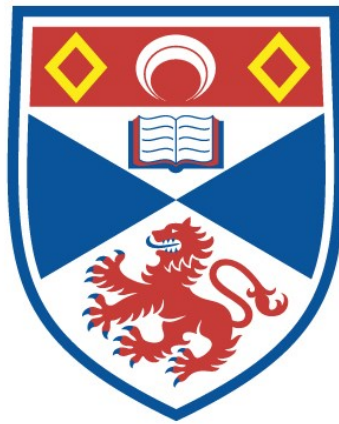


PROVIDE ALL THE DETAILS THAT YOU CAN REMEMBER:
ASSESSING THE QUANTITY AND QUALITY OF
AUTOBIOGRAPHICAL RETRIEVAL

Irina-Maria Lucaciu

A Thesis Submitted for the Degree of MPhil
at the
University of St Andrews



2018

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Provide All the Details that You Can Remember:
Assessing the Quantity and Quality of
Autobiographical Retrieval

Irina-Maria Lucaciu



University of
St Andrews

This thesis is submitted in partial fulfilment for the degree of

Master of Philosophy (MPhil)

at the University of St Andrews

September 2018

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Abstract

People asked to recall the memory of an event during testimony are encouraged to prioritize both quantity and quality – "the whole truth and nothing but the truth".

Extensive research has shown that people can provide detailed, confident accounts that nevertheless prove to be inaccurate (Loftus, 1996). However, the question remains of how pressuring people to give confident and elaborate accounts of their memories subsequently changes these accounts. We conducted an experiment in which 51 participants provided accounts of autobiographical events and film plots (control condition), and later re-told these accounts under the instruction to retrieve more information. We measured the effects of task demands on the quantity (number of words and number of facts) and quality (confidence ratings) of information retrieved, as well as on the affective and cognitive language used during each account. Task demands at re-telling led to participants providing a greater amount of information, with their likelihood of doing so and their confidence in these newly communicated memory details linked to rumination tendencies and mood. These findings give insights into the cognitive processing of autobiographical memories, and provide a better understanding of the factors affecting eyewitness testimony.

Table of contents

1. Introduction	1
1.1. Popular Beliefs About Memory	1
1.2. Research Findings: Memory as a Reconstruction	3
1.3. Factors Influencing Memory Retrieval	5
1.3.1. Interviewing Techniques	5
1.3.2. Personality Characteristics	7
1.3.3. Perfectionism	8
1.3.4. Rumination	9
1.3.5. Behavioral Approach and Inhibition	9
1.3.6. Affective State	9
1.3.7. Repetition	10
1.4. Understanding What Affects Autobiographical Memory Confidence	11
1.4.1. The Relationship Between Confidence and Accuracy	11
1.4.2. Confidence and Accuracy for Highly Emotional Events	13
1.4.3. Measuring Confidence	14
1.5. Language as a Mirror of Confidence in Autobiographical Memories	14
1.5.1. Linguistic Analysis	14
1.5.2. The Linguistic Inquiry and Word Count (LIWC) as a Tool	15
1.6. Aims and Hypotheses	16
2. Methods	19
2.1. Research Design	19
2.2. Participants	19
2.3. Materials	20
2.3.1. Personality Scales	20
2.3.2. Autobiographical Memory and Film Plot Interviews	22
2.3.3. Confidence Questionnaires	22
2.4. Experimental Procedure	22
2.4.1. First Session	22
2.4.2. Second Session	24

2.5. Transcription of the Interviews	25
2.6. Confidence Assessment	25
2.7. Analyses	27
3. Results	28
3.1. Changes in Narrative Output Following the Manipulation	28
3.1.1. Number of Words	28
3.1.2. Number of Statements Generated	31
3.2. Confidence	34
3.2.1. Differences Between Confidence in Old, New, and Repeated Details	34
3.2.2. Correlations Between Confidence in Details and Confidence in the Entire Memory.....	36
3.3. Personality Characteristics and Autobiographical Retrieval	37
3.3.1. Rumination	37
3.3.2. Affect	39
3.4. Linguistic Analysis of Autobiographical and Film Plot Accounts	41
3.4.1. Affective Language	41
3.4.2. Cognitive Language	45
4. Discussion	46
5. Conclusion	55
References	56
Appendix A. UTREC Approval	76
Appendix B. Ten-Item Personality Inventory (TIPI)	77
Appendix C. Almost Perfect Scale – Revised	78
Appendix D. Rumination Scale	79
Appendix E. Behavioral Inhibition/Behavioral Approach Systems (BIS/BAS)	80
Appendix F. Positive and Negative Affect Schedule (PANAS)	81
Appendix G. Autobiographical Memory Questionnaire	82
Appendix H. Film Plot Questionnaire	84
Appendix I. Example of a Pair of Accounts of a Sad Autobiographical Memory and the Associated Confidence Judgement Questionnaire Sent to Participant	85

List of Figures

Figure 1. Experimental Procedure	25
Figure 2. Narrative Length Before and After the Manipulation	31
Figure 3. Number of Old, New, and Repeated Statements by Memory Type and Valence	33
Figure 4. Confidence in Old, New, and Repeated Details	36
Figure 5. Correlations Between the Change in Number Words from Session 1 to Session 2 and Rumination Scores	38
Figure 6. Correlations Between the Number of Words for Session 1 and Session 2 and Negative Affect Scores	40
Figure 7. Affective Language in Session 1 and Session 2 Accounts	42
Figure 8. Positive and Negative Emotion Words in Session 1 and Session 2 Accounts	44
Figure 9. Cognitive Language in Session 1 and Session 2 Accounts	45

List of Tables

Table 1. Demographics and personality profile of the study population	21
Table 2. Number of Words and Statements According to Memory Type and Valence	29

1. Introduction

Extensive research on the mechanisms of memory has resulted in increasing efforts to better communicate research findings to the general public (Lacy & Starck, 2013). Nevertheless, erroneous beliefs about human memory abilities endure (Loftus, 1979; Simons & Chabris, 2011). The tight link between memory and selfhood makes any autobiographical account a subjective one; thus, separating facts from distorted details in one's autobiographical account is a constant challenge (Conway, 2005). Beliefs and prior expectations, personality, and mood are all factors that influence how a memory is retrieved, and how confident the person who remembers it is about the details of the event being recalled (Wise et al., 2014). This project investigated the link between people's confidence in their autobiographical memories and their response to being instructed to provide rich narrative accounts of happy and sad events that happened to them. Participants were first asked to provide accounts of autobiographical events and film plots (control condition), and later re-told these accounts under the instruction to retrieve more information. We measured the effects of task demands on the quantity (number of facts) and quality (confidence ratings) of information retrieved, as well as on the language used during each account. The goals of this project were to describe the effects of a demand to recount as many details as possible about a memory on the length of the accounts provided and on participants' confidence in the details of these accounts. We also addressed the impact of personality characteristics on both variables.

1.1 Popular beliefs about memory

The general public tends to be more confident about human memory abilities than memory experts, and scientific findings established for decades do not influence public

belief as much as intuition and common sense do (Simons & Chabris, 2011; Wise et al., 2011). A study conducted by Simons and Chabris in 2011 showed that 63% of the U.S. population believes that memory works like a video camera; 47.6% believes that once a memory of an event is formed, that memory does not change; 37.1% believes that the testimony of a confident eyewitness should be enough to convict a defendant of a crime; and 77.5% believes that people generally notice when something unexpected enters their field of view, even when they are paying attention to something else (Simons & Chabris, 2011). These results have been replicated with British and Indian populations, where 59.4% of British and 84.4% of Indian respondents agreed that memories of everything experienced are stored permanently in the brain (Patihis et al., 2014). Although a higher level of education corresponded with more skepticism about memory abilities, a surprisingly high percentage of the population remains unaware about established findings on the mechanisms of memory (Simons & Chabris, 2011).

Misconceptions about memory similarly affect those who make crucial legal decisions based on their evaluation of others' accounts about events. Two thirds of US law enforcement officers believe that memory works like a video camera (Wise et al., 2011), and jurors are prone to endorsing erroneous beliefs about memory (Schmechel et al., 2006). In addition, it has been shown that once established, beliefs are difficult to change and subsequent contradictory information is often ignored or pushed aside (Otero, 1998; Vosniadou, 2001). As a result, many individuals still maintain misconceptions about memory that affect not only their personal belief systems, but also rules and regulations set by institutions and policing entities (Simons & Chabris, 2011). In environments such as the legal arena, decisions based on erroneous ideas about the nature

of memory can have life-changing consequences for witnesses as well as the accused (Lacy & Stark, 2013; Simons & Chabris, 2011).

When people are asked to testify under oath, they agree to provide as many accurate details about an event as they are capable of: “the whole truth and nothing but the truth”. The ensuing narration, however, maintains the elements of memories recalled under any other circumstances, and can therefore be subjected to the deletion and insertion of episodic details (Loftus, 1996). This reality stands in contrast with the popular belief, as well as the one most often endorsed in the court system, that a confident account is an accurate account (Benton et al., 2006). In the current research, we wanted to know how pressuring individuals to give elaborate, confident accounts of their memories changes these accounts.

1.2 Research findings: memory as a reconstruction

Autobiographical memory is, many argue, the building base of selfhood (Schacter, 2001). Memories of specific events come together in a unique pattern of interweavement that becomes a life story specific to each person (McAdams, 2015). To support this concept, decades of research have shown that memory does not provide a reliable representation of events as they happened, since factors during both encoding – the process by which an event becomes a memory that is stored as information – and retrieval – the process by which the memory of an event is brought back to mind and reminisced upon – affect the way in which an event is remembered (Tulving, 1983; Schacter, 2001; Loftus, 2005; Howe & Knott, 2015).

In this study, we investigated effects occurring at the retrieval phase – more specifically, participants’ reaction to an instruction to provide as much information as

possible – as we had no way to verify the accuracy of the narratives related by participants and thus any effects present at the encoding and consolidation stages. Once encoded, a memory is screened against the inventory of memories already stored in long-term memory storage and adjusted to fit an existing narrative (Zaragoza et al., 2011), as well as discussed with others (Marsh, Tversky, & Hutson, 2005; Kensinger et al., 2016). This reconstructive process has been demonstrated at the cellular and molecular level, where long-term potentiation (LTP) and long-term depression (LTD) orchestrate the strengthening and weakening of synapses that allow a memory to be retrieved (Martin & Morris, 2002; Redondo & Morris, 2011), or that allow subsequent memories to interfere with the original memory (Hardt, Einarsson, & Nader, 2010). Last but not least, retrieval is dependent upon the conditions present in the instance of the memory elicitation – relationship to the person or persons listening to the account, purpose of communicating the information, and emotional state during the instance of sharing (Mirandola & Toffalini, 2016; Thorley et al., 2016; Straube, 2012). Memory accuracy upon recall, therefore, fluctuates and is ever changing, and the precise details of an event that happened to someone cannot be accessed without video or others forms of objective recording. In the absence of a form of objective record, one must rely on a person’s report to gain insight into an individual’s personal experience of an event.

To control for the connection between memory and selfhood, we asked participants to describe the plots of happy and sad films they watched; films are similar to event memories in that they constitute an episode, but are not connected to a sense of identity in the same way that emotional autobiographical memories are. While we did acknowledge that some people form strong associations between films and self-identity,

we reasoned that these associations are different from those between autobiographical events and a sense of self, since the events unraveling in films are temporarily detached from the instance of encoding – unlike autobiographical events, for which the person experiencing them is also an active participant.

1.3 Factors influencing memory retrieval

1.3.1. Interviewing Techniques

An extensive body of research by Loftus and her colleagues has shown that people are not only likely to insert new details or fail to mention others in their reports of events, but that they can be so highly sensitive to suggestions from a researcher as to give detailed reports about events that never happened to them. Events that participants were able to describe include a hospital visit (Hyman et al, 1995), an instance of getting lost at the local mall (Loftus & Pickrell, 1995), and flying in a hot air balloon (Porter, Yuille, & Lehman, 1999). Although these events are fictional, participants become convinced that they actually happened and give rich, confident reports of their false memories of them (Loftus & Bernstein, 2005).

The way in which an interviewer poses a question also influences the response of the person interviewed (Loftus & Pickrell, 1995). For example, Loftus and Palmer (1974) have proven the misinformation effect – a response to being exposed to misleading or distracting information after the event happened – by showing that the way in which an interviewer phrases a question about a car accident viewed on video determines the speed that participants report for the car involved (Loftus & Palmer, 1974). Although participants viewed the same video of two cars colliding, those who were queried about the speed of the cars using the word “smashed” reported significantly higher speeds than

those who were queried using the word “hit” (Loftus & Palmer, 1974). In the aftermath of the interview, the interviewer can still exert an influence over participants’ confidence in their accounts by providing either positive feedback to increase confidence (Semmler, Brewer & Wells, 2004), or negative feedback to decrease confidence (Luus & Wells, 1994).

The relationship between the interviewer and the interviewee is another factor, since it can determine how open and willing to cooperate the interviewee is (Garbarski, Schaeffer, & Dykema, 2016). Since interviewers are often perceived as authority figures, those who are interviewed may become biased towards mentioning details they believe the interviewer would like to hear (Loftus & Ketcham, 1994), especially if the interviewer is well liked (Jourard, 1959; Certner, 1973) and attentive (Pasupathi, Stallworth, & Murdoch, 1998). The quality of the information retrieved can also vary depending to whom it is relayed: if relayed to a peer, the account contains more evaluations and links to other events and concepts, while when relayed to an interviewer, it contains more details meant to clarify the specific situation under scrutiny (Hyman, 1994). In addition, a cross-race bias has been repeatedly shown, with respondents being more skeptical to elaboration when the interviewer had a different racial background (Meissner & Brigham, 2001). In the effort to provide a guideline for obtaining unbiased reports, Fowler and Mangione (1990) introduced a series of guidelines. Their guidelines are that first, questions should be written before the interview, and the same questions should be read to all those interviewed; second, answers that are not on the topic should be addressed similarly and in a pre-established manner; third, answers should be recorded as they are given; and fourth, the interviewer should stay nonjudgmental at all times

during the interview (Fowler & Mangione, 1990). For the purposes of this study, we tried to reduce interviewer bias by following Fowler and Mangione's guidelines, maintaining a neutral disposition across interviews, and avoiding deviation from the focus of the interview.

1.3.2. Personality Characteristics

Personality characteristics could also modulate people's likelihood to engage in disclosure. While previous research has addressed the impact of personality on self-disclosure, there is limited research on the effects of personality characteristics on the quantity and quality of information retrieved specifically, or on the confidence that participants have in their accounts. Introverts engage in self-disclosure less than extroverts (Mullaney, 1964), finding which was later replicated by Zimbardo (1977), who showed that shy students engage less and are reluctant to add new ideas to a discussion (Zimbardo, 1977).

Emotional stability and neuroticism have also been shown to correlate with disclosure, but sex differences exist. Pedersen and Breglio (1968) found a negative correlation between self-disclosure and emotional stability in males, but not in females (Pedersen & Breglio, 1968). Men are also less likely to participate in disclosure the higher they score on a "toughness" scale (Bruch, 2002). Since many of the personality characteristics in these studies are captured by the concise Ten-Item Personality Inventory, or TIPI (Gosling, Rentfrow, & Swann, 2003, Appendix B), we chose to use this scale to capture any effects of the Big-Five personality dimensions on disclosure.

1.3.3. Perfectionism

The relationship between perfectionism, disclosure, and performance under pressure is complex, mainly because perfectionism can manifest itself in two distinct ways (Rice & Ashby, 2007). On one hand, perfectionists have high standards and performance expectations, which translate into increased efforts to accomplish tasks and goals (Rice, Ashby, & Slaney, 2007). On the other hand, perfectionism can manifest itself in a dysfunctional way by increasing negative emotions associated with fear of failure or meeting expectations (Rice & Ashby, 2007). In 2015, Richardson and Rice used the APS-R (Appendix C), a scale that captures both of these dimensions, to show that those who score high in self-critical perfectionism are less likely to engage in disclosure (Richardson & Rice, 2015). In the current study, we used the APS-R to describe the relationship between perfectionism and the quantity and quality of information disclosed under pressure.

1.3.4. Rumination

Rumination, a style of thinking in which negative feelings and problems are continuously brought to mind, has been often associated with depression (Sansone & Sansone, 2012) and affects the way in which depressed individuals report their autobiographical memories (Williams, 1996). In a study by Sutherland and Bryant (2007), ruminators gave more vague reports about their memories when they were highly depressed, but not when they were lowly depressed (Sutherland & Bryant, 2007). Since the present study did not specifically recruit dysphoric participants, we were interested in whether rumination may affect disclosure of both positive and negative events, and whether the instruction to increase the amount of detail mentioned would have a stronger

or a weaker effect on those who are prone to rehearsing negative events. Furthermore, since rumination has been linked to fear of commitment and fear paralysis (Ward et al., 2003), as well as poor problem solving (Lyubomirsky et al, 1999), we wanted to specifically investigate the effects of rumination on confidence in autobiographical memories.

1.3.5. Behavioral Approach and Inhibition

Behavioral approach and avoidance has been studied in the context of high-risk behaviors such as drinking (Franken & Muris, 2006), smoking (O'Connor, Stewart, & Watt, 2009), and self-injury (Jenkins et al, 2014). Those who score high on the behavioral approach subscale are more likely to engage in these behaviors than those who score high on the inhibition subscale (Carver & White, 1994). Gray (1981) described the behavioral approach system (BAS) as that which pushes individuals to strive towards rewards, while the behavioral inhibition system (BIS) as the one that works towards avoiding aversive stimuli (Gray, 1981). Since BAS was associated with impulsivity (Corr, 2004), and BIS with anxious behaviors (Gray, 1982), we were interested in how BIS and BAS may influence confidence in autobiographical reports.

1.3.6. Affective State

While the effect of mood on retrieval is under debate, many previous studies have shown that it can influence the way in which people remember events (Thorley et al, 2016). On one hand, a negative mood could increase irrelevant thoughts, diminish attentional resources, and therefore impair recall (Ellis et al., 1997). In addition, a negative mood during the retrieval phase was found to diminish the number of correct details remembered, but a negative mood during both encoding and retrieval enhanced

memory (Thorley et al, 2016) – a mood congruency effect that has been shown repeatedly (Matt et al, 1992). On the other hand, Storbeck and Clore (2005) found that when participants were induced into a negative mood, they were less likely to report false memories than when they were induced in a positive mood (Storbeck & Clore, 2005), and Rusting (2005) found that negative mood can also improve the recall of positive memories (Rusting, 1998). When individuals are in a positive mood, they are more likely to engage in social interaction, which often translates to an increased likelihood to share personal information with someone else (Cunningham, Steinberg, & Grev, 1980). Overall, these findings support the idea that mood and autobiographical memory are linked, and that more research on this relationship is warranted.

1.3.7. Repetition

Memories are reconstructed every time they are retrieved (Schacter, 1999). The factors discussed above – interviewing techniques, prior expectations and knowledge, personality, and mood – are all variables, and differ at each instance of retrieval. The more times an autobiographical memory is retrieved and then reconsolidated, the more opportunities exist for these factors to mold the memory. In an experiment investigating the effects of retelling events on memory, Tversky and Marsh (2000) found that on a second retelling, participants revealed more details about a hypothetical situation involving a roommate. Furthermore, exposing participants to a biased version of the roommate story also changed their retellings in accordance to the perspective induced (Tversky & Marsh, 2000). When the relationship between repeated recounting and memory confidence was investigated, repeated recounting was shown to increase confidence in the overall memory (Shaw & McClure, 1996). This finding was valid even

when memory accuracy decreased (Hirst et al., 2009). In the context of our study, we had no way to control how much participants thought about or discussed the events and film plots in the interval between sessions, so we took into consideration the possibility that an increase in length at the second retelling could be partially motivated by memory repetition.

1.4 Understanding What Affects Autobiographical Memory Confidence

1.4.1. The Relationship Between Confidence and Accuracy

The relationship between memory confidence and accuracy has been intensely researched, and many studies have found a positive correlation between the two (Wixted & Mickes, 2010). Nevertheless, it is difficult to characterize this relationship as it depends on the material that is being remembered, on who is doing the remembering, and on the different manipulations used to distract or lure participants (Roediger, 2008). Previous research has investigated the effect of cueing on remembering using both the Deese-Roediger-McDermott (DRM) paradigm and eyewitness-like scenarios. In the DRM paradigm, participants are given a list of related words such as “student”, “book”, “studying”, “test”, “teacher”, “exam”, and “homework”, and then asked to remember as many words from the list as possible (Deese, 1959; Roediger & McDermott, 1995). More often than not, participants also remembered related words that were not presented, or lures, such as “school”, with just as much confidence as they remembered words that were presented (Roediger & McDermott, 1995).

In the realm of autobiographical memories, the relationship between confidence and accuracy is even more difficult to describe, as confidence can change independently of accuracy, and access to an objective account of the memory is rarely available (Lacy

and Stark, 2013). As discussed, an individual's account of an autobiographical memory can be influenced by suggestive interviewing techniques from the person inquiring about the event, expectations and prior knowledge both at the moment of encoding and at the moment of retrieval, personality characteristics, affective state, and repeated retrieval and reconsolidation (Lacy and Stark, 2013); similarly, confidence in the details conveyed in the account can be swayed by the same factors (Luus & Wells, 1994; Semmler, Brewer, & Wells, 2004). In the current research, we assumed that participants described autobiographical events and film plots as accurately as they possibly could, since they did not have any incentive to do otherwise.

Autobiographical memories fade with time, and forgetting decreases memory accuracy (Hirst et al., 2009). However, confidence may not be affected to the same degree, as shown by a study by Schmolck et al. (2000). In that study, participants' memory for the Simpson verdict was assessed 15 and 35 months after it was first tested three days after the verdict. After 15 months, only 50% of the recollections were accurate, and after 35 months the percentage decreased further to 29% percent; memory distortions also increased in-between the testing sessions (Schmolck et al., 2000). As the accuracy of these memories decreased, however, participants felt confident enough in them to report them. In our study, participants provided accounts of their autobiographical memories twice with a 5 to 9 days interval in between, as we looked to minimize the effect of time-induced forgetting on memory confidence.

Last but not least, information that is forgotten initially is deemed to be less important than information that is recalled (Castel et al., 2012). If people assign a level of importance to event details retrospectively, based on what they mention on a first

account, it would follow that they would find anything they remember on a second try to be less important to the overall memory (Rhodes et al., 2016).

1.4.2 Confidence and Accuracy for Highly Emotional Events

Emotion is a potent modulator of both the encoding and the retrieval processes (Buchanan, 2007). Thus, emotion may alter the normal coupling between accuracy and subjective confidence – such as it happens in the case of flashbulb memories, in which case individuals can be certain that details of their memories are true without that being the case (Talarico & Rubin, 2003; Hirst & Phelps, 2016). In the legal context, jurors place significant weight in how confident witnesses are when taking their testimony into account (Benton et al., 2006). In a 2012 study, Campbell, Patterson and Bybee found that 86% of sexual assaults are never prosecuted because the victim's testimony, in its incomplete and disjointed form, does not satisfy the jury's demand for confidence as a prerequisite for reliability (Campbell, Patterson, & Bybee, 2012).

Authentic emotional memories are, however, often disjointed and poorly remembered, while memories that are recalled with confidence are often filled with inaccurate information (Lacy and Stark, 2013). While emotion can have a positive effect on memory processing by increasing one's attention to the details of the event, it can also impair it in cases of elevated intensity (Rooszendaal & McGaugh, 2011). In the case of traumatic events, for example, emotion can increase the overall understanding of the event, as victims of violence generally recollect easily the feelings associated with such an act; however, they show difficulties remembering details of the traumatic event (Burke, Heuer, & Reisberg, 1992). For example, the presence of a weapon decreases the ability of an eyewitness to describe both the perpetrator and the scene of the crime

(Johnson & Scott, 1976; Kramer, Buckhout, & Eugenio, 1990). While emotional arousal may not have any effects on retrieval abilities, it can nevertheless increase what Phelps and Sharot (2005) call the “subjective feeling of remembering” (Phelps & Sharot, 2008).

Even when details of an emotional event are remembered, they may not be necessarily accurate (Laney & Loftus, 2005). With an impaired ability to recollect such details, confidence in their accuracy and in the accuracy of the overall memory is also affected. In a 2009 study of witnesses of an armed robbery, Odinet, Wolters, and van Koppen found that although witnesses remembered accurate details with more confidence than they remembered inaccurate details, the correlation between confidence and accuracy was weak (Odinot, Wolters, & van Koppen, 2009).

1.4.3. Measuring Confidence

There are several ways to measure subjective confidence in memory, or metamemory (Krug, 2007). Previous studies have used a Likert 5-point scale, with 1 corresponding to low confidence and 5 corresponding to high confidence (Perfect & Hollins, 1996; Busey et al., 2000), a 1-100 % scale broken in several intervals (Bornstein & Zickafoose, 1999, or other kinds of scales (Luna & Martín-Luengo, 2012; Kvidera & Koutstaal, 2008). In the current study, we used the three-point scale (Low, Medium, High), as we believed it would be sensitive enough to capture participants’ confidence in individual details of their narratives.

1.5 Language as a mirror of confidence in autobiographical memories

1.5.1. Linguistic analysis

Autobiographical narratives are a reliable measure of how individuals remember events in their lives, and analyzing the language used to describe such events can give

insight into their physical and mental states (Gottschalk & Gleser, 1969; Rosenberg & Tucker, 1978; Stiles, 1992). Linguistic processing technologies have also been used as a treatment tool to follow cognitive and emotional changes throughout psychotherapy (McCarthy, Caputi, & Grenyer, 2017). For example, the use of positive emotion words as well as words indicating causal thinking has been linked to better health outcomes (Pennebaker & Francis, 1996), while the increased use of negative words has been associated with transitions in people's lives (Valdés et al., 2010).

1.5.2. The Linguistic Inquiry and Word Count (LIWC) as a tool

The Linguistic Inquiry and Word Count (LIWC) 2015 (Pennebaker et al., 2015) is a dictionary-based package that reads textual input and classifies words into various psychologically-relevant categories. Each category is defined as a list of words and word-stems. Affective and cognitive mechanisms can be detected in the language that people use by analyzing the use of certain categories such as Affective or Cognitive (Pennebaker & Francis, 1996). For example, the use of affective words – words that describe positive and negative emotional states, such as “nice”, “hurt”, and “crying” – can give insight into the emotional intensity of the memory (Rubin et al., 2008).

Cognitive words mark the existence of an underlying cognitive process, that is, one that has as a goal the justification, organizing, and understanding of previous events (Boals & Rubin, 2011). Individuals use cognitive words when they are trying to make sense of events and behaviors. Examples of cognitive words include “think”, “should”, and “because”. The overarching category of Cognitive Words contains several subcategories, one of which is Certainty words. Since we also measured subjective confidence using confidence ratings, we were interested to see how confidence

manifested itself in the language participants used. LIWC has been previously validated (Kahn et al, 2007; Bantum & Owen, 2009).

1.6 Aims and Hypotheses

In an attempt to recreate the pressures placed on eyewitnesses when they are asked to testify, the current study describes changes in the quantity and quality of information retrieved following an instruction to maximize quantity. We measured the quantity of information as the number of facts mentioned during each of two sessions, first allowing participants to reveal as much as they wanted, and then asking them to provide all the details that they can remember, even those not mentioned in the previous account. We measured confidence by asking participants to rate their confidence in details mentioned only during the first session, only during the second session, or in details that repeated across sessions.

For the first session of the study, participants were allowed to narrate as much or as little as they wanted about sad and happy events that happened to them, and about sad and happy films they watched. The manipulation was introduced during the second session, when they were asked to describe the same events and film plots once again, this time including all the details that they can remember about each. We were tracking details that appeared only during the first interview, details that appeared only during the second interview, and details that were repeated across interviews.

In order to analyze the relationship between personality, disclosure, and memory confidence, participants in our study will complete a battery of personality questionnaires assessing the five-factor model dimensions (TIPI), rumination (RRQ), perfectionism (APS-R), mood (PANAS), and behavioural inhibition (BIS/BAS). To add a further

dimension to this research, we will also analyse the language that individuals use to describe autobiographical memories, as previous research suggests that information about the physical and mental states of individuals permeates the language they use (Gottschalk & Gleser, 1969; Stiles, 1992) using LIWC.

We tested the following hypotheses:

Hypothesis 1: Participants provide longer and more detailed accounts of personal events following a request to do so.

To quantify the increase in narrative output, we compared the word counts for narratives from each section, as well as the number of statements generated for the confidence judgment questionnaires. We predicted that significantly more details would be repeated across the two sessions than only mentioned during one or the other. Furthermore, we also expected that the number of new statements generated for the second session would correlate positively with the increase in the number of words for each event session.

Hypothesis 2: Participants' confidence in details added under the pressure to provide as much information as possible is lower than in details mentioned in a no-pressure condition. In addition, confidence and intensity scores attributed to the overall event correlate with confidence scores attributed to individual details of the respective accounts.

We asked participants to rate their confidence in details mentioned only during the first session (Old), details mentioned only during the second session (New), and details mentioned during both sessions (Repeated). We predicted that participants would be less confident in New details than in Old and Repeated details. We used participants'

overall memory confidence ratings on Autobiographical Memory Questionnaires to correlate with discrete details of the corresponding accounts.

Hypothesis 3: There are correlations between personality characteristics and the quantity and quality of information retrieved.

We hypothesized that these personality effects on confidence are present at both session times, and maintained our approach as exploratory to describe the direction and size of these effects.

Hypothesis 4: The language in participants' accounts is consistent with participants' subjective assessment of their confidence.

We used LIWC to quantify participants' use of affective and cognitive language. We predicted that autobiographical memories contain more affective and more cognitive language than film plot accounts, and that the more cognitive and affective words participants use in their event narratives, the higher confidence ratings they give on single details of their autobiographical memories and film plots.

2. Methods

2.1. Research Design

The study employed a within subjects design by which all participants completed both the experimental condition, an autobiographical memory recall task, and the control condition, a movie plot recall task. Data was collected at two time points separated by a period of five to nine days, and through a personalized confidence judgements questionnaire sent to each participant after the conclusion of the second session. The present study was approved by the University Teaching and Research Ethics Committee (UTREC) at the University of St Andrews and carried out in accordance with guidelines provided by UTREC (Appendix A).

2.2. Participants

Fifty-one participants (38 females, 13 males; mean age = 21.20 years, SE = 0.31) were recruited through an online participant recruitment system at the University of St Andrews. All participants consented to participate in the study, completed both experimental sessions, and were reimbursed with £10 for their time. Thirty of these participants completed confidence questionnaires distributed by email via the Qualtrics platform after the second session (25 females, 5 males; mean age = 21.17, SE = 0.34). No significant differences in age, personality characteristics, and narrative output, as quantified by number of words per narrative, were found between females and males (all $ps > .053$). The subsequent analyses were therefore conducted on the entire sample regardless of sex. Demographic and personality characteristics of the study population are presented in [Table 1](#).

Table 1. Demographics and Personality Profile of the Study Population

Scale	Subscale	M (SE)
TIPI	Extraversion	4.28 (0.17)
	Agreeableness	4.88 (0.13)
	Conscientiousness	4.99 (0.16)
	Emotional Stability	3.95 (0.16)
	Openness to Experience	5.55 (0.15)
Rumination Score		51.04 (1.82)
Affect	Positive	31.92 (0.82)
	Negative	21.63 (1.03)
BAS	Drive	11.39 (0.32)
	Fun Seeking	12.24 (0.32)
	Reward Responsiveness	17.22 (0.29)
BIS		21.98 (0.53)
APS-R	Standards	40.24 (0.78)
	Order	19.98 (0.58)
	Discrepancy	51.48 (2.40)

Note: TIPI = Ten-Item Personality Inventory; BAS = Behavioral Approach System; BIS = Behavioral Inhibition System; APS-R = Almost Perfect Scale-Revised

2.3. Materials

2.3.1. Personality Scales

Participants completed a battery of five personality scales in the order listed below.

TIPI (Ten-Item Personality Inventory) (Gosling, Rentfrow, & Swann Jr., 2003) is a quick, easy-to-administer measure of the Big-Five personality dimensions, and has been used in many studies looking to enhance methodology (Holmes, 2010). As explained by its creators, the scale was built as a short instrument meant to optimize validity, not to perform highly in terms of alpha and Confirmatory Factor Analysis (CFA) (Gosling, Rentfrow, & Swann, 2003); the authors' claim is supported (Furnham, 2008; Holmes, 2010).

RRQ (Ruminative Response Scale) (Trapnell & Campbell, 1999) was used to assess rumination tendencies. Previous studies demonstrated good reliability and validity in various populations (Burwell & Shirk, 2007; Erdur-Baker & Bugay, 2010; Extremera & Fernández-Berrocal, 2006; Hasegawa, 2013), including when used in individuals diagnosed with major depressive disorder (Parola et al, 2017).

PANAS (Positive and Negative Affect Schedule) (Watson, Clark, & Tellegen, 1988) provided an evaluation of mood by using two 10-item scales measuring both positive and negative affect. PANAS has been shown to be reliable and valid by several previous studies (Crawford & Henry, 2004; Crocker, 1997; Harmon-Jones et al, 2009).

APS-R (Almost Perfect Scale Revised) (Slaney et al, 1996; Slaney et al, 2001) to measure perfectionism using three variables – High Standards, Order, and Discrepancy. The psychometric properties of the scale have been analyzed (Vandiver & Worrell, 2002; Mobley, Slaney, & Rice, 2005; Diamantopoulou & Platsidou, 2014), and the research indicates that the APS-R is a valid and reliable scale to assess the three different aspects of perfectionism.

BIS/BAS (Behavioral Inhibition System/Behavioral Approach System Scales) (Carver & White, 1994) is a 24-item self-report questionnaire used to describe two motivational systems underlying behavior, as suggested by its name: the inhibition, or avoidance system, which captures the tendency to disengage from something unpleasant, and an approach system, which regulates moving towards something desired. The BIS/BAS scale has been validated in studies with undergraduate samples as well as studies with offenders (Newman et al, 2005; Poythress et al, 2009).

Appendices B-F contain copies of these scales.

2.3.2. Autobiographical Memory and Film Plot Interviews

Participants completed the Autobiographical Memory Questionnaire (AMQ) (Appendix G), which posed in-depth questions about the properties and intensity of the memory, for each event described (Rubin, Schrauf, & Greenberg, 2003). They also completed the Film Plot Questionnaire (FPQ) (Appendix H) – a modified version of the AMQ adapted to fit questions about participants' memories of the film plots – for each film described.

2.3.3. Confidence Questionnaires

After the conclusion of the second session, each participant was asked to complete a personalized confidence judgement questionnaire sent through email.

2.4. Experimental Procedure

2.4.1. First Session

Figure 1 outlines the experimental procedure. The first session started with the experimenter explaining the research and participants consenting to participation,

followed by the completion of the psychometric battery described above. Participants needed approximately 10 to 15 minutes to complete these steps.

Participants then completed both the autobiographical memory recall task and the film plot recall task. We first asked participants to list either five happy and five sad events that happened to them, or five happy and five sad films they watched in the space provided on a form. Participants did not receive any restrictions on the time periods when these events had to have occurred or films had to be watched. The form was two-sided, with one side containing space to list events and the other side containing space to list films. Half of the participants were assigned to list events first, and were subsequently interviewed about the events listed; they were then asked to complete the reverse side of the form containing space to list films, and were next interviewed about the plots of the films listed. The opposite happened when participants were assigned to start with the film list first. We varied both the type of memory participants started with (autobiographical or film plot) and the valence of the memory (happy or sad).

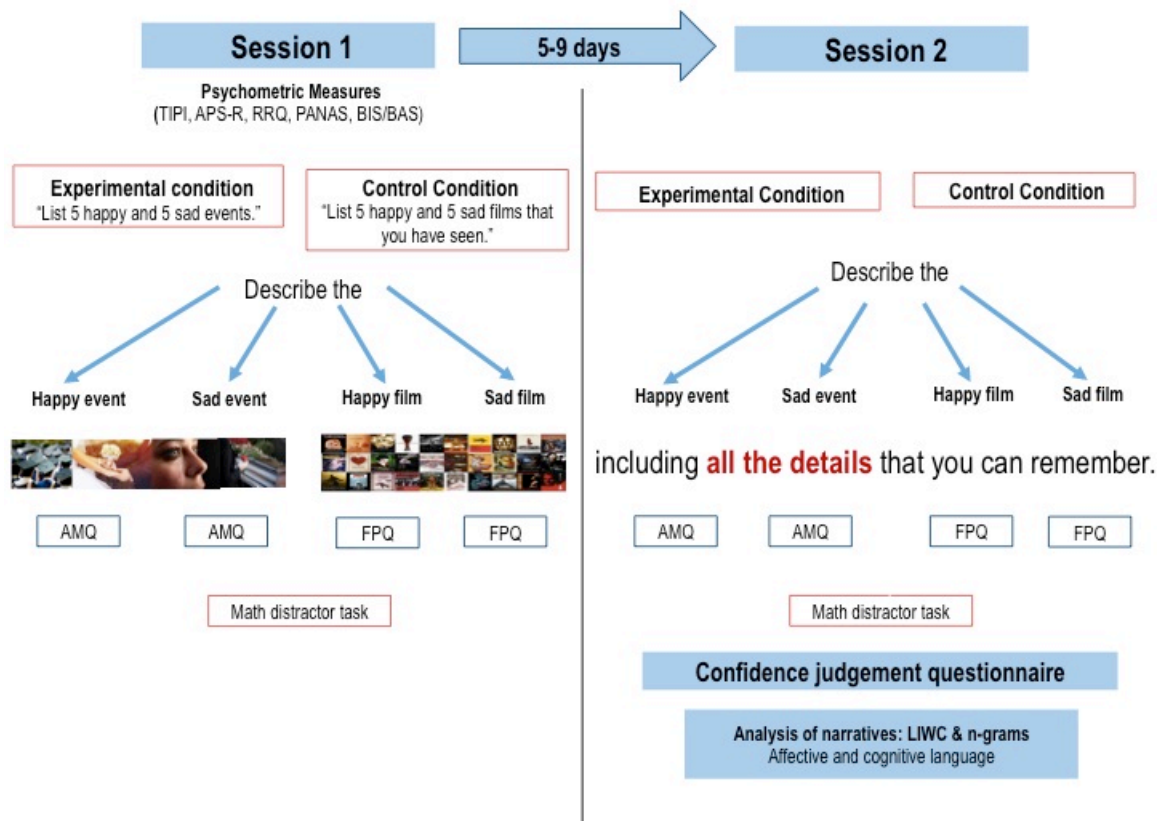
Participants were asked to provide an oral description of one of the happy events and one of the sad events with the following command: “I want you to think about [randomly chosen happy event/sad event]. Can you tell me what happened then?” In turn, the command used for obtaining the description of one of the happy film plots and one of the sad film plots was: “I want you to think about [randomly chosen happy film/sad film]. Can you tell me the plot of this film?” The interviews were audio-recorded, and no time limit for answering the question was enforced. After describing the first event, participants completed the AMQ (Autobiographical Memory Questionnaire) (Rubin, Schrauf, & Greenberg, 2003) specifically for that event, before describing the second

event and completing a second AMQ. The same protocol was followed for the film plots, but the FPQ (Film Plot Questionnaire) was distributed after each film plot was described. At the end of the session, participants completed a short mathematical distraction task of subtracting a digit for three minutes, which was meant to improve mood by loading working memory (Van Dillen and Koole, 2007).

2.4.2. Second Session

Participants returned for the second session the following week. The researcher brought back the forms where participants listed events and films. Upon being showed their respective form, participants were asked to report once again about the same two events and film plots, but this time they were encouraged to retrieve all the details that they were able to think of. The command used during the second session was: “Last week you told me about [insert event/film]. I would like you to tell me the same story, but this time please make sure that you include all the details that you can remember, including details not previously mentioned for any reason.” The interviewer placed a vocal emphasis on the word “all”; furthermore, when participants stopped talking, they were asked if their report contained everything that they remembered in order to create an additional pressure for including as many details as possible. They once again completed an AMQ for each event report and a FPQ for each film plot report they provided, and finished the session with the short mathematical distraction task.

Figure 1. Experimental Procedure



2.5. Transcription of the interviews

The researcher listened to the recorded interviews and transcribed them verbatim.

2.6. Confidence judgement questionnaires

Two accounts were provided for each happy and sad autobiographical memory, and two descriptions for each happy and sad film plot. Therefore, a total of eight narratives were collected from each participant (one version of the happy autobiographical memory from Session 1, another version of the happy autobiographical

memory from Session 2; etc.). The researcher and one other trained individual had access to the transcripts of the interviews, with the second coder encountering the data only once it was anonymized. The coders read the Session 1 and Session 2 transcripts for each event and film plot, and extracted individual pieces of information comprising specific details of the respective autobiographical memory and film plot. These details answered questions related to the who, what, where, and when of the events and film plots. Coders aimed to extract 20 details from each set of transcripts, but the maximum number of details was extracted if the transcripts did not contain sufficient information. For example, a pair of short narratives of a happy memory might have contained only enough information for five statements. On the opposite hand, some pairs of longer narratives contained information for more than 20 statements, in which case the coders aimed to write the set maximum of 20 statements using details mentioned in all parts of the description homogenously (i.e. we aimed for a similar emphasis on details mentioned in the first part of the interviews as on details mentioned in the middle or end parts of the interviews). These details were compiled as lists of statements and used to create personalised questionnaires on Qualtrics that were then sent to each participant's personal email. Participants had to make a confidence judgment about every statement itemised in their questionnaire by choosing one of three confidence options (low, medium, or high). Appendix I contains an example of a pair of accounts for the participant's sad event, and the associated confidence judgement statements that were sent to the participant.

We kept track of statements that appeared only in the first telling of the events and film plots (only mentioned during Session 1, referred to as "Old"), which only appeared in the second telling (only during Session 2, referred to as "New"), and which

appeared in both sessions (referred to as “Repeated”). A detail was counted as “New” if it contained information about the time, location, emotional reaction to the event, other participants etc., that was not mentioned in first account. A detail was counted as “Repeated” if the information it contained did not add anything new to the original account, i.e. anything that would change the listener’s mental image of the event. We also tracked any mention of incongruent details (example in Appendix I).

2.7. Analyses

The narratives collected were analyzed using LIWC (Linguistic Inquiry and Word Count) (Pennebacker et al., 2007). LIWC is a dictionary-based package that read textual input and classifies words into various psychologically-relevant categories, such as the Affective Processes cluster, Cognitive Processes Cluster, Pronouns, and others. For our purposes, we will use LIWC to describe the prevalence of affect and cognitive processing language primarily, and potentially analyse other language trends if any arise post-analysis.

Both correlational and categorical analyses were employed in the current study. We used categorical analyses to assess the change in the quantity and quality of information retrieved. We used correlational analyses to investigate the relationship between personality characteristics, cognitive and affective language, and the quantity (number of words) and quality (confidence ratings) of information retrieved.

3. Results

3.1. Changes in narrative output following the manipulation

We hypothesized that individuals would provide longer and more detailed accounts of personal events as well as of film plots when instructed to do so. We measured the change in narrative output in two ways: by number of words and by number of statements generated for the confidence questionnaires later distributed to all participants.

3.1.1 Number of Words

The average number of words per narrative was 235.2 words ($SE = 11.03$). The narratives delivered by participants when instructed to give as many details as possible were significantly longer than the narratives provided when they did not receive the instruction (Session 1: 156.2 words, Session 2: 314.2 words, $t(50) = -7.27$, $p < 0.001$, $d = -0.96$).

Table 2 contains of breakdown of the average number of words and statements per narrative according to memory type (Autobiographical Memory or Film Plot) and valence (Happy or Sad).

Table 2. Number of Words and Statements According to Memory Type and Valence

		Number of words (<i>N</i> =51; <i>M</i> (<i>SE</i>))		Old statements	New statements	Repeated statements
		Session 1	Session 2			
		Memory	Happy	138.9 (14.3)	272.9 (29.5)	3.0 (0.4)
Sad	152.2 (23.0)		288.0 (38.6)	2.5 (0.4)	6.6 (0.6)	5.3 (0.5)
Film	Happy	170.0 (15.1)	383.3 (46.8)	1.8 (0.3)	7.3 (0.6)	8.0 (0.6)
	Sad	163.6 (13.6)	312.8 (32.7)	1.8 (0.3)	6.2 (0.5)	7.6 (0.6)

Note: Old statements were based on details only mentioned during Session 1. New statements were based on details only mentioned during Session 2. Repeated statements were based on details that appeared during both sessions.

We further wanted to investigate if valence and memory type had an effect on the length of the narratives (Figure 1). In a 2 (Valence: Happy; Sad) x 2 (Memory Type: Autobiographical Memory; Movie Plot) x 2 (Session: Session 1; Session 2) within subjects factorial ANOVA there were no significant main effects of valence, $F(1, 50) = 0.666, p = 0.428$, on narrative length. There was a significant main effect of session, with Session 2 accounts being longer than Session 1 accounts, $F(1,50) = 52.81, p < 0.001, \eta^2_p = 0.514$ (Session 1: $M = 156.2$ words, $SE = 13.5$; Session 2: $M = 314.3$ words, $SE = 29.7$), and a significant main effect of memory type, with film plot accounts being longer than event memory narrations, $F(1,50) = 6.68, p = 0.013, \eta^2_p = 0.118$ (Autobiographical Memories: $M = 213.0$ words, $SE = 23.0$; Film plots: $M = 257.4$ words, $SE = 21.2$). We found a significant interaction between memory type and session, $F(1,50) = 4.17, p = 0.047, \eta^2_p = 0.077$, which could be explained by the larger increase in number of words

per account for the film plots following the manipulation (Autobiographical memory, Session 1: $M = 145.6$, $SE = 17.6$; Session 2: $M = 280.4$, $SE = 31.9$ and Film Plot, Session 1: $M = 166.8$, $SE = 12.4$; Session 2: $M = 348.0$, $SE = 32.8$). No other significant interactions were found: Valence x Memory Type, $F(1,50) = 2.0$, $p = 0.162$; Valence x Session, $F(1,50) = 1.89$, $p = 0.176$; Valence x Memory Type x Session, $F(1,50) = 2.07$, $p = 0.156$. These results suggest that participants provide more detailed accounts of both their autobiographical and their film plot memories when they are instructed to provide as much information as possible, which is consistent with the purpose of our manipulation. Interestingly, participants talked more at length about film plots than about their autobiographical memories, although follow-up paired samples t-tests showed that reports of autobiographical memories, collapsed across valence, were significantly longer for the second session than for the first (Session 1: $M = 145.6$, $SE = 17.6$ and Session 2, $M = 280.4$, $SE = 31.9$, $t(50) = -5.81$, $p < .001$, $d = -0.73$). That is, the main effect of session is maintained despite the significant interaction between memory type and session in the within subjects factorial ANOVA (Figure 2).

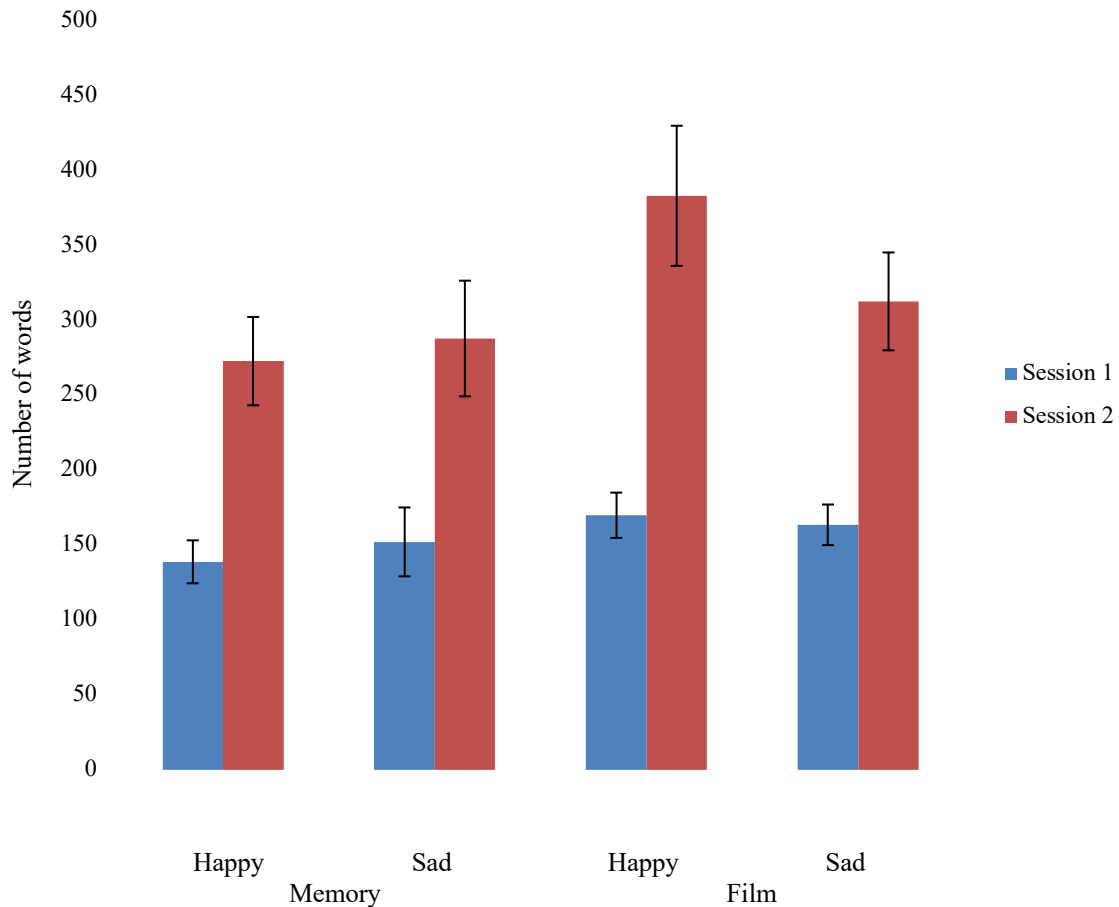


Figure 2. Narrative Length Before and After the Manipulation. Bars show ± 1 SEM.

3.1.2. Number of Statements Generated

The mean number of Old, New, and Repeated statements is summarized in Table 1. We hypothesized that the statements produced by the researcher for the confidence judgment questionnaires would contain significantly more Repeated details (that appeared during both Session 1 and Session 2 accounts) than Old details (that only appeared in Session 1 accounts) and New details (that appeared only in Session 2 accounts). For an initial understanding of the factors affecting the number of statements generated, we performed a 2 (Valence: Happy; Sad) x 2 (Memory Type:

Autobiographical Memory; Film Plot) x 3 (Type of Detail: Old; New; Repeated) within subjects factorial ANOVA. We found significant main effects of valence, $F(1, 49) = 9.40$, $p = 0.004$, $\eta^2_p = 0.161$ (Happy: $M = 5.41$ statements, $SE = 0.16$; Sad: $M = 4.98$ statements, $SE = 0.16$), memory type, $F(1, 49) = 4.74$, $p = 0.034$, $\eta^2_p = 0.088$ (Autobiographical Memory: $M = 4.97$ statements, $SE = 0.20$; Film Plot: $M = 5.42$ statements, $SE = 0.16$), and type of detail $F(1, 49) = 56.80$, $p < 0.001$, $\eta^2_p = 0.703$ (Old: $M = 2.29$ statements, $SE = 0.23$; New: $M = 6.77$ statements, $SE = 0.40$; Repeated: $M = 6.54$ statements, $SE = 0.42$) on the number of statements generated. There was a significant interaction between memory type x type of detail, $F(1,49) = 23.17$, $p < 0.001$, $\eta^2_p = 0.491$. No other significant interactions were found: valence x memory type, $F(1,49) = 0.34$, $p = 0.565$; valence x type of detail, $F(1,49) = 0.77$, $p = 0.471$; valence x memory type x type of detail, $F(1,49) = 0.58$, $p = 0.567$. Figure 3 shows the distribution of Old, New, and Repeated details for happy and sad memories and happy and sad film plots.

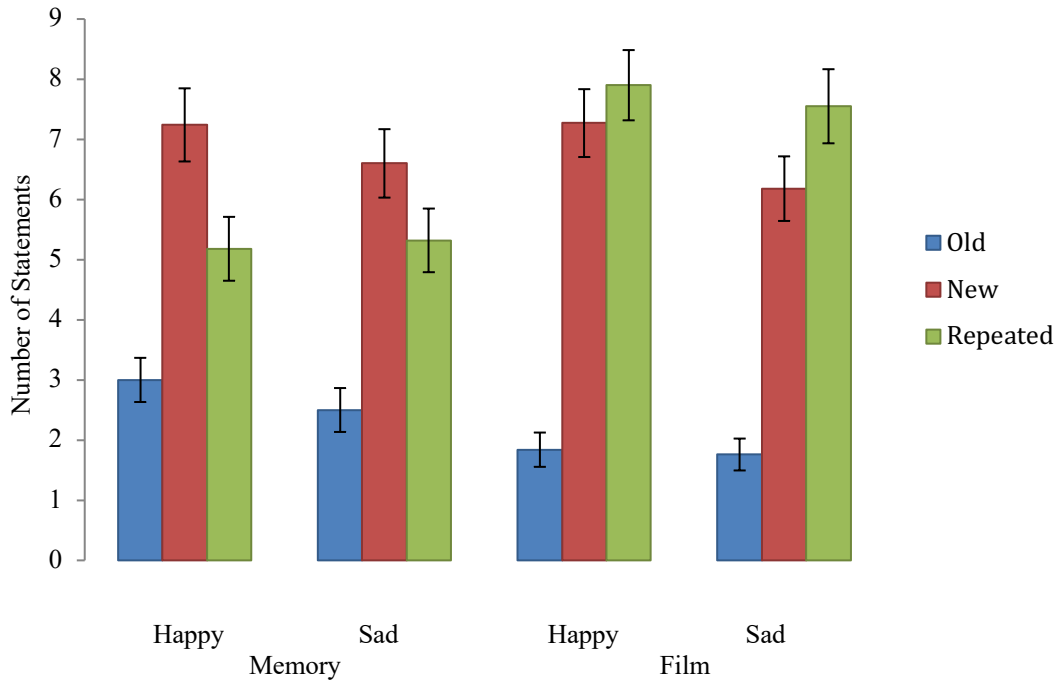


Figure 3. Number of Old, New, and Repeated Statements by Memory Type and Valence.

Bars show ± 1 SEM.

Additionally, paired-samples t-test revealed a significant difference between the number of Old statements and Repeated statements, as well as Old and New statements, regardless of valence and memory type (Happy Memories: Old and Repeated: $t(49) = -3.32, p = 0.002, d = -0.67$, Old and New : $t(49) = -5.33, p < 0.001, d = -1.19$; Sad Memories: Old and Repeated: $t(49) = -3.88, p < 0.001, d = -0.88$, Old and New : $t(49) = -5.68, p < 0.001, d = 1.21$; Happy Film Plots: Old and Repeated: $t(49) = -8.42, p < 0.001, d = -1.87$, Old and New : $t(50) = -7.74, p < 0.001, d = -1.72$; Sad Film Plots: Old and Repeated: $t(50) = -7.81, p < 0.001, d = -1.7$, Old and New : $t(50) = -7.92, p < 0.001, d = -1.45$; all relevant means can be found in Table 1). Our findings suggest that most of the information present in each of the four sets of narratives collected was either repeated across sessions, or was only introduced once the request for as many details as possible

was made. Correspondingly, there was significantly less information that was only mentioned during the first account.

We conducted correlational analyses to test the hypothesis that the number of New statements will correlate positively with the increase in number of words per account between sessions, regardless of memory type and valence. Indeed, we found that the increase the number of words was positively correlated with the number of New statements generated for each participant for all conditions except Happy Film Plots ($p > 0.05$): Happy Memories: $r(50) = .53, p < 0.001$; Sad Memories: $r(50) = .51, p < 0.001$; Sad Film Plots: $r(50) = .46, p = 0.001$). Therefore, the instruction to provide more details had the scouted effect, increasing both the length and the amount of detail provided in the accounts given by participants.

The findings above support our hypothesis that individuals will provide longer and more detailed accounts after an instruction to give as many details as possible, as measured by both number of words and number of statements generated for the confidence questionnaires.

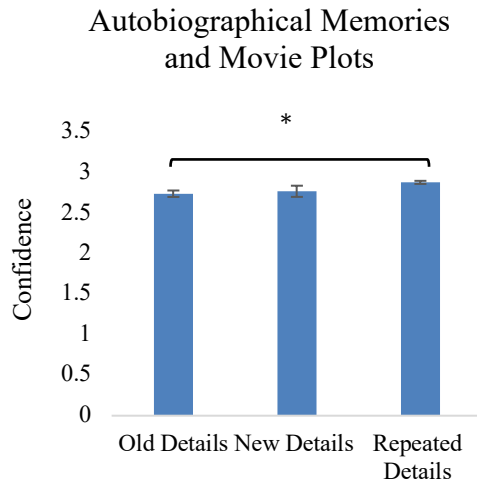
3.2. Confidence

3.2.1. Differences between confidence in Old, New, and Repeated details

We hypothesized that confidence ratings on New statements will be significantly lower than confidence ratings on Old and Repeated statements. For an initial understanding of the factors affecting confidence, we performed a 2 (Valence: Happy; Sad) x 2 (Memory Type: Autobiographical Memory; Film Plot) x 3 (Type of Detail: Old; New; Repeated) within subjects factorial ANOVA, but we did not find any significant effects or interactions (valence, $F(1,16) = 1.47, p = 0.245$; memory type, $F(1,16) = 0.29$,

$p = 0.599$; type of detail, $F(1,16) = 2.67, p = 0.104$; valence x memory type, $F(1,16) = 1.98, p = 0.180$; valence x type of detail, $F(1,16) = 0.15, p = 0.863$; memory type x type of detail, $F(1,16) = 0.208, p = 0.82$; valence x memory type x type of detail, $F(1,16) = 1.68, p = 0.222$). After examining the mean confidence values for Old, New, and Repeated statements and observing that mean confidence in Old details was lower than mean confidence in Repeated details by a decimal, we furthered the analysis by collapsing groups across valence and memory type. We found a significant difference between confidence in Old details and confidence in Repeated details, $t(29) = -3.508, p = 0.001, d = -0.50$ (Confidence Old: 2.74, $SE = 0.04$; Confidence Repeated: 2.88, $SE = 0.02$). No significant differences were found between Old and New details, $t(29) = 0.471, p = 0.641$, and between New and Repeated details, $t(29) = -1.506, p = 0.143$ (Figure 4A). When looking only at details present in the autobiographical memories, but not in the film plots, we once again found a significant difference between confidence in Old details and confidence in Repeated details, $t(27) = -4.10, p < 0.001, d = -0.885$ (Confidence Old: 2.75, $SE = 0.04$; Confidence Repeated: 2.91, $SE = 0.02$), but no difference between Old and New details ($t(27) = 0.378, p = 0.709$) or New and Repeated ($t(27) = -1.61, p = 0.119$) (Figure 4B). These findings suggest that participants were more confident in details that they repeated across sessions than in details they only mentioned during the first session.

A)



B)

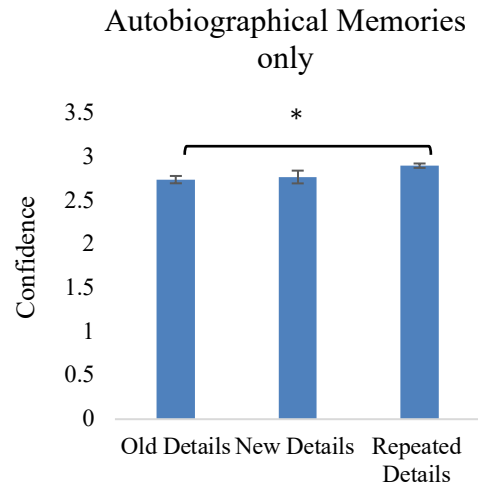


Figure 4. A) Confidence in Old, New, and Repeated Details of Autobiographical Memories and Film Plots. A significant difference was found between confidence in Old and Repeated details B) Confidence in Old, New, and Repeated Details of Autobiographical Memories only. The difference between confidence in Old and Repeated details was statistically significant. Bars show ± 1 SEM.

3.2.2. Correlations between confidence in details and confidence in the general memory

Our hypothesis was that the confidence and intensity scores that participants attributed to each autobiographical account and film plot, as measured by the AMQ and FPQ respectively, will correlate with the confidence scores on the respective individual details of each account. We focused on “New” details only because we thought that those would be most relevant – if participants are confident in newly added information even after the demand, then they should feel more confident about the overall memory, and these newly added details simply “slipped away” the first instance of recall. Confidence

scores in “New” details correlated with a higher score in “reliving” ($r(22) = 0.427, p = 0.042$) and “remembering the setting” ($r(22) = 0.446, p = 0.033$) for Happy Memories during the second session. That is, the more confident participants are in details mentioned only in the second session, the more vivid the entire happy memory is rated after the instruction. A similar trend was observed for sad memories, with higher scores on “New” statements being positively correlated with scores on “reliving” ($r(22) = 0.503, p = 0.014$), “hear” ($r(22) = 0.681, p < 0.001$), “spatial layout” ($r(22) = 0.601, p = 0.002$), “remember rather than know” ($r(22) = 0.745, p < 0.001$), “comes in words” ($r(22) = 0.538, p = 0.008$), “coherent story” ($r(22) = 0.641, p = 0.001$). This finding suggests that higher confidence in details of autobiographical memories sponsor a memory that is then rated as more vivid and is reported as more trustworthy.

3.3. Personality Characteristics and Autobiographical Retrieval

3.3.1. Rumination

We hypothesized that individuals who score high on rumination would have a significantly smaller increase in narrative output during the second session, as measured by both number of words and number of new statements. We found a significant negative correlation between rumination scores and difference in the number of words between the first and second session for both Happy Memories ($r(50) = -0.275, p = 0.050$) and Happy Film Plots ($r(50) = -0.330, p = 0.018$), but no significant correlation between rumination scores and difference in words between the first and the second session for Sad Memories and Sad Film Plots (Figure 5, A-D).



Figure 5. Correlations Between the Change in Number of Words from Session 1 to Session 2 and Ruminations Scores. Line of best fit is represented in each figure.

Note: A positive Δ corresponds to an increase in narrative output, as measured in number of words, between Session 1 and Session 2 accounts. Accordingly, a negative Δ corresponds to a decrease.

Corroborating these results, we found that higher ruminations scores correlated with lower scores on several questions of the AMQ: “Comes in Words” (Session 1: $r(51) = -0.372, p = 0.008$, Session 2: $r(51) = -0.332, p = 0.017$), “Travel Back in Time”

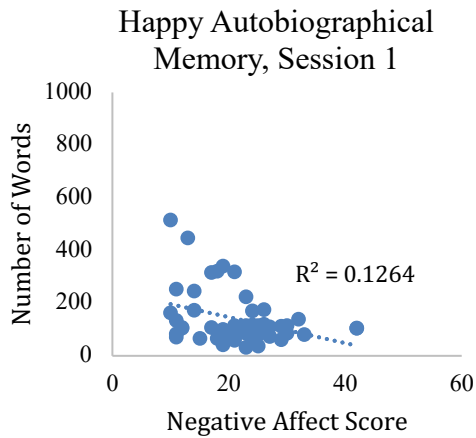
(Session 2 only: $r(51) = -0.323, p = 0.021$), “Story Coherence” (Session 2 only: $r(51) = -0.319, p = 0.023$), “Court of Law” (Session 2 only: $r(51) = -0.323, p = 0.021$), “Imaginary to Real” (Session 2 only: $r(51) = -0.384, p = 0.006$) for Happy Autobiographical Memories. Only one significant negative correlation was found between rumination scores and “Comes in Words” scores for Sad Memories (Session 2 only: $r(51) = -0.338, p = 0.015$). Similarly, significantly negative correlations were found between the corresponding question scores on the FPQ for Happy Film Plots for “Comes in Words” (Session 2 only: $r(51) = -0.315, p = 0.024$) and “Travel Back in Time” (Session 2 only: $r(51) = -0.316, p = 0.024$), but not for Sad Film Plots (all $ps > 0.05$). These results suggest that ruminators have more difficulties accessing memories of happy events than memories of sad events, and that they have a subjective awareness of this difficulty as well.

3.3.2. Affect

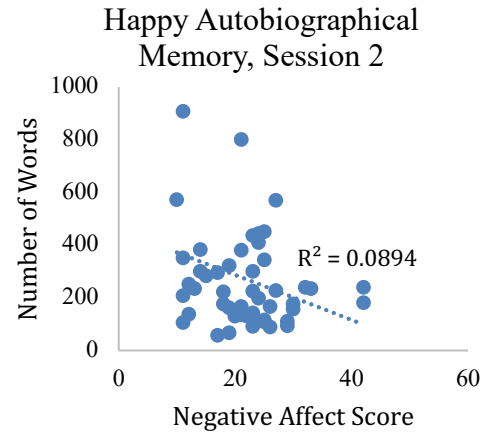
We conducted correlational analyses to test the hypothesis that Negative Affect scores will correlate negatively with narrative output, and that Positive Affect scores will correlate positively with narrative output. The Positive and Negative Affect Scale (PNAS) used measured participants’ mood over the past few weeks, and provided a numeric value for their inclination towards a positive affect or a negative affect. We found negative correlations between Negative Affect scores and number of words per account for both Happy and Sad Memories for both sessions (Happy Memory, Session 1: $r(50) = -0.356, p = 0.010$ and Session 2: $r(50) = -0.299, p = 0.033$; Sad memory, Session 1: $r(50) = -0.288, p = 0.040$ and Session 2: $r(50) = -0.280, p = 0.047$) (Figure 6, A-D). Negative affect did not correlate with narrative output for Sad Film Plots for either

session and Happy Film Plots for Session 1 (all $ps > 0.05$), but it did correlate negatively with narrative output for Happy Film Plots during the Session 2 ($r(50) = -0.331, p = 0.018$). These findings suggest that the higher participants scored on the negative affect scale, the less autobiographical information they provided for either one of the sessions.

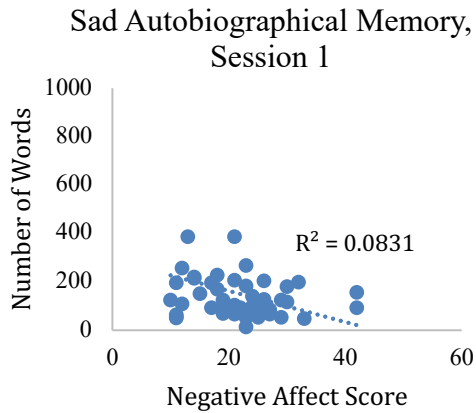
A)



B)



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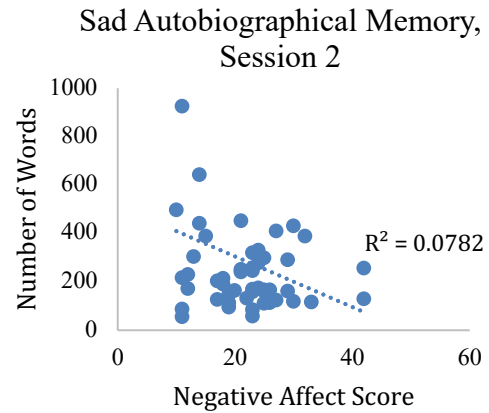


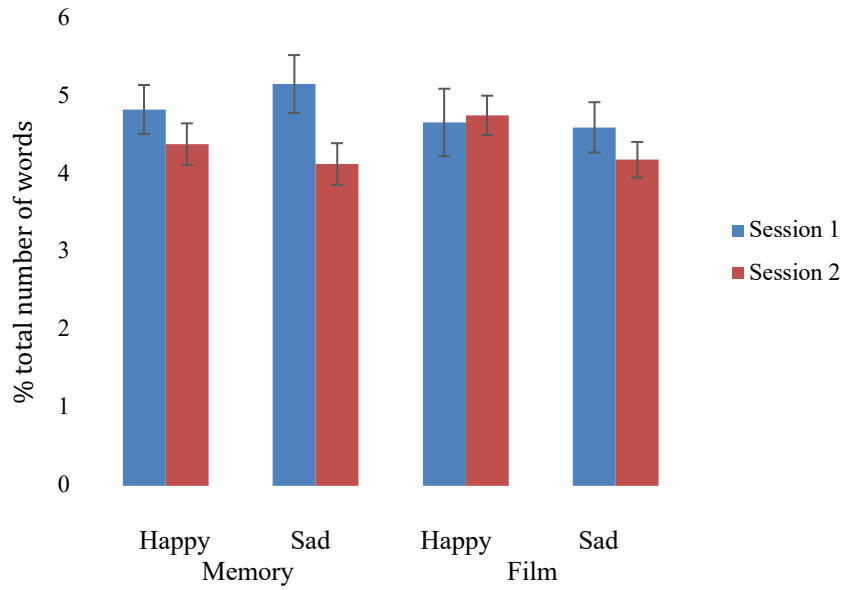
Figure 6. Correlations between the number of words for Session 1 and Session 2 and Negative Affect scores. Line of best fit is represented.

3.4. Linguistic analysis of Autobiographical and Film Plot accounts

3.4.1. Affective language

We used LIWC to determine the amount of affective language contained in each account collected. We then tested the hypothesis that autobiographical memory accounts contain more affective language than film plot accounts. However, in a 2 (Valence: Happy; Sad) x 2 (Memory Type: Autobiographical Memory; Movie Plot) x 2 (Session: Session 1; Session 2) within subjects factorial ANOVA there were no significant main effects of valence, $F(1, 50) = 0.373, p = 0.544$, and memory type, $F(1, 50) = 0.093, p = 0.762$, on the amount of affective language, but there was a significant effect of session, with Session 2 accounts containing significantly less affective language than Session 1 accounts $F(1,50) = 8.087, p = 0.006, \eta^2_p = 0.139$ (Session 1: $M = 4.661, SE = 0.212$; Session 2: $M = 4.366, SE = 0.186$). No significant interactions were found: Valence x Memory Type, $F(1,50) = 0.522, p = 0.473$; Session x Valence, $F(1,50) = 1.996, p = 0.164$; Session x Memory Type, $F(1,50) = 2.811, p = 0.100$; Session x Valence x Memory Type, $F(1,50) = 0.014, p = 0.907$. An observation of the mean percentage of affective words in Session 1 and Session 2 accounts of autobiographical memories led us to also conduct a t-test, which revealed that Session 2 accounts of autobiographical memories contain significantly more affective language than Session 1 accounts, $t(50) = 3.91, p < 0.001, d = 0.44$ (Session 1: $M = 4.99, SE = 0.25$; Session 2: $M = 4.26, SE = 0.225$). These results suggest that participants use less affective language in their autobiographical and film plot accounts during the second session, thus decreasing the amount of emotional content in the face of a request to emphasize detail. This effect remains accurate for autobiographical memories only (Figure 7, A-B).

A)



B)

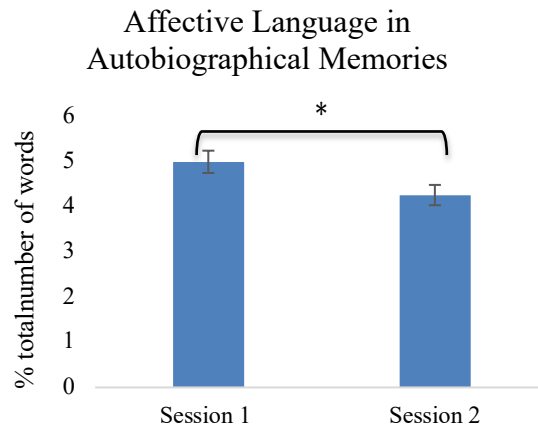
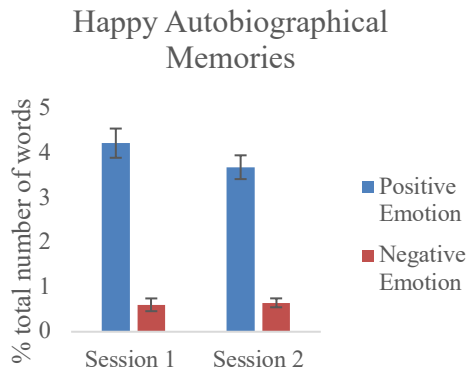


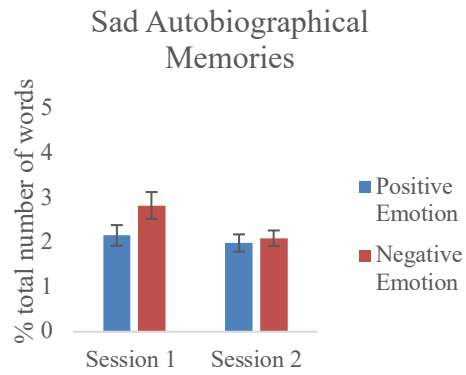
Figure 7. A) Affective Language in Session 1 and Session 2 Accounts. B) Session 1 Autobiographical Memory accounts contain significantly more affective language than Session 2 accounts. Bars show ± 1 SEM.

Happy memory accounts contained significantly more positive emotion words than sad memory accounts during both sessions, Session 1: $t(50) = 5.04, p < 0.001, d = 1.02$ (Happy Memories: $M = 4.23, SE = 0.33$; Sad Memories: $M = 2.16, SE = 0.23$), Session 2 : $t(50) = 6.164, p < 0.001, d = 0.96$ (Happy Memories: $M = 3.69, SE = 0.27$; Sad Memories: $M = 2.1; SE = 0.2$), and sad memory accounts contained significantly more negative emotion words than happy memory accounts during both sessions, Session 1: $t(50) = -6.847, p < 0.001, d = -1.32$ (Happy Memories: $M = 0.6, SE = 0.143$; Sad Memories: $M = 2.83, SE = 0.3$), Session 2: $t(50) = -6.806, p < 0.001, d = -.807$ (Happy Memories: $M = 0.68, SE = 0.1$; Sad Memories: $M = 1.99; SE = 0.18$). A similar finding was revealed for happy and sad film plot accounts. Happy film plots contained significantly more positive emotion words than sad film plot accounts during both sessions, Session 1: $t(50) = 2.53, p = 0.015, d = 0.45$ (Happy Film Plots: $M = 3.24, SE = 0.34$; Sad Film Plots: $M = 2.24, SE = 0.27$), and Session 2: $t(50) = 3.04, p = 0.004, d = 0.64$ (Happy Film Plots: $M = 2.93, SE = 0.24$; Sad Film Plots: $M = 1.98; SE = 0.18$). Sad film plot accounts contained significantly more negative emotion words than happy film plot accounts during Session 1: $t(50) = -3.00, p = 0.004, d = -0.62$ (Happy Film Plots: $M = 1.38, SE = 0.21$; Sad Film Plots: $M = 2.35, SE = 0.23$), but not during Session 2: $t = -1.2, p = 0.236$. Figure 8 presents a breakdown of the affective language used by participants in their accounts, and suggests that the task had the expected effect on the use of language.

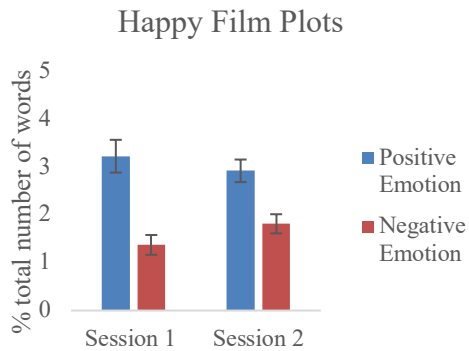
A)



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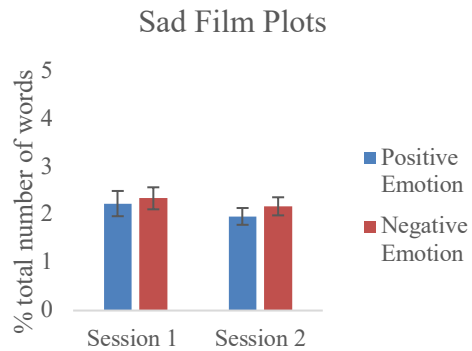


Figure 8. Positive and Negative Emotion words in Session 1 and Session 2 accounts for A) Happy Autobiographical Memories, B) Sad Autobiographical Memories, C) Happy Film Plots, D) Sad Film Plots. Happy autobiographical memories and happy film plots contained more positive emotion words than negative emotion words, while sad autobiographical memories and sad film plots contained more negative emotion words than positive emotion words. Bars show ± 1 SEM.

3.4.2. Cognitive language

We tested the hypothesis that autobiographical memories contain more cognitive language than film plot narratives. We conducted a 2 (Valence: Happy; Sad) x 2 (Memory Type: Autobiographical Memory; Film Plot) x 2 (Session: 1;2) within subjects factorial ANOVA, and found significant effects of memory type $F(1, 50) = 9.13, p = 0.004, \eta^2_p = 0.154$ (Autobiographical Memories: $M = 12.11, SE = 0.36$; Film Plots: $M = 10.99, SE = 0.29$) and valence $F(1, 50) = 16.22, p < 0.001, \eta^2_p = 0.245$ (Happy: $M = 10.85, SE = 0.29$; Sad: $M = 12.25, SE = 0.34$). No other significant effects were found (Session: $F(1,50) = 3.86, p = 0.055$, valence x memory type, $F(1,50) = 2.62, p = 0.112$; valence x session, $F(1,50) < 0.001, p = 0.986$; valence x memory type x session, $F(1,50) = 0.05, p = 0.820$.) These findings suggest that participants use more cognitive language when they talk about memories that have personal significance than when they talk about film plots, and that sad memories of either type contain more cognitive processing than happy memories (Figure 9).

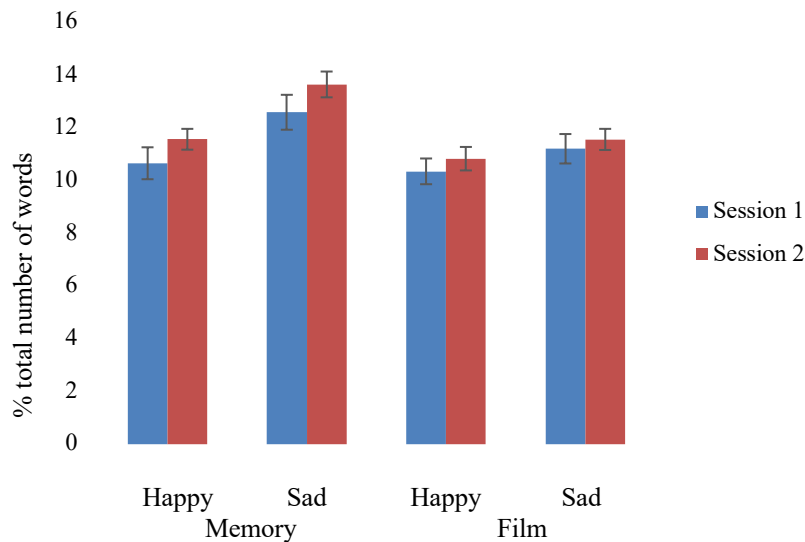


Figure 9. Cognitive language in Session 1 and Session 2 accounts. Bars show ± 1 SEM.

4. Discussion

The present study investigated changes in the quantity (number of facts) and quality (confidence ratings) of autobiographical memory accounts following an instruction to maximize both. In addition, we studied the effect of personality characteristics on these two variables, and we looked at how affective and cognitive processing manifest in the language participants used. We found that participants provided longer and more detailed accounts of personal events following an instruction to do so, and that they were more confident in details repeated across sessions than in details they only mentioned when first interviewed. Personality characteristics influenced the quantity of information retrieved: high ruminators showed a smaller increase in the information provided about happy memories, but not sad memories, than low ruminators in response to the added pressure; similarly, those who scored high in negative affect provided shorter accounts of their autobiographical memories than those who scored low. When analyzing language, we found that the amount of emotional content in participants' accounts decreased in the face of a request to emphasize detail, and that autobiographical memory accounts contain more cognitive language than film plot accounts.

Consistent with our hypothesis, participants provided longer and more detailed accounts of their autobiographical memories when instructed to do so. This finding is consistent with previous research showing that participants respond to demands from an interviewer (Loftus & Ketcham, 1994; Loftus & Bernstein, 2005; Pasupathi, Stallworth, & Murdoch, 1998), and serves as a manipulation check for the pressure command we proposed. We also found a difference in length between autobiographical memories and film plot accounts, with film plot accounts being longer than autobiographical memory

accounts. This finding might suggest that describing an autobiographical event engages different mechanisms than describing a film plot does, and that the intricate link between memory and the self makes describing personal narratives intrinsically different from describing impersonal narratives. This finding is interesting in the light of several previous studies that used videotaped events – primarily of emotional, negative events, such as robberies and crime scenes – to test recall (Turtle & Yuille, 1994; Fisher & Cutler, 1995; Brock, Fisher, & Cutler, 1999; Smeets, Candel, & Merckelbach, 2004; Odinot & Wolters, 2006; Gilbert & Fisher, 2006; Krix et al., 2015). It may be that the kind of memory tested in these studies is different from authentic memories of negative or traumatic events that participants might have experienced. In that case, the conclusions about memory confidence and accuracy made by these studies are less generalizable to real life scenarios than previously thought.

Participants had the freedom to think and talk about the memories they recalled for this study in the period between sessions. Therefore, exposure to post-event information could introduce details not previously recalled, therefore increasing the amount of information available for recall at the next solicitation (Benjamin & Ross, 2011). However, since some details were only remembered during the first session and not during the second, differences in retrieval may be mainly attributed to varying retrieval conditions (Tulving & Thomson, 1973). Future studies could control for any effects of repetition by having another group of participants who is asked to relay happy and sad events and happy and sad film plots, but who is not pressured to maximize the quantity of detail during the second session. That way, we could observe whether

repetition alone can increase the length and amount of details present in narratives as much as it did in our study, and thus isolate the effects of the pressure command.

The idea that participants may mentally rewrite the story each time they recall it led us to hypothesize that they will be less confident in details added under the pressure to provide as much information as possible than in details mentioned in a no-pressure condition. Our finding was that participants were significantly more confident in details repeated during both sessions than in details mentioned only in one or the other, and is consistent with previous conclusions in the field (Shaw & McClure, 1996; Odinot & Wolters, 2006; Stanley & Benjamin, 2016). It is possible that less confident details are more likely to be forgotten after the first recall, and more likely to be generated following the instruction to provide more information, while repeated details are held with more confidence during both accounts. Our second finding concerning participants' subjective confidence was that higher confidence scores in details added in the pressure condition corresponded to the entire memory being rated as more vivid and trustworthy. Incorporating our findings into the model put forth by Shaw & McClure (1996), which suggests that repeated recounting increases confidence in the overall memory, we propose that repetition may increase confidence in the memory episode by increasing confidence in the distinct details that are repeated. In other words, the subjective awareness of having access to information that can be retrieved repeatedly may lead participants to better trust their ability to remember.

This finding is relevant because there is a strong belief within the legal system that inconsistencies are linked to unreliability (Berman & Cutler, 1996; Kerper, 1997; Brewer et al., 1999), and as a result inconsistent accounts are often dismissed (Stanley &

Benjamin, 2016). These concerns are partially justified, as it was found that information not reported initially but only at a later point was less accurate than information that was reported consistently across accounts (Stanley & Benjamin, 2016). Stanley and Benjamin (2016) propose the possibility that people are more likely to report details that they are confident about initially, and only at later occasions or under additional pressure also mention details that they are less certain about (Stanley & Benjamin, 2016). Their reasoning fits well with Shaw and McClure's idea of retrieval fluency, which says that subjective ease of retrieval can lead participants to feel more confident about the information retrieved, and therefore to give higher confidence judgments (Shaw & McClure, 1996).

Koriat and Goldsmith (1994) distinguish between free and forced reports, and warn about the difference in accuracy that may exist between the two (Koriat & Goldsmith, 1994). When asked to report freely, like we did for the first session of our study, participants may unconsciously screen for accuracy and report information they are confident in. On the contrary, a forced report – which Koriat and Goldsmith define as one in which answering all items is required, and which is similar to our command to include “all the details remembered” – removes accuracy screening, therefore allowing details that would not be mentioned freely to make it into autobiographical accounts (Koriat & Goldsmith, 1994). Our findings fit this model well, and may suggest that autobiographical information that is repeated across different occasions is subjectively perceived as being of a higher quality by both the person holding it and by the ones receiving it.

Based on their personality, some people were more likely to have thought about the events described in the interval between session. Accordingly, we found that the more rumination tendencies participants showed, the less they increased the amount of information added during the second session for their happy memories, but not for their sad memories. These findings are consistent with previous research about rumination, which shows that rumination is linked to negative thinking patterns (Sansone & Sansone, 2012). In the context of our study, a focus on negative events would logically decrease the ability to rehearse positive events, and therefore less information about happy memories would be available for recall. Studies conducted with older adults suggest that low rumination tendencies may facilitate the recall of positive memories (Ricarte et al., 2016), while younger adults, who tend to remember negative events better, may do so because of higher rumination tendencies (Kennedy, Mather, & Carstensen, 2004). Since all participants in our study were young adults, with ages ranging between 18 and 28, our findings support the idea that young age favors the remembering of negative memories.

Not only is rumination associated with the quantity of information retrieved, but it is also associated with its quality, as ruminators recall less specific autobiographical memories than non-ruminators (Sumner, 2012). In the context of eyewitness testimony, the finding that rumination is associated with the quantity and quality of information retrieved is relevant, as many of those who come forward to testify have been victims of trauma and may be affected by posttraumatic stress disorder or depression, two conditions often linked to rumination (Williams, 1996; Michael et al., 2006). Previous research has shown that positive memories are remembered more holistically than negative memories. The increase in the quantity of information provided by ruminant

participants about their sad memories may therefore be directly related to the increase in detail. If that is so, rumination may be the link between participant's reaction to the pressure command, and influence both the quantity and the quality of information retrieved directly.

Besides rumination tendencies, participants' mood also impacted the length of the accounts retrieved. While we believed that individuals who scored high in negative affect would provide more detailed and confident accounts of their sad memories, we did not expect to find an effect of negative mood on the quality and quantity of happy memories. Instead, we found that those who scored high in negative affect provided shorter accounts for both their sad and their happy memories. Therefore, we were not able to replicate the mood congruency effect (Matt et al., 1992; Thorley et al., 2016). Our finding supports the idea that a negative mood may reduce recall of any autobiographical information regardless of valence (Ellis et al., 1997).

The effect of the manipulation and participants' personality characteristics was also observed in the language used in accounts. We found that participants used less affective language in their autobiographical and film plot accounts during the second session, thus decreasing the amount of emotional content in the face of a request to emphasize detail. To our knowledge, no previous research has addressed the effects of a command to prioritize both quantity and quality of information on the emotional content of autobiographical memories. Since the use of affective words gives insight into the emotional intensity of the memory (Rubin et al., 2008), it follows that accounts given under the pressure condition were less emotionally intense, although they were remembered in more detail. The exact implications of this finding warrant further

research, because events queried during testimony are emotional in nature, and pressure to perform is inherent to sworn testimony.

Participants used more cognitive language in their autobiographical accounts than in their film plots accounts. People use cognitive words in their accounts when they are actively trying to make sense or organize an event (Boals & Klein, 2005). In a study investigating the use of cognitive words, participants who had recently broken up with their partners were asked to describe their situations pre-break, during the break-up, and after the break-up. The results showed that more cognitive words were used in the break up and post-break-up narratives than in the pre-break-up narratives, suggesting that participants were actively trying to make sense of the negative event that happened to them (Boals & Klein, 2005). Similarly, participants in our study might have been actively organizing and trying to understand the autobiographical events they were relaying as they were relaying them, and this process manifested itself in the descriptive language they used.

Our second finding regarding the use of cognitive language was that sad accounts contained significantly more cognitive language than happy accounts. One possible explanation is that sad events require more cognitive processing for organization and meaning-making purposes, particularly for self-growth purposes (Ullrich & Lutgendorf, 2002). Studies conducted by Pennebaker and colleagues repeatedly found that the use of cognitive language in narrative accounts seems to be associated with positive outcomes (Pennebaker, 1993; Pennebaker & Francis, 1996; Pennebaker, Mayne, & Francis, 1997), finding which was also replicated with highly traumatized populations of HIV + adults (Rivkin et al., 2006) and sexual assault victims (Alvarez-Conrad, Zoellner, & Foa, 2001).

A strength of our experimental paradigm was that we were able to assess both the quality and the quantity of the memories retrieved, unlike other experiments that only assess one or the other. Koriat and Goldsmith (1994) discuss the confusion that is often made between the two, and distinguish between input bound and output bound assessments of memory (Koriat and Goldsmith, 1994). Memory reports, as those collected in the present study, are output bound – that is, we received the output (the report) and are asking questions about the memory (the input), specifically questions having to do with the percentage of items remembered that are correct. Stanley and Benjamin (2016) call this the “nothing but the truth” part of the oath, and identify it as the main avenue for studying eyewitness testimony. In contrast, input bound assessments start with the input – such as a list of words to learn or a short film to watch – and quantify the amount of information retrieved, thus corresponding with the “whole truth” part of the oath (Stanley & Benjamin, 2016). By collecting narrative accounts, we had access to objective quantifying of information; by requesting participants to provide confidence judgments on distinct details of their memories, we also collected subjective reports of confidence.

A limitation of our study involved the variation in the amount of time between the end of the second session and when each participant received his or her confidence judgment questionnaire. While we initially tried to send questionnaires within a week from the second interview, some participants received their questionnaires several weeks after. This could have biased participants’ confidence judgments, since participants who received their questionnaires after a longer period of time may have forgotten more and therefore be less confident in what they mentioned or failed to mention. Future studies

could address this limitation by distributing the questionnaires after a fixed amount of time.

Future studies could also attempt to replicate our findings using manual coding conducted by several individuals according to a pre-specified set of rules. The software we used in our analysis, although a widely employed and efficient measure of linguistic content, is limited. LIWC counts words regardless of context and narrative structure, and therefore can easily miss on sarcasm, humor, or any cultural nuances used by speakers or narrators. For example, if someone says “I was not pleased”, LIWC would count the word “pleased” as a positive emotion word, although the speaker used it to communicate being upset (Tausczik & Pennebaker, 2010). Another example would be someone saying “It was the dark before the dawn” to mean that things got better; LIWC would not capture the positive emotion expressed with the usage of the expression. Another way to better capture context would be using n-grams, an analysis method in which words are grouped and which can better capture context (Oberlander & Gill, 2006).

The word “truth” is relative when it comes to personal memories, since there is no way to verify that an account given by an individual is accurate or not (Bernstein & Loftus, 2009). Similarly, testimonies in today’s courts of law are intrinsically vulnerable to fundamental memory editing processes. Since they are often taken as crucial evidence in criminal cases, they directly affect the judges’ ability to make a correct decision about punishment (Buratti, Allwood, & Johansson, 2014). If an eyewitness presents false information with the conviction of it being the true, courses of lives can be steered. By investigating the relationship between memory confidence and response to demand characteristics under the form of pressure to provide as much information as possible, this

study provides a step forward into ensuring that the current misunderstandings are corrected and that the potential harm that false testimony could cause to individuals and society is diminished.

5. Conclusion

We found that participants retrieved more information when pressured to do so, and that they were more confident in details they repeated across sessions than in details they only mentioned once. Furthermore, we found that rumination and negative mood affected the quantity of information retrieved, but not the quality. Ruminators increased the length of their reports of happy autobiographical memories significantly less than low-ruminators, and those scoring high in negative affect provided shorter autobiographical accounts. Last but not least, participants used less affective language under the pressure to prioritize both the quantity and quality of information, and more cognitive language in their autobiographical memory accounts than in their film plot accounts. This is the only study, to our knowledge, to study the direct effects of the pressure to provide “the whole truth and nothing but the truth” on the quantity and quality of information retrieved as well as on the language used in narrative accounts of events, while also looking at the effects of personality characteristics on these variables. These findings may have implications for eyewitness testimony, and could inform better interviewing strategies.

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Appendix A. UTREC Approval



University Teaching and Research Ethics Committee

27 November 2015

Dear Irina

Thank you for submitting your ethical application which was considered at the School of Psychology & Neuroscience Ethics Committee meeting on 17th November 2015; the following documents have been reviewed:

1. Ethical Application Form
2. Protocol
3. Advertisements
4. Participant Information Sheet
5. Consent Form
6. Debriefing Form
7. Questionnaires
8. Data Management Plan

The School of Psychology & Neuroscience Ethics Committee has been delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has granted this application ethical approval. The particulars relating to the approved project are as follows -

Approval Code:	PS11836	Approved on:	23/11/2015	Approval Expiry:	23/11/2018
Project Title:	Memories for personal events and movie plots				
Researcher:	Irina Maria Lucaciu				
Supervisor:	Dr Akira O'Connor				

Approval is awarded for three years. Projects which have not commenced within two years of approval must be re-submitted for review by your School Ethics Committee. If you are unable to complete your research within the 3 three year approval period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

If you make any changes to the project outlined in your approved ethical application form, you should inform your supervisor and seek advice on the ethical implications of those changes from the School Ethics Convener who may advise you to complete and submit an ethical amendment form for review.

Any adverse incident which occurs during the course of conducting your research must be reported immediately to the School Ethics Committee who will advise you on the appropriate action to be taken.

Approval is given on the understanding that you conduct your research as outlined in your application and in compliance with UTREC Guidelines and Policies (<http://www.st-andrews.ac.uk/utrec/guidelinespolicies/>). You are also advised to ensure that you procure and handle your research data within the provisions of the Data Provision Act 1998 and in accordance with any conditions of funding incumbent upon you.

Yours sincerely

Convener of the School Ethics Committee

cc Dr Akira O'Connor (Supervisor)

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Appendix B. TIPI (Ten-Item Personality Inventory)

TIPI (Ten-Item Personality Inventory)

This scale is available at gosling.psy.utexas.edu and its author has authorized its use for any purpose.

Instructions

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with the statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree

1. _____ Extraverted, enthusiastic
2. _____ Critical, quarrelsome
3. _____ Dependable, self-disciplined
4. _____ Anxious, easily upset
5. _____ Open to new experiences, complex
6. _____ Reserved, quiet
7. _____ Sympathetic, warm
8. _____ Disorganized, careless
9. _____ Calm, emotionally stable
10. _____ Conventional, uncreative

(Gosling, Rentfrow, and Swann Jr., 2003)

Appendix C. Almost Perfect Scale – Revised

Almost Perfect Scale-Revised

This scale is freely available at kennethwang.com/apsr.

Instructions

The following items are designed to measure attitudes people have toward themselves, their performance, and toward others. There are no right or wrong answers. Please respond to all of the items. Use your first impression and do not spend too much time on individual items in responding.

Respond to each of the items using the scale below to describe your degree of agreement with each item. Fill in the appropriate number circle on the computer answer sheet that is provided.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree

1. I have high standards for my performance at work or at school.
2. I am an orderly person.
3. I often feel frustrated because I can't meet my goals.
4. Neatness is important to me.
5. If you don't expect much out of yourself, you will never succeed.
6. My best just never seems to be good enough for me.
7. I think things should be put away in their place
8. I have high expectations for myself.
9. I rarely live up to my high standards.
10. I like to always be organized and disciplined.
11. Doing my best never seems to be enough.
12. I set very high standards for myself.
13. I am never satisfied with my accomplishments.
14. I expect the best from myself.
15. I often worry about not measuring up to my own expectations.
16. My performance rarely measures up to my standards.
17. I am not satisfied even when I know I have done my best.
18. I try to do my best at everything I do.
19. I am seldom able to meet my own high standards of performance.
20. I am hardly ever satisfied with my performance.
21. I hardly ever feel that what I've done is good enough.
22. I have a strong need to strive for excellence.
23. I often feel disappointment after completing a task because I know I could have done better.

(Slaney, Mobley, Trippi, Ashby, & Johnson, 1996)

Appendix D. Rumination Scale

Rumination Scale

A copy of this scale has been distributed by Dr Susan Nolen-Hoeksema and is available for download at yale.edu/snhlab.

Instructions

People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate what you generally do, not what you think you should do.

1 almost never 2 sometimes 3 often 4 almost always

1. think about how alone you feel
2. think "I won't be able to do my job if I don't snap out of this"
3. think about your feelings of fatigue and achiness
4. think about how hard it is to concentrate
5. think "What am I doing to deserve this?"
6. think about how passive and unmotivated you feel.
7. analyze recent events to try to understand why you are depressed
8. think about how you don't seem to feel anything anymore
9. think "Why can't I get going?"
10. think "Why do I always react this way?"
11. go away by yourself and think about why you feel this way
12. write down what you are thinking about and analyze it
13. think about a recent situation, wishing it had gone better
14. think "I won't be able to concentrate if I keep feeling this way."
15. think "Why do I have problems other people don't have?"
16. think "Why can't I handle things better?"
17. think about how sad you feel.
18. think about all your shortcomings, failings, faults, mistakes
19. think about how you don't feel up to doing anything
20. analyze your personality to try to understand why you are depressed
21. go someplace alone to think about your feelings
22. think about how angry you are with yourself

(Trenor, Gonzalez, and Nolen-Hoeksema, 2003)

Appendix E. BIS/BAS (Behavioral Inhibition/Behavioral Approach Systems) Scales

BIS/BAS (Behavioral Inhibition/Behavioral Approach System) Scales

The BIS/BAS Scales and scoring are available at psy.miami.edu/faculty/ccarver.

Instructions

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to all the items; do not leave any blank. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

- 1 = very true for me
- 2 = somewhat true for me
- 3 = somewhat false for me
- 4 = very false for me

1. A person's family is the most important thing in life.
2. Even if something bad is about to happen to me, I rarely experience fear or nervousness.
3. I go out of my way to get things I want.
4. When I'm doing well at something I love to keep at it.
5. I'm always willing to try something new if I think it will be fun.
6. How I dress is important to me.
7. When I get something I want, I feel excited and energized.
8. Criticism or scolding hurts me quite a bit.
9. When I want something I usually go all-out to get it.
10. I will often do things for no other reason than that they might be fun.
11. It's hard for me to find the time to do things such as get a haircut.
12. If I see a chance to get something I want I move on it right away.
13. I feel pretty worried or upset when I think or know somebody is angry at me.
14. When I see an opportunity for something I like I get excited right away.
15. I often act on the spur of the moment.
16. If I think something unpleasant is going to happen I usually get pretty "worked up."
17. I often wonder why people act the way they do.
18. When good things happen to me, it affects me strongly.
19. I feel worried when I think I have done poorly at something important.
20. I crave excitement and new sensations.
21. When I go after something I use a "no holds barred" approach.
22. I have very few fears compared to my friends.
23. It would excite me to win a contest.
24. I worry about making mistakes.

(Carver and White, 1994)

Appendix F. Positive and Negative Affect Schedule

PANAS
Positive and Negative Affect Schedule

Instructions

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 during the past few weeks. 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
_____	Interested	_____	Irritable	
_____	Distressed	_____	Alert	
_____	Excited	_____	Ashamed	
_____	Upset	_____	Inspired	
_____	Strong	_____	Nervous	
_____	Guilty	_____	Determined	
_____	Scared	_____	Attentive	
_____	Hostile	_____	Jittery	
_____	Enthusiastic	_____	Active	
_____	Proud	_____	Afraid	

(Watson, Clark, and Tellegen, 1988)

3. 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.

Scale: 1=not at all; 3=in some details; 5=in some main points; 7=completely

4. 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 a day?

Scale: 1=once; 2=merging; 3=extended

5. Please date the memory (day/month/year) as accurately as you can. Please fill in a month, day, and year even if you must estimate. If the memory extended over a period of time, report the approximate middle of the period.
6. To what extent is your memory of the event distorted by your beliefs, motives, and expectations rather than an accurate reflection of the event as a neutral observer would report it?

Scale: 1=100% distorted; 7=100% accurate

(Rubin, Schrauf, and Greenberg, 2003)

Appendix I. Example of a pair of accounts of a sad autobiographical memory and the associated confidence judgement questionnaire that was sent to the participant.

P030 Sad memory, Session 1

So, one day, all of the family in the living room and the two babies crying and mama and dad, and stepdad stressed, and so stepdad asked my big brother to make juice and big brother said no and went upstairs, they asked me and then I begin to move and then stepdad explodes and start shouting and swearing and everything, and so yeah. That's it.

P030 Sad memory, Session 2

Ok, so it's dark outside, evening, all the family is sitting in the living room, two sofas and mom and dad sitting on one sofa, two young children crying, and um, my big brother Tom is there and I am there on the other sofa I think. And yeah they're crying, and crying. The TV may be on, I can't remember. Maybe, maybe not. Anyway, so mom asks Tom, the big brother, to make orange juice for the children and Tom kind of refuses and eventually leaves the room and walks up the stairs to his own bedroom. And so, I think mom asks me and then me, probably because Tom didn't do it, I kind of say no as well. And then the stepdad, who'd been quiet up to this point, suddenly explodes in rage and he's obviously very distressed, very stressed, the baby is crying, working hard, so he explodes, starts swearing, and he starts to approach me and I obviously back off and back off, and he approaches me and starts swearing. Man, make this juice, swearