducted two sets of analyses. First, I tested the effects of group on the qualities of the reframing narratives. Second, I examined how with-in group individual differences in shifting abilities were related to reframing measures.

Group effects on reframing. A series of GLMs were carried out to test the effect of group on the reframing narrative measures while accounting for the two covariates identified in preliminary analyses. Each model predicted only one reframing variable. Table 5 shows the actual means and standard deviations, as well as the adjusted means estimated from the GLMs, on the reframing measures by group. Note that the models predicting reframing coding scores and time spent producing the narratives also controlled for narrative length. As shown in the table, there was a trend that the AS group had higher *Self-Growth* and lower *External Benefit* scores than the other groups; and the GLMs shows *External Benefit* scores were significantly lower for the AS group than the Control group, p = .013.

Individual differences in shifting and reframing. As another test of the links between attention shifting and memory reframing, I looked at whether individual differences in AS and NAS abilities, as indexed by the shift costs for the two tasks, contributed to differences in memory reframing within groups. I first included shift cost and the interaction between shift cost of group, controlling for group, narrative length, response time and accuracy, in the models. No significant interactions were found, thus the interaction terms were dropped from the final set of models. Unexpectedly, I found no effects of shift cost, however response time predicted several reframing variables within the shifting groups. As shown in Table 6, longer response time predicted longer time used to produce the reframing narratives, F (1, 88) = 11.48, p = .0011; lower *Self-Growth* score, F (1, 88) = 7.74, p = .0067; and lower total reframing score, F (1, 88) = 5.15, p = .026.

Using a similar procedure, I further tested the predictive value of response time for the Control task as well. Compared to the two shifting groups, response time was not correlated with any reframing measures in the control group (see Table 6 for the estimates from this set of GLMs).

Shifting and Post-Reframing Emotion

I hypothesized that attention shifting should affect participants' memory reframing and further influence their emotional states. Two sets of analyses tested the contributions of shifting to post-reframing emotion. First, I tested the effect of cognitive task group. Second, I looked at whether within group individual differences in shifting abilities predicted participants' mood states after reframing.

Group effects on Post-Reframing Emotion. I carried out two repeated measures GLMs predicting positive and negative mood from group, controlling for the two pre-existing group

differences (see Preliminary Analyses). Each model predicted pre-reframing (Time 3) and post-reframing (Time 4) mood scores as the dependent variables, with time as the repeated measure or within-subjects variable. No interaction with time were found, and there were significant group differences in negative mood state, F (2, 129) = 3.28, p = .041, and marginally significant differences in positive mood state, F (2, 129) = 2.48, p = .088, for both times. Pairwise comparisons (using Tukey as multiple comparison adjustment) for each time further revealed that, AS group reported lower positive (p = .059) and negative (p = .077) mood than the Control group at Time 3, but not at Time 4. These results suggest that the AS task reduced both negative and positive mood after the cognitive task compared with the Control task, probably due to the fact that the AS task is cognitive taxing. Supporting this fatigue explanation, response time was negatively correlated with positive, r = -.16, p = .075, and negative mood, r = -.14, p = .12, at Time 3 across groups. However, the absence of interaction between time and group indicated that group had no addition effects on post-reframing mood when pre-reframing mood scores were considered. Table 7 displays the actual means and standard deviations, as well as the adjusted means estimated from the repeated measures GLMs, of positive and negative mood scores at Time 3 and Time 4 by group.

Individual differences in shifting abilities. To determine whether variations in shifting abilities were associated with different emotional responses to memory reframing within groups, I conducted two repeated measures GLMs predicting positive and negative mood at Times 3 and 4 from shift cost, controlling for response time, accuracy and group. Each model predicted pre-reframing and post-reframing mood scores as the dependent variables, with time as the repeated measure or within-subjects variable. Individual differences in shift cost did not predict mood at either time point, nor did response time or accuracy.

Reframing and Post-Reframing Emotion.

One assumption underlying our prediction about the effects of shifting on emotional responses to reframing was that variations in positive reframing, influenced by shifting, should relate to emotion after reframing. More specifically, I expected that higher reframing scores should be linked with more positive mood increase and more negative mood decrease from before to after reframing across groups. To test this, I conducted two repeated measures GLMs predicting positive and negative mood scores from reframing narrative measures. Again, each model predicted pre-reframing and post-reframing mood scores as the dependent variables, with time as the repeated measure or within-subjects variable. Because total reframing score was highly correlated with all three reframing coding scores, I removed it from this analysis to reduce the number of predictors included in each model. The results revealed a marginally significant interaction between time and *Resolution*, F (1, 128) = 2.91, p = .091; and higher *Resolution* scores predicted more positive mood after reframing, F (1, 133) = 8.60, p = .0040, for Time 4 only. Moreover, higher *External Benefit* scores were linked with lower positive mood after reframing at both Time 3 and Time 4, F (1, 128) = 3.38, p = .068. The interaction between *External Benefit* and time was not significant, suggesting that *External Benefit* had no additional effect on Time 4 positive mood after Time 3 positive mood was considered. No other reframing measures were linked with the mood variables. The estimates predicting Time 4 mood scores are shown in Table 8.

Predicting Reframing from Other Individual Difference Factors.

I also expected variations in reframing within groups to be predicted by several individual difference factors other than shifting abilities, including participant characteristics (age, gender, coping tendencies and mental health), mood states after memory generation, and

the characteristics of the memories being reframed. Therefore I tested GLMs predicting reframing measures from these individual difference factors. Each model predicted only one reframing measure and all models controlled for group and reframing narrative length.

Age, gender, mental health and coping tendencies. To reduce the number of predictors in this set of models, I first examined the interrelations among mental health and coping tendency indicators to determine which variables to include. Because depression, PTSD severity and life satisfaction scores were highly correlated, I only used one mental health measure – depression- in each model. As for the five coping variables, I only included three of them – secondary control, disengagement and involuntary engagement – in each model as primary control and involuntary disengagement was highly correlated with the other coping scores. The estimates are presented in Table 9. Depressive symptoms had no associations with reframing, but there were several links between reframing and gender and coping tendencies. Compared to males, females seemed more adept at memory reframing as indicated by less time used to produce their reframing narratives, F (1, 132) = 6.92, p = .0096, higher *External Benefit* scores, F (1, 132) = 11.70, p = .0008, and higher total reframing scores, F (1, 132) = 9.43, p = .0026. Moreover, both higher secondary control coping and involuntary engagement coping predicted less time spent on completing the reframing narratives, Fs (1, 132) > 6.47, ps < .012.

Mood after memory generation. In this set of models, I tested the predictive value of mood after memory generation (Time 2) for the reframing measures. Each model included only one type of mood state scores (positive or negative) and also included gender, group and reframing narrative length as covariates. Because Time 1 and Time 2 mood scores were highly correlated (r = .72, p < .0001, for positive mood; r = .47, p < .0001, for negative mood), I included Time 1 mood score as a covariate as well. As shown in Table 9, higher Time 2 negative

mood predicted less time used in reframing, F (1, 132) = 4.12, p = .045, and higher total reframing score, F (1, 132) = 4.93, p = .028. Lower positive affect after memory generation was linked with higher *External Benefit* scores, F (1, 132) = 3.39, p = .068. I also tested whether mood states right before reframing (Time 3) had anything to do with reframing, but found no significant associations.

Memory characteristics. Finally, the characteristics of the memories themselves may have had specific implications for how they were reframed. Table 9 shows the estimates of the GLMs predicting reframing measures from a set of memory characteristics, including subjective event severity, reliving experience, visceral response, importance and narrative structure (i.e., how easily one can put the memory into words). Each model included gender, group and reframing narrative length as covariates. A general pattern of these results was that participants who recalled more aversive events or reported more negative feelings associated with the memories showed more difficulty reframing their memories, whereas, participants who reported their memories to be more central to themselves and easier to put into words showed better reframing. Specifically, reports of more visceral responses predicted lower *Self-Growth* scores, F (1, 133) = 3.62, p = .059; and higher stressful event severity predicted slower writing during reframing, F (1, 133) = 10.09, p = .0019. Individuals who reported their memories to be more important included more resolutions, F (1, 133) = 4.75, p = .031, and had higher total reframing score, F (1, 133) = 7.80, p = .0061. Moreover, memories there were easier to put into words were linked with inclusion of more external benefits, F (1, 133) = 2.18, p = .031.

Individual differences × group interactions. In the final set of models, I tested whether group effects on positive reframing were moderated by any of the examined individual difference factors, including shifting abilities, emotion after memory generation, memory

characteristics, and participant characteristics. Each model predicted only one reframing variable from one individual difference factor and the interaction of that factor with group, controlling for reframing narrative length and the two covariates that identified in preliminary analyses. Among the tested individual difference factors, memory importance interacted with group in predicting *Self-Growth*, F (1, 132) = 4.40, p = .038, and *External Benefit*, F (1, 132) = 3.75, p = .055. Figure 3 plotted estimated reframing scores at high (M + 1 SD) and low (M - 1 SD) values of *Memory Importance* for all three groups. Tests of group differences at the two *Memory Importance* values revealed that the AS group included more *Self-Growth* than the Control (p = .011) and NAS (p = .058) group, and less *External Benefit* than the Control (p = .0055) and NAS (p = .074) group, but only for individuals who wrote about highly important memories. For those who reported less important memories, there were no effects of group. Therefore, it appears that the group effects on reframing as reported earlier were more significant among individuals who reported highly important memories.

DISCUSSION

The major goal of this research was to test the contributions of attention shifting to positively reframing and coping with memories of negative experiences. More specifically, this study was designed to examine how different forms of attention shifting might contribute to positive reframing of negative autobiographical memories and affect emotional responses after reframing, using both experimental and idiographic methods. The results of this study provide some evidence for the role of attention shifting in memory reframing; participants who were assigned to perform the affective shifting task wrote more about self-growth and less about external benefits than those who were assigned to non-affective shifting and non-shifting (but affective) control group, especially among participants who reported highly important memories.

Moreover, faster responding to the shifting tasks (but not the control task) predicted faster reframing with higher *Self-Growth* and total reframing scores.

Attention Shifting and Memory Reframing

The group difference analyses revealed that participants who completed the affective shifting (AS) task, which involves shifting between emotionally positive and negative information, tended to write more about self-growth (e.g., lessons, insights, or personal growth), than those who were assigned to the non-affective shifting (NAS) and Control tasks. This group effect, moreover, was moderated by the importance of participants' memories as they rated on the AMQ. Specifically, the interaction analysis showed that the AS group had significantly higher *Self-Growth* scores than the other two groups, but only among the participants who considered their memories highly important.

What made the AS group include more *Self-Growth* than the other two groups? First, as proposed at the outset, memory reframing relies on affective shifting ability, therefore, practicing AS briefly may have primed the participants in a state of shifting between positive and negative information, leading to more positive meaning in the reframing narratives. Second, the fact that the AS only increased *Self-Growth*, but not other forms of meaning assessed (*External Benefit* and *Resolution*) may be because *Self-Growth* is more effortful and draws more on the affective shifting function. The literature on finding positive meaning in past negative experiences has suggested that the kinds of positive meaning that people make are not equivalent and may differ in sophistication and involve different levels of cognitive effort. For example, *Personal Growth* that involves drawing insights about the self (e.g., "I became more mature and confident") is thought to be more sophisticated than learning lessons (behavioral changes such as "I learned to be more careful while driving") because it involves deeper and broader changes in how one sees

oneself than lessons; and the ability to draw insights about the self appears to develop later than lesson. (e.g., Bauer et al., 2005; King et al., 2000; McLean, 2008; Pals, 2006).

Viewed in a similar way, *Self-Growth* may be more sophisticated and thus challenging than seeking more superficial, externally focused meanings (e.g., Pasupathi & Mansour, 2006; Swann, 1997). Given that the affective shifting function is theoretically critical in the process of reframing, it is likely that *Self-Growth* may draw more heavily on this type of executive function than shallower reframing such as looking for external benefits (e.g., "I got a new car because of the accident") and focusing on resolutions (e.g., "I called my parents and things turned out fine in the end"). This explanation is bolstered by our finding that the effect of AS on *Self-Growth* was exaggerated among the participants who reported memories highly central to themselves, suggesting that affective shifting may play a particularly important role in a specific type of reframing – reframing that involves finding positive self-changes in negative experiences that are more important or self-defining.

It is also worth mentioning that our group difference analyses also showed that the AS group had lower *External Benefit* scores than the other two condition among people who reported high memory importance. One interpretation for higher *Self-Growth* but lower *External Benefit* scores in the AS group was that there may be a trade-off between these two types of reframing within subjects. Indeed, I found that *Self-Growth* and *External Benefit* scores were negatively correlated across the whole sample, suggesting that the participants tended to concentrate on only one rather than both types of reframing. This may partly have to do with the instruction given in the beginning of the reframing stage: "think about the event in a different light to make it seem more positive". It is possible that if the participants couldn't find a way that

they have grown positively, they would just seek some more superficial positives such as external benefits in order to complete the reframing task.

Comparisons of the two shifting groups showed that the NAS task, which asks one to shift attention between non-emotional information, did not have the same effects on reframing as the AS task. This pattern of results converges with the emerging trend from the EF and emotion regulation literature that measures of emotion-related EF were more closely related to emotion regulation measures than EF measured in conventional, cool contexts (e.g., Amir et al., 2009; Dandeneau et al., 2007; Joormann & Gotlib, 2010; Malooly et al., 2013; McRae et al., 2012; Najmi et al., 2010; Johnson, 2009; Schmidt et al., 2009; Wadlinger & Isaacowitz, 2011). As was predicted, the affective shifting task might have primed the participants in a state of shifting between happy and sad emotional expressions, which facilitated the subsequent finding of *Self-Growth* in emotionally negative memories in that group. In contrast, shifting between non-emotional information (left and right eye directions) as practiced in the NAS group may not be as closely related to the type of attention shifting that underlies memory reframing as in the AS task. In a broader sense, this finding also supports the theoretical distinction between cool (non-affective) and hot (affective) EF in their relations with emotional functioning (see Figure 3; Zelazo & Carlson, 2012; Zelazo & Müller, 2002).

However, the cool-hot EF model also suggests that cool EF could also contribute to emotion-related problem solving because it overlaps with hot EF. Indeed, although I did not observe a causal link between NAS and reframing, our individual difference analyses revealed several links between variations in performance on both shifting tasks and reframing measures. Specifically, shorter response time on both shifting tasks predicted faster reframing (i.e., less time spent on producing the reframing narratives) and higher *Self-Growth* and total reframing

scores. In contrast, response time for the control task (a non-EF task) did not predict any reframing measures. This pattern provides some evidence for the linkage of variations in emotional functioning with individual differences in both cool EF (performance on the NAS task in this case) and hot EF (performance on the AS task) abilities.

It is important to note that I did not find any associations between variations in reframing and individual differences in shift cost – the indicator of attention shifting per se. The fact that the manipulation of shifting influenced reframing but individual differences in shifting did not may be due to the lack of variation in shift costs in our university student sample. Future research may measure shift costs in relations to reframing in a more heterogeneous sample with broader mental health and demographical backgrounds. It is also possible that it may not have been individual differences in the shifting component of the tasks per se that predicted reframing scores, but rather some other dimension of the task such as selective and sustained attention that can contribute to individual difference in overall responding speed, which I found correlated with several reframing measures.

Memory Reframing and Post-Reframing Emotion

I looked at the associations between reframing and post-reframing emotion. First, I found significant increase in self reports of positive mood and decrease in self reports of negative mood after reframing. However, these mood changes do not necessarily result from the memory reframing activity per se but may be due to participants' expectation of mood changes or/and a simple recovery effect of time. Because this research was designed to examine the effects of shifting on emotional changes via reframing (rather than the impact of reframing on emotion), I could not address these possibilities at this point. To test the emotional impact of memory reframing more rigorously, future research should include a control condition in which

participants are not instructed to reframe the memories, and should include additional measures of emotion that are not based on self-report (e.g., heart rates, cortisol levels).

I found a few associations between indices of positive reframing and post-reframing mood states. After pre-reframing mood states were considered, the repeated measures GLMs showed only one reframing measure that predicted post-reframing mood – *Resolution*. Specifically, higher *Resolution* scores predicted higher positive mood after reframing. Therefore, inconsistent with the commonly-held belief that *Self-Growth* in reframing difficult experiences should benefit for coping (e.g., Alea & Bluck, 2013; McLean & Thorne, 2003; Park, 2010), our results showed that *Self-Growth* did not contribute to better mood after reframing. One possible explanation is that most of the prior studies examined the associations between *Self-Growth* and concurrent mental health or coping measures (e.g., Alea & Bluck, 2013; Banks & Salmon, 2013; Dunlop & Tracy, 2013; Lilgendahl, McLean & Mansfield, 2013; Waters, Shallcross, & Fivush, 2013), no one has looked at how making *Self-Growth* meaning was linked with the emotional states immediately after reframing. As several researchers have proposed, positive reframing may take time to have positive effects (e.g., Pasupathi, 2013). It is thus possible that *Self-Growth* is not effective in regulating emotion associated with negative memories shortly after writing about it, but might be adaptive in the long run. To address this question, future research should follow up on participants' emotional responses to reframing over time after the study.

Surprisingly, in contrast with *Self-Growth*, more resolutions – a presumably less sophisticated form of reframing – were linked with more increase in positive mood shortly after reframing, with pre-reframing positive mood accounted for. This suggests that shallower positive meaning may be generally more effective in regulating emotion in the short term. However,

whether it contributes to long-term coping and adjustment still needs to be examined in future studies.

Attention Shifting and Post-Reframing Emotion

Although our results revealed several effects of shifting on reframing, as well as some linkage between reframing and post-reframing mood, I did not find evidence for direct associations between shifting and emotion. I predicted that attention shifting should facilitate reframing, which, in turn, lead to more increase in positive mood increase and decline in negative mood from before to after reframing. However, the repeated measures GLMs showed no group effects on post-reframing mood states when pre-reframing mood states were considered. Using similar procedures, I also tested whether individual differences in shifting abilities predicted variations in post-reframing mood states, but fount no significant associations. One possible explanation was consistent with the one I proposed for the lack of relations between reframing and mood changes: the emotional effects of reframing may need longer time to emerge. Therefore, although shifting appeared to contribute to positive reframing, it did not, in turn, lead to better emotion regulation in the short term. A future direction would be to follow up on the post-reframing emotional changes over a longer period of time.

I did find significant group differences in the mood states at Time 3 (after cognitive tasks and before memory reframing). In particular, the AS group reported significantly lower positive and negative mood than the control group, as well as lower negative affect than the NAS group. The exact reason for this pattern was unclear but one possibility is the presence of affective information and requirement for attention shifting in the AS task might make participants in this group experience greater cognitive and emotional fatigue, leading to more blunted mood states. Supporting the cognitive fatigue explanation, response time was negatively correlated with

positive and negative mood at Time 3 across groups. This is also consistent with the research that showed a linkage between fatigue and emotional exhaustion (e.g., Lee & Ashforth, 1993).

To determine whether individual differences in shifting abilities contribute to the variations in pre- and post-reframing mood states, I also tested the predictive values of shift cost, response time and accuracy, using repeated measures GLMs. However, I found no links between the cognitive performance measures and mood states within groups at either time. This result may be partly due to the lack of associations between variations in shifting abilities and reframing at the first place.

Other Individual Different Factors and Memory Reframing

It has been proposed that reframing is a highly complex and dynamic process (e.g., Greenhoot & McLean, 2013) and many factors could contribute to the differences in reframing. Indeed I found several factors other than shifting abilities to be linked with positive reframing. For example, several gender differences were revealed: females were better at finding external benefits, had higher total reframing score and also completed the reframing narratives faster than males. This finding is consistent with some studies showing that females are generally better at making meaning in life stories than are men (e.g., Fivush et al., 2012; McLean, 2008). Such gender differences, moreover, may develop through early socialization of girls and boys. Previous findings have suggested that parents tend to guide different memory conversations with daughters and sons, and may work harder to help resolve negative affect with their daughters than with their sons (e,g., Fivush, 1991; McLean & Breen, 2009). It would be interesting to examine whether parent-guided conversations aimed to help children make sense of difficulty experiences shape how children come to cope with negative memories as adults.

Individual differences in mood after memory retrieval also had implications for positive reframing. The overall pattern was that participants who had more negative feelings about the recalled events wrote more and faster during reframing, and included more external benefits. More specifically, the participants who reported more negative emotion after memory generation used less time producing their reframing narratives, and had higher total reframing scores. In addition, those who reported less positive mood scored higher on *External Benefit* scores. It is possible that individuals who felt worse after generating the memories had greater need to make positive meaning.

Indices of positive reframing were also predicted by several characteristics of the memories that were being reframed. In particular, the participants who recalled more subjectively severe events and those who reported more visceral responses associated with the memories seemed to have a harder time reframing their memories, as indicated by longer time spent on generating the reframing narratives and lower *Self-Growth* scores. This is consistent with the general argument that reframing traumatic or highly stressful experiences is more difficult and uncommon than reframing less severe experiences (e.g., Lilgendahl et al., 2013). It is surprising that emotion after memory generation and emotion reported during memory generation showed somewhat opposite effects on reframing. However, given that these two emotional measures predicted different types of reframing, it may suggest that participants tend to rely on shallow positives (external benefits) and reduce sophisticated meaning making (self-growth) when feeling bad about a past experience. Although research has started to examine factors that influence memory reframing, most of the work has focused on person characteristics such as age, sociocultural factors and personality (e.g., Lilgendahl et al., 2013; Bauer, McAdams, & Sakaeda, 2005; McLean, 2006; Greenhoot et al., 2013), and little attention has been paid to the

concurrent conditions of positive reframing. Our findings highlight the important contributions of such factors to the process of meaning making.

In conclusion, this research provides first experimental investigation of the roles of different forms of attention shifting in positively reframing memories of negative experiences. Our results show that manipulating attention shifting affects subsequent reframing, and individual differences in shifting task performance contribute to variations in reframing. In particular, practicing affective shifting (AS) leads to more finding of self-growth, especially when the events being reframed are highly important. In contrast, non-affective shifting (NAS) has no noticeable impact on reframing. Further, although individual difference in shift cost did not contribute to differences in reframing for either type of shifting, faster responding to both tasks was associated with indicators of better reframing. The pattern that both NAS and AS have some links with reframing, but AS has stronger associations, is in line with the cool and hot EF model. Contrary to the common belief that personal growth is beneficial for coping with past experiences, our findings suggest that resolutions, rather than more sophisticated *Self-Growth*, may be more effective in regulating emotion associated with the memories, at least in the short term. Finally, consistent with the proposal that memory reframing is a complex and dynamic process that can be influenced by many concurrent conditions, our findings revealed several contributions of narrators' mood states and feelings about the memories to reframing. This research provides additional insights into models of executive function and its linkage with emotional functioning, and has potential implications for promoting coping through cognitive function training.

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Table 1. Summary of Narrative Coding Scheme

Coding Dimension	**Description**	**Codes and Examples**
Stressful Event Severity	The objective severity of the stressful events as reported in the memory narratives.	***0*** **=** not a severe/challenging/stressful experience. E.g., learning to ride a bike, vacationing. ***1*** **=** minimal stress (short-term/temporary, but not overwhelming stressors). E.g., taking/failing a test, short-term relational conflict, death of pet. **2 =** moderate stress (chronic, but not overwhelming, stressors). E.g., long term relational conflicts, long-term but stable/manageable illness/disease for self or others. ***3*** **=** severe stress-non-life-threatening. E.g., serious mental illness of close person or self, parental divorce/separation, sexual abuse/assault of close other. ***4*** **=** severe stress-life-threatening. E.g., serious accident, natural disaster, life threatening illness, abuse, sexual assault.
Self-Growth	Sophistication of self-growth that subject gains as a result of the event, including lessons (behavioral changes), psychological growth, and insights into the world/other people/relationships with other people.	***0*** **=** No self-growth is reported. ***1*** = Subject learns a lesson (e.g., "After the wreck I learned to be more alert when driving and to always wear my seatbelt.") ***2*** **=** Subject reports a vague psychological growth or insight (e.g., "I have changed a lot since then.") ***3*** **=** Subject gains a clear psychological growth or insight (e.g., "I learned about how life can be extremely unfair" "I became a stronger person.")
External Benefit	Degree to which subject gains a benefit as a result of the event that is not captured by *Self-Growth*	***0*** = No evidence of external benefit ***1*** = Vague evidence of external benefit ***2*** = Clear evidence of external benefit (e.g., "I got into college because of this event", "The family became closer")
Resolution	Degree to which the main character's problems were resolved	***0*** = No resolution mentioned ***1*** = Vague reference to resolution (e.g., "Things got better at the end.") ***2*** = Specific mention of the way in which the character's problem was resolved (e.g., "Other people were there to pull me out of the water. ")
Gratitude	Degree to which subject feels grateful that the event was not worse	***0*** = No evidence of gratitude ***1*** = Vague evidence of gratitude ***2*** = Clear evidence of gratitude (e.g., "I was lucky that this wreck didn't happen on the highway when I would have been going a lot faster.")

Table 2. Means and Standard Deviations of Cognitive Task Performance Measures by Group.

Group	*n*	Accuracy			Response time (ms)			Shift cost (ms)		
		Mean	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*
Control	43	0.96	0.03	0.96	1425.22	329.16	**1410.98**	--	--	--
NAS	43	0.97	0.02	0.97	2043.16	414.72	**2066.26**	-16.10	146.27	**-16.21**
AS	45	0.97	0.03	0.97	1798.36	319.96	**1789.89**	95.19	137.65	**95.29**

Significant group differences are shown in bold.

Table 3. Interrelations between Reframing Narrative Measures.

	# of Words	Time Spent	Self-Growth	External Benefit	Resolution	Total Reframing
# of Words	1					
Time Spent	0.89****	1				
Self-Growth	0.22*	0.22*	1			
External Benefit	0.22**	0.14	-0.23**	1		
Resolution	0.31***	0.21*	0.12	0.38****	1	
Total Reframing	0.40****	0.31***	0.63****	0.48****	0.73****	1

**** $p < .0001$ ***$p < .001$, **$p < .01$, *$p < .05$, [a]$p < .07$

Table 4. Means and Standard Deviations of Positive and Negative Mood Scores across Times for the Whole Sample.

	n	Positive Mood (1-5) *M* (*SD*)	Negative Mood (1-5) *M* (*SD*)
Time 1: Pre-retrieval/Baseline	133	3.12 (0.75)	1.62 (0.63)
Time 2: Post-retrieval/Pre-cognitive-task	134	2.58 (0.89)	2.07 (0.82)
Time 3: Post-cognitive-task/Pre-reframing	134	2.53 (0.97)	1.51 (0.47)
Time 4: Post-reframing	134	2.74 (0.96)	1.42 (0.44)

Table 5. Means and Standard Deviations of Reframing Measures by Group.

Reframing Measures	Control Group (*n* = 44)			NAS Group (*n* = 44)			AS Group (*n* = 45)		
	Mean	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*
Word Count	77.08	54.77	76.58	76.95	47.36	77.70	64.17	39.49	63.93
Time Spent (sec)	148.85	108.08	141.35	146.98	71.86	140.82	136.36	72.60	149.72
Self-Growth	1.77	0.95	1.74	1.59	0.99	1.58	1.93	0.91	1.97
External Benefit	0.86	0.70	**0.88**	0.79	0.64	0.74	0.47	0.49	**0.51**
Resolution	1.05	0.70	1.03	0.89	0.66	0.88	0.93	0.62	0.96
Total Reframing	3.68	1.54	3.64	3.27	1.34	3.20	3.33	1.28	3.44

Significant group differences are shown in bold.

Table 6. Estimates of GLMs Predicting Reframing Narrative Measures from Cognitive Performance Measures.

	Time Spent		Self-Growth		External Benefit		Resolution		Total Reframing	
AS & NAS	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
	.78		.22		.12		.11		.26	
Group		.15		.19		-.42		.08		-.02
Word Count		**.80******		**.33****		.18		**.34****		**.47******
Shift Cost		.05		.07		-.06		-.03		.003
Accuracy		.07		.06		-.06		-.10		-.03
Resp. Time		**.18****		**-.33****		.05		-.09		**-.25***
Control	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
	.87		.03		.05		.15		.13	
Word Count		**.94******		.16		.23		.28		**.33***
Accuracy		-.05		-.01		.01		.20		.09
Resp. Time		.09		-.01		-.05		-.21		-.13

**** $p < .0001$ ***$p < .001$, **$p < .01$, *$p < .05$

Table 7. Means and Standard Deviations of Pre- and Post-Reframing Mood Scores by Group

		Positive Mood Scores						Negative Mood Scores					
	n	Time 3: Pre-Reframing			Time 4: Post-Reframing			Time 3: Pre-Reframing			Time 4: Post-Reframing		
		Mean	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*	*Mean*	*SD*	*Adj. Mean*
Control	44	2.80	1.05	2.75	3.04	0.96	2.98	3.04	0.96	1.59	1.49	0.49	1.50
NAS	44	2.38	0.89	2.45	2.60	0.98	2.68	2.60	0.98	1.58	1.44	0.44	1.43
AS	45	2.43	0.92	2.40	2.58	0.89	2.56	2.58	0.89	1.37	1.32	0.40	1.32

Table 8. Estimates of Repeated Measures GLMs Predicting Pre- and Post-Reframing Mood Scores from Reframing Measures.

	Positive Mood Scores				Negative Mood Scores			
	Time 3: Pre-Reframing		Time 4: Post-Reframing		Time 3: Pre-Reframing		Time 4: Post-Reframing	
	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
	0.03		0.10		0.04		0.03	
# of Words		-0.14		-0.07		0.43		0.31
Time Spent		0.14		0.18		-0.39		-0.28
Self-Growth		-0.05		-0.001		0.01		0.005
External Benefit		-0.12		-.20		-0.02		-0.1
Resolution		0.15		**.27****		-0.03		-0.39

**** $p < .0001$ ***$p < .001$, **$p < .01$, *$p < .05$

The significant effect on Time 4 mood, with Time 3 mood accounted for, was shown in bold.

Table 9. Estimates of GLMs Predicting Positive Reframing Measures from Individual Characteristics, Mood States, and Memory Characteristics.

	Self-Growth		External Benefit		Resolution		Total Reframing		Time Spent	
Model I: Individual	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
Characteristics	.09		.19		.16		.25		.82	
Age		-.11		.04		-.05		-.08		.09*
Gender		.06		**.29*** **		.16		**.25** **		**-.11** **
Depression		-.05		-.05		-.09		-.10		-.01
Secondary Coping		.06		.12		.29		.23		**-.19***
Disengagement		.07		.03		.01		.06		-.07
Involuntary Engagement		.16		.01		.20		.20		**-.21** **
Model II: Memory	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
Characteristics		.13		.23		.16		.28		.82
Event Severity		-0.08		0.01		0.03		-0.04		**0.13** **
Memory Narr. Length		-0.04		0.14		-0.03		0.02		-0.08
AMQ: Reliving		0.12		-0.19		-0.04		-0.02		0.08
AMQ: Visceral Resp.		**-0.20**[a]		0.08		-0.12		-0.16		-0.06
AMQ: Importance		0.16		0.10		**0.22***		**0.26***		-0.08
AMQ: Narr. Structure		-0.12		**0.19***		0.07		0.04		-0.04
Model III: Emotion After	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*	R^2	*B*
Memory Generation	.07-.09		.18-.20		.13-.15		.23-.27		.80-.81	
Positive Affect		.13		**-.22**[a]		.15		.06		.02
Negative Affect		.14		.06		.15		**.20***		**-.09***

**** $p < .0001$ ***$p < .001$, **$p < .01$, *$p < .05$, [a]$p < .07$

Estimates for covariates (e.g., group, reframing narrative length) are omitted from the table.

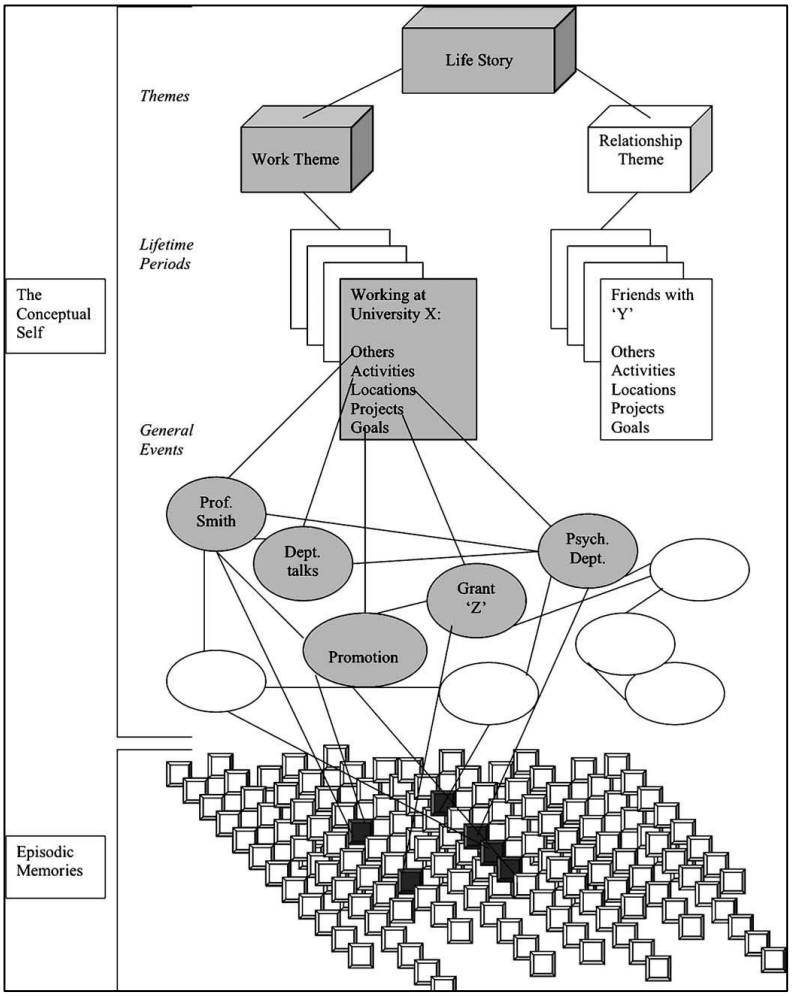

Figure 1. The Self-Memory System Model of autobiographical memory representations. From "Memory and the Self", by M. A. Conway, 2005, *Journal of Memory and Language*, 53, p. 609. Copyright 2005 by Elsevier.

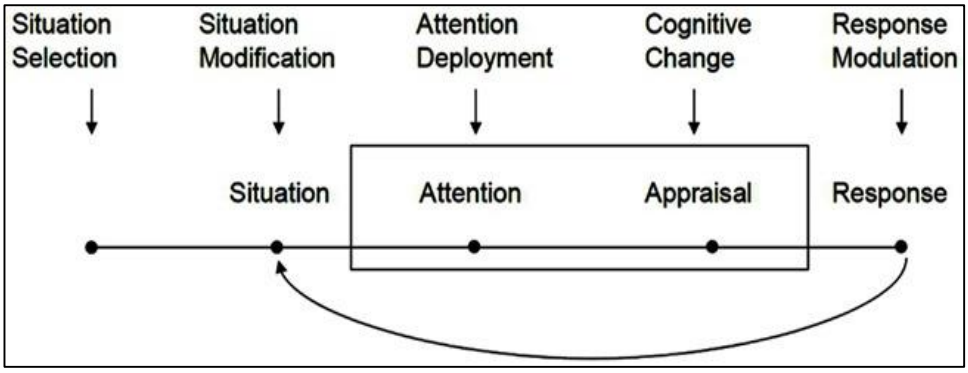

Figure 2. The process model of emotion regulation. Reproduced from "Emotion Regulation: Conceptual Foundations", by J. J. Gross and R. A. Thompson, in J. J. Gross (Ed.), Handbook of Emotion Regulation (p. 10), 2007, New York, NY: Guilford Press.

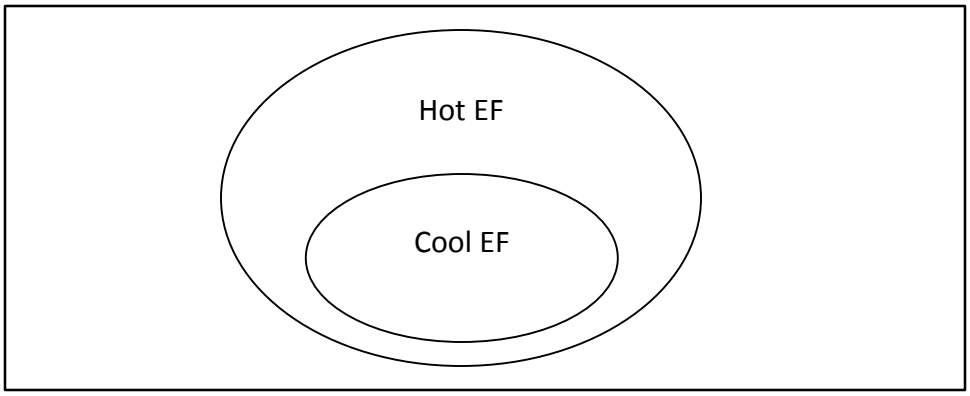

Figure 3. Simplified illustration of the relation between cool and hot executive function. Based on the "Cool-Hot EF Model" developed by Zelazo and colleagues (e.g., Zelazo & Carlson, 2012; Zelazo & Müller, 2002)

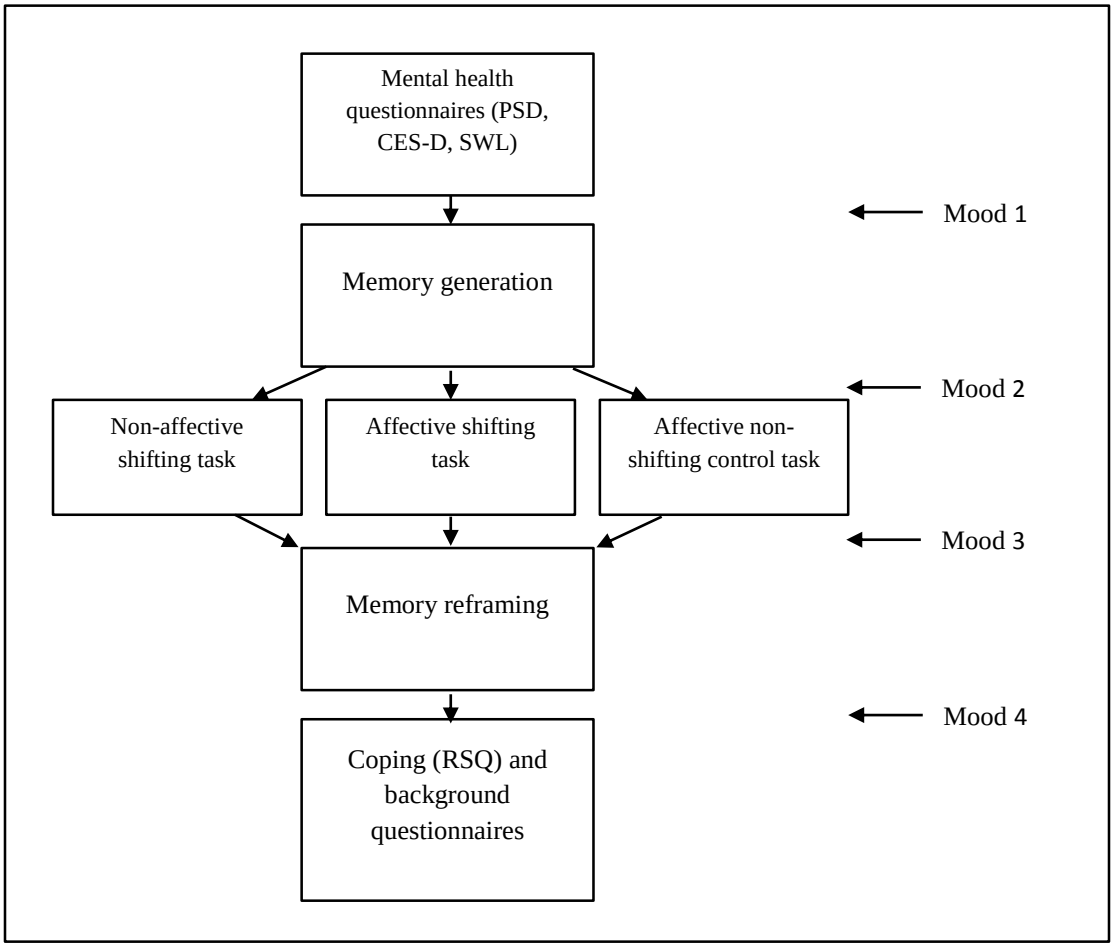

Figure 4. Experimental procedures.

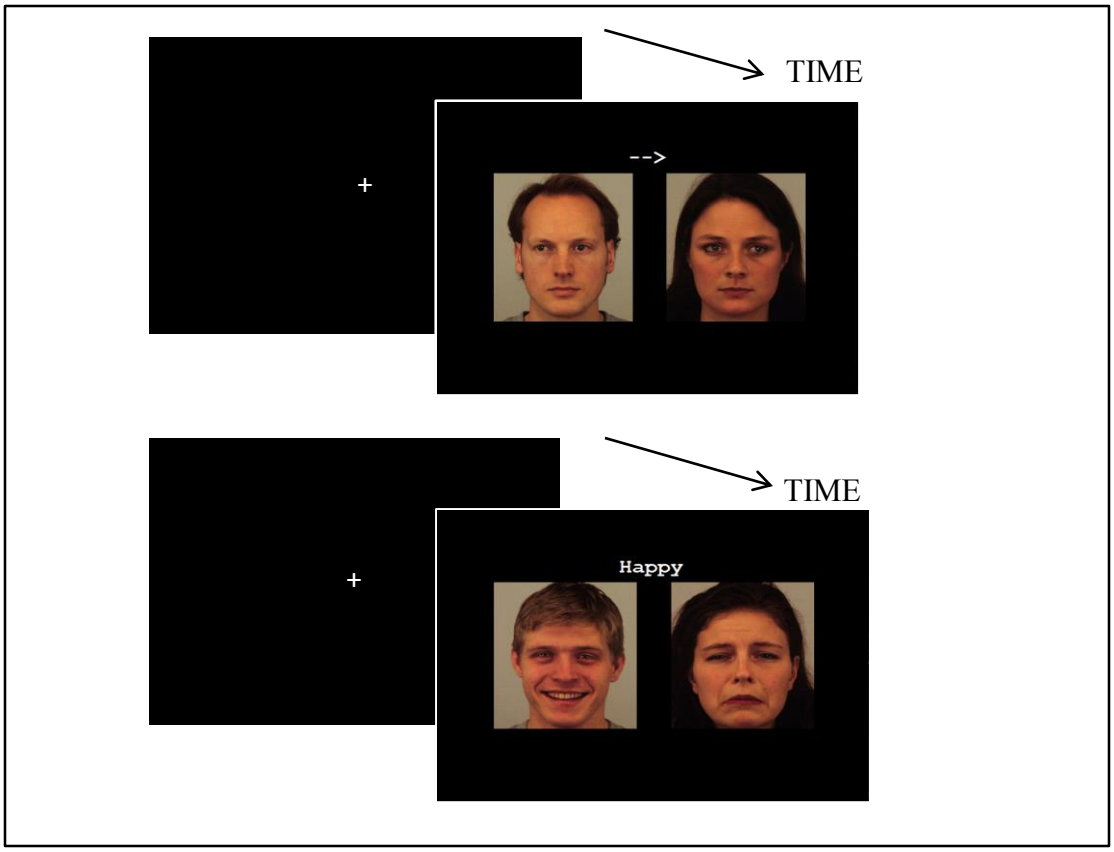

Figure 5. An example stimulus display for the non-affective shifting (above) and affective shifting/control (below) task.

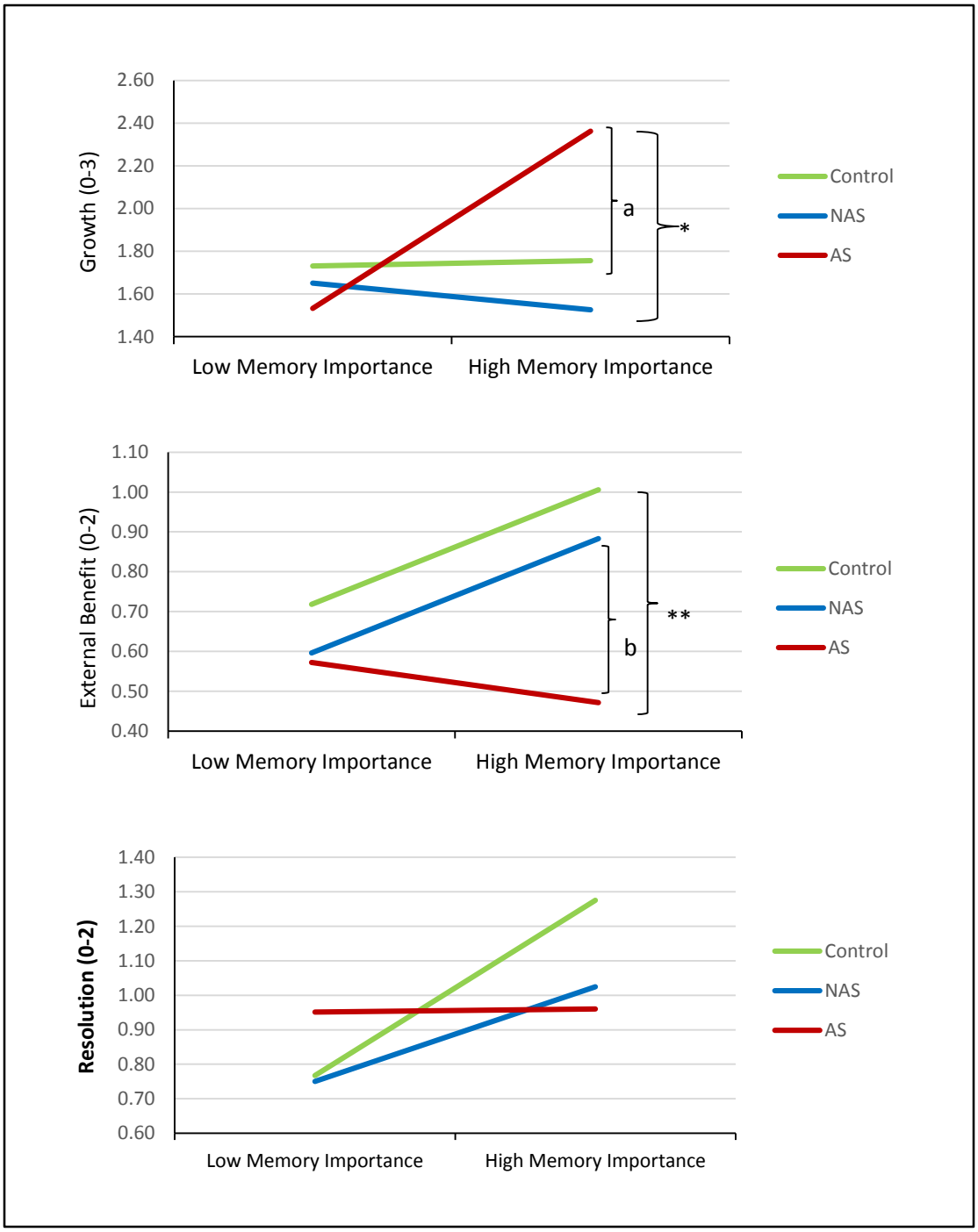

Figure 6. The interaction between Group and Memory Importance in predicting positive reframing. $^{**}p < .01$, $^{*}p < .05$, $^{a}p < .07$, $^{b}p < .10$

Appendix A: Mental Health Questionnaires

Center for Epidemiologic Studies-Depression Scale (CES-D)

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way ***during the past week.***

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	☐	☐	☐	☐
2. I did not feel like eating; my appetite was poor.	☐	☐	☐	☐
3. I felt that I could not shake off the blues even with help from my family or friends.	☐	☐	☐	☐
4. I felt I was just as good as other people.	☐	☐	☐	☐
5. I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
6. I felt depressed.	☐	☐	☐	☐
7. I felt that everything I did was an effort.	☐	☐	☐	☐
8. I felt hopeful about the future.	☐	☐	☐	☐
9. I thought my life had been a failure.	☐	☐	☐	☐
10. I felt fearful.	☐	☐	☐	☐
11. My sleep was restless.	☐	☐	☐	☐
12. I was happy.	☐	☐	☐	☐
13. I talked less than usual.	☐	☐	☐	☐
14. I felt lonely.	☐	☐	☐	☐
15. People were unfriendly.	☐	☐	☐	☐
16. I enjoyed life.	☐	☐	☐	☐
17. I had crying spells.	☐	☐	☐	☐
18. I felt sad.	☐	☐	☐	☐
19. I felt that people dislike me.	☐	☐	☐	☐
20. I could not get "going."	☐	☐	☐	☐

Posttraumatic Stress Diagnostic Scale (PDS) – Adapted
PART 1

Many people have lived through or witnessed a very stressful and traumatic event at some point in their lives. Indicate whether or not you have experienced or witnessed each traumatic event listed below by selecting Yes or No.

1. Serious accident, fire, or explosion (for example, an industrial, farm, car, plane, or boating accident)
   ☐ Yes ☐ No
2. Natural disaster (for example, tornado, hurricane, flood, or major earthquake)
   ☐ Yes ☐ No
3. Non-sexual assault by a family member or someone you know (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint)
   ☐ Yes ☐ No
4. Non-sexual assault by a stranger (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint)
   ☐ Yes ☐ No
5. Sexual assault by a family member or someone you know (for example, rape or attempted rape)
   ☐ Yes ☐ No
6. Sexual assault by a stranger (for example, rape or attempted rape)
   ☐ Yes ☐ No
7. Military combat or a war zone
   ☐ Yes ☐ No
8. Sexual contact when you were younger than 18 with someone who was 5 or more years older than you (for example, contact with genitals, breasts)
   ☐ Yes ☐ No
9. Imprisonment (for example, prison inmate, prisoner of war, hostage)
   ☐ Yes ☐ No
10. Torture
    ☐ Yes ☐ No
11. Life-threatening illness
    ☐ Yes ☐ No
12. Other traumatic event
    ☐ Yes ☐ No
13. If you answered Yes to Item 12, specify the traumatic event below:

_____

_____

_____

IF YOU SELECTED YES TO ANY OF THE ITEMS ABOVE, CONTINUE. IF NOT, STOP HERE.

PART 2

14. If you selected Yes for more than one traumatic event in Part 1, indicate *which one bothers you the most*. If you selected Yes for only one traumatic event in Part 1, select the same one.

☐ 1. Accident
☐ 2. Disaster
☐ 3. Non-sexual assault/someone you know
☐ 4. Non-sexual assault/stranger
☐ 5. Sexual assault/someone you know
☐ 6. Sexual assault/stranger
☐ 7. Combat
☐ 8. Sexual contact under 18 with someone 5 or more years older
☐ 9. Imprisonment
☐ 10. Torture
☐ 11. Life-threatening illness
☐ 12. Other traumatic event

Below are several questions about the traumatic event you selected in Item 14.

15. How long ago did the traumatic event happen? (Select ONE.)

☐ 1. Less than 1 month
☐ 2. 1 to 3 months
☐ 3. 3 to 6 months
☐ 4. 6 months to 3 years
☐ 5. 3 to 5 years
☐ 6. More than 5 years

For the follow questions, select Yes or No.

During this traumatic event:

16. Were you physically injured? ☐ Yes ☐ No
17. Was someone else physically injured? ☐ Yes ☐ No
18. Did you think that your life was in danger? ☐ Yes ☐ No
19. Did you think that someone else's life was in danger? ☐ Yes ☐ No
20. Did you feel helpless? ☐ Yes ☐ No
21. Did you feel terrified? ☐ Yes ☐ No

PART 3

Below is a list of problems that people sometimes have after experiencing a traumatic event. Read each one carefully and choose the answer (0–3) that best describes how often that problem has bothered you IN THE PAST MONTH. Rate each problem with respect to the traumatic event you selected in Item 14.

22. Having upsetting thoughts or images about the traumatic event that came to your head when you didn't want them to

☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

23. Having bad dreams or nightmares about the traumatic event

☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while

☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

24. Reliving the traumatic event, acting or feeling as if it was happening again
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

25. Feeling emotionally upset when you were reminded of the traumatic event (for example, feeling scared, angry, sad, guilty, etc.)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

26. Experiencing physical reactions when you were reminded of the traumatic event (for example, breaking out in a sweat, heart beating fast)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

27. Trying not to think about, talk about, or have feelings about the traumatic event
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

28. Trying to avoid activities, people or places that remind you of the traumatic event
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

29. Not being able to remember an important part of the traumatic event
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

30. Having much less interest or participating much less often in important activities
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

31. Feeling distant or cut off from people around you
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

32. Feeling emotionally numb (for example, being unable to cry or unable to have loving feelings)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

33. Feeling as if your future plans or hopes will not come true (for example, you will not have a career, marriage, children, or a long life)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while

☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

34. Having trouble falling or staying asleep
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

35. Feeling irritable or having fits of anger
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

36. Having trouble concentrating (for example, drifting in an out of conversations, losing track of a story on television, forgetting what you read)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

37. Being overly alter (for example, checking to see who is around you, being uncomfortable with your back to a door, etc.)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

38. Being jumpy or easily startled (for example, when someone walks up behind you)
☐ 0 – Not at all or only one time ☐ 1 – Once a week or less/once in a while
☐ 2 – 2 to 4 times a week/half the time ☐ 3 – 5 or more times a week/almost always

39. How long have you experienced the problems that you reported above? (Select only ONE.)
☐ 1. Less than 1 month
☐ 2. 1 to 3 months
☐ 3. More than 3 months

40. How long after the traumatic event did these problems begin? (Select only ONE.)
☐ 1. Less than 6 months
☐ 2. 6 or more months

PART 4

Indicate if the problems you rated in Part 3 have interfered with any of the following areas of your life DURING THE PAST MONTH. Select Yes or No.

41. Work	☐ Yes	☐ No
42. Household chores and duties	☐ Yes	☐ No
43. Relationships with friends	☐ Yes	☐ No
44. Fun and leisure activities	☐ Yes	☐ No
45. Schoolwork	☐ Yes	☐ No
46. Relationships with your family	☐ Yes	☐ No
47. Sex life	☐ Yes	☐ No
48. General satisfaction with life	☐ Yes	☐ No

49. Overall level of functioning in all areas of your life ☐ Yes ☐ No

The Satisfaction with Life Scale (SWL)

Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

7 - Strongly agree 6 - Agree 5 - Slightly agree 4 - Neither agree nor disagree
3 - Slightly disagree 2 - Disagree 1 - Strongly disagree

____ In most ways my life is close to my ideal.
____ The conditions of my life are excellent.
____ I am satisfied with my life.
____ So far I have gotten the important things I want in life.
____ If I could live my life over, I would change almost nothing.

Appendix B: Autobiographical Memory Questionnaire (AMQ)

	not at all						as clearly as if it were happening right now
1. As I remember the event, I feel as though I am reliving the original event.	1	2	3	4	5	6	7
2. As I remember the event, I can hear it in my mind.	1	2	3	4	5	6	7
3. As I remember the event, I can see it in my mind.	1	2	3	4	5	6	7
4. As I remember the event, I can smell it in my mind.	1	2	3	4	5	6	7
5. As I remember the event, I or other people are talking.	1	2	3	4	5	6	7
6. As I remember the event, I know its spatial layout.	1	2	3	4	5	6	7
7. As I remember the event, I can now feel the emotions that I felt then.	1	2	3	4	5	6	7
8. As I remember the event, I can recall the setting where it occurred.	1	2	3	4	5	6	7

	not at all						completely
9. Sometimes people know something happened to them without being able to remember it. As I think about the event, I can actually remember it rather than just knowing it happened.	1	2	3	4	5	6	7
10. My memory is fragmented into details with missing bits.	1	2	3	4	5	6	7
11. As I remember the event, it comes to me in words.	1	2	3	4	5	6	7
12. As I remember the event, I feel that I travel back to the time when it happened, that I am a subject in it again, rather than an outside observer tied to the present.	1	2	3	4	5	6	7
13. As I remember the event, it comes to me in words or in pictures as a coherent story or episode, and not as an isolated fact, observation, or scene.	1	2	3	4	5	6	7
14. This memory is significant to my life because it imparts and important message for me or represents an anchor, critical juncture, or turning point.	1	2	3	4	5	6	7
15. My memory has no details specific to my life. It is based on general knowledge that I would expect most people to have.	1	2	3	4	5	6	7
16. If another witness to the event, who you generally trusted, existed and told you a very different account of the event, to what extent could you be persuaded that your memory was wrong?	1	2	3	4	5	6	7

	100% imaginary						100% real
17. I believe the event in my memory really occurred in the way that I	1	2	3	4	5	6	7

remember it and that I have not imagined or fabricated anything that did not occur.

	Not at all						As often as any event in my life
18. Since it happened, I have thought or talked about this event.	1	2	3	4	5	6	7

	Not at all						As much as any memory
19. While remembering the event, I feel happy.	1	2	3	4	5	6	7
20. While remembering the event, I feel my heart pound, race, or quicken.	1	2	3	4	5	6	7
21. While remembering the event, I feel sweaty or clammy.	1	2	3	4	5	6	7
22. While remembering the event, I feel tense all over.	1	2	3	4	5	6	7
23. While remembering the event, I feel knots, butterflies, or cramps in my stomach	1	2	3	4	5	6	7

24. To the best of your knowledge, is the memory of an event that occurred once at one particular time and place, a summary or merging of many similar or related events, or for events that occurred over a fairly continuous extended period of time lasting more than one day?

Extended	Single day	Merged
1	2	3

Appendix C: Memory Reframing Questionnaire

Memory Narrative 1: [*participant's first narrative here…]*

	Never		Sometimes				All the time
Before this study, how often did you share that memory with others?	1	2	3	4	5	6	7
Before this study, how often did you think about that memory?	1	2	3	4	5	6	7
Before this study, how often did you see that memory in a positive way?	1	2	3	4	5	6	7

Memory Narrative 2: [*participant's second narrative here…*]

	Never		Sometimes				All the time
Before this study, how often did you share that memory with others?	1	2	3	4	5	6	7
Before this study, how often did you think about that memory?	1	2	3	4	5	6	7
Before this study, how often did you see that memory in a positive way?	1	2	3	4	5	6	7

Memory Narrative 3: [*participant's third narrative here…*]

	Never		Sometimes				All the time
Before this study, how often did you share that memory with others?	1	2	3	4	5	6	7
Before this study, how often did you think about that memory?	1	2	3	4	5	6	7
Before this study, how often did you see that memory in a positive way?	1	2	3	4	5	6	7

Appendix D: Coping and Background Questionnaires

The Response to Stress Questionnaire (RSQ) – Adapted

A. Even when things are going well, almost everyone still has some exposure to interpersonal conflict.
1. So that we can find out how things have been going for you lately, please put a check mark by all the things on this list that have been a problem for you recently.

☐ Arguments with your parents
☐ Being criticized by family members
☐ Being asked to do things you are not comfortable with by people close to you
☐ Unreasonable expectations and/or requests by people close to you
☐ Having physical disputes with people you care about
☐ Seeing physical disputes between people you care about
☐ Witnessing verbal arguments between people you care about

2. Circle the number that shows how stressful, or how much of a hassle these problems were for you.

1	2	3	4
Not at all	A little	Somewhat	Very

B. This is a list of things that people sometime do, think, or feel when something stressful happens. Everybody deals with problems in their own ways – some people do a lot of the things on this list or have a bunch of feelings, other people just do or think a few things.
Think of the situations you just checked off. For each item on the list below, circle **one** number from 1 (not at all) to 4 (a lot) that shows how much you do or feel these things when you have interpersonal conflict like the items you just checked off. Please let us know about everything you do, think, and feel, even if you don't' think it helps make things better.

	How much do you do this?			
	Not at all	A little	Some	A lot
1. I **try** not to feel anything.	1	2	3	4
2. When I have problems with other people I feel sick to my stomach or get headaches.	1	2	3	4
3. I try to think of different ways to change the problem or fix the situation.	1	2	3	4
Write one plan you thought of: _____				
4. When interpersonal conflicts happen I don't feel anything, it's like I have no feelings.	1	2	3	4
5. I wish that I were stronger, smarter, or more popular so that things would be different.	1	2	3	4
6. **I keep remembering** what happened with other people or **can't stop thinking** about what might happen.	1	2	3	4
7. I let someone or something know how I feel. (Remember to circle a number). -------→	1	2	3	4

Check all you talked to:

☐ Parent ☐ Friend ☐ Brother/Sister ☐ Boyfriend/Girlfriend/Spouse ☐ Pet
☐ Teacher ☐ God ☐ Counselor ☐ Other mentor ☐ None of these

8. I decide I'm okay the way I am, even though I'm not perfect.	1	2	3	4
9. When I'm around other people I act like the problems never happened.	1	2	3	4
10. I just **have** to get away when I have interpersonal conflicts, I can't stop myself.	1	2	3	4
11. I deal with the problem by wishing it would just go away, that everything would work itself out.	1	2	3	4
12. I get really jumpy when I'm having problems with others.	1	2	3	4
13. I realize that I just have to live with things the way they are.	1	2	3	4
14. When I have problems with others, I just **can't** be near anything that reminds me of the situation.	1	2	3	4
15. I **try** not to think about it, to forget all about it.	1	2	3	4
16. When interpersonal conflicts come up I really don't know what I feel.	1	2	3	4

17. I ask other people for help or for ideas about how to make the problem better. ------→ 1 2 3 4
(Remember to circle a number.)

Check all you talked to:

☐ Parent ☐ Friend ☐ Brother/Sister ☐ Boyfriend/Girlfriend/Spouse ☐ Pet
☐ Teacher ☐ God ☐ Counselor ☐ Other mentor ☐ None of these

18. When I'm having problems with others, I **can't stop** thinking about them when I try to sleep, or I have bad dreams about them. 1 2 3 4
19. I tell myself that I can get through this, or that I'll do better next time. 1 2 3 4
20. I let my feelings out. (Remember to circle a number.) ----------→ 1 2 3 4

I do this by: (Check all that you did.)

☐ Writing in my journal/diary ☐ Drawing/painting
☐ Complaining to let off steam ☐ Being sarcastic/making fun
☐ Listening to music ☐ Punching a pillow
☐ Exercising ☐ Yelling
☐ Crying ☐ None of these

21. I get help from others when I'm trying to figure out how to deal with my feelings. → 1 2 3 4

Check all that you went to:

☐ Parent ☐ Friend ☐ Brother/Sister ☐ Boyfriend/Girlfriend/Spouse ☐ Pet
☐ Teacher ☐ God ☐ Counselor ☐ Other mentor ☐ None of these

22. I just can't get myself to face the person I'm having problems with or the situation. 1 2 3 4
23. I wish that someone would just come and get me out of the mess. 1 2 3 4
24. I do something to try to fix the problem or take action to change things. 1 2 3 4

Write one thing that you did: _____

25. Thoughts about my interpersonal conflicts just pop into my head. 1 2 3 4
26. When I have problems with others, I feel it in my body. ----------→ 1 2 3 4
(Remember to circle a number.)

Check all that happen:

☐ My heart races ☐ My breathing speeds up
☐ I feel hot or sweaty ☐ My muscles get tight
☐ None of these

You're half done! Before you keep working, look back at the first page so you remember what kinds of interpersonal conflicts you told us about. Remember to answer these questions thinking about those problems.

27. I **try** to stay away from people and things that make me feel upset or remind me of the problem. 1 2 3 4
28. I don't feel like myself when I have interpersonal conflict, it's like I'm far away from everything. 1 2 3 4
29. I just take things as they are, I go with the flow. 1 2 3 4
30. I think about happy things to take my mind off the problem or how I'm feeling. 1 2 3 4
31. When interpersonal conflicts come up, I **can't stop** thinking about how I am **feeling.** 1 2 3 4
32. I get sympathy, understanding, or support from someone. ----------→ 1 2 3 4
(Remember to circle a number.)

Check all you went to:

☐ Parent ☐ Friend ☐ Brother/Sister ☐ Boyfriend/Girlfriend/Spouse ☐ Pet
☐ Teacher ☐ God ☐ Counselor ☐ Other mentor ☐ None of these

33. When interpersonal conflicts happen, I can't always control what I do. ----------→ 1 2 3 4
(Remember to circle a number.)

Check all that happen:

☐ I can't stop eating ☐ I can't stop talking

☐ I do dangerous things ☐ I have to keep fixing/checking things
☐ None of these

34. I tell myself that things could be worse.	1	2	3	4
35. My mind just goes blank when I have problems with others, I can't think at all.	1	2	3	4
36. I tell myself that it doesn't matter, that it isn't a big deal.	1	2	3	4
37. When I have problems with others right away I feel really (**Check all you feel**.) ---→ (Remember to circle a number.)	1	2	3	4

☐ Angry ☐ Sad ☐ Scared ☐ Worried/anxious ☐ None of these

38. It's really hard to concentrate or pay attention when I have problems with others.	1	2	3	4
39. I think about the things I'm learning from the situation, or something good that will come from it.	1	2	3	4
40. When I have problems with others I **can't stop** thinking about what I **did** or **said**.	1	2	3	4
41. When something goes wrong with others, I say to myself, "This isn't real."	1	2	3	4
42. When I'm having interpersonal conflicts I end up just lying around or sleeping a lot.	1	2	3	4
43. I keep my mind off problems with others by: (Remember to circle a number.) ----→	1	2	3	4

Check all that you do:
☐ Exercising ☐ Seeing friends ☐ Watching TV
☐ Playing video games ☐ Doing a hobby ☐ None of these

44. When problems with others come up, I get upset by things that don't usually bother me.	1	2	3	4
45. I do something to calm myself down when I'm having problems with others. ------→ (Remember to circle a number.)	1	2	3	4

Check all that you do:
☐ Take deep breaths ☐ Pray ☐ Walk
☐ Listen to music ☐ Take a break ☐ Meditate ☐ None of these

46. I just freeze when I have interpersonal conflicts, I can't do anything.	1	2	3	4
47. When I'm having a problem with others, sometimes I act without thinking.	1	2	3	4
48. I keep my feelings under control when I have to, then let them out when they won't make things worse.	1	2	3	4
49. When problems with other people happen I **can't** seem to get around to doing things I'm supposed to do.	1	2	3	4
50. I tell myself that everything will be all right.	1	2	3	4
51. When I have problems with other people, I **can't stop** thinking about why they happened to me.	1	2	3	4
52. I think of ways to laugh about it so that it won't seem so bad.	1	2	3	4
53. My thoughts start racing when I'm having a tough time with other people.	1	2	3	4
54. I imagine something really fun or exciting happening in my life.	1	2	3	4
55. When a rough situation with other people happens, I can get so upset that I can't remember what happened or what I did.	1	2	3	4
56. I try to believe it never happened.	1	2	3	4
57. When I have interpersonal conflicts, sometimes I **can't** control what I do or say.	1	2	3	4

Demographic and Background Questionnaire

(1) Ethnicity: _____
(2) Gender: Male Female
(3) Date of Birth: _____
(4) Age: _____
(5) What year are you (e.g., sophomore, junior, etc.)? _____
(6) What was your most recent GPA? _____
(7) Have you ever gone to counseling or been treated for a mental health difficulty (e.g., adjustment, depression, anxiety, ADHD)?
YES NO
(8) What was the approximate date of your last visit? _____
(9) Why did you seek counseling or mental health treatment?

Appendix E: The Positive and Negative Affect Schedule-Expanded Form (PANAS-X)

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way right now. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ cheerful	_____ sad	_____ active	_____ angry at self
_____ disgusted	_____ calm	_____ guilty	_____ enthusiastic
_____ attentive	_____ afraid	_____ joyful	_____ downhearted
_____ bashful	_____ tired	_____ nervous	_____ sheepish
_____ sluggish	_____ amazed	_____ lonely	_____ distressed
_____ daring	_____ shaky	_____ sleepy	_____ blameworthy
_____ surprised	_____ happy	_____ excited	_____ determined
_____ strong	_____ timid	_____ hostile	_____ frightened
_____ scornful	_____ alone	_____ proud	_____ astonished
_____ relaxed	_____ alert	_____ jittery	_____ interested
_____ irritable	_____ upset	_____ lively	_____ loathing
_____ delighted	_____ angry	_____ ashamed	_____ confident
_____ inspired	_____ bold	_____ at ease	_____ energetic
_____ fearless	_____ blue	_____ scared	_____ concentrating
_____ disgusted with self	_____ shy	_____ drowsy	_____ dissatisfied with self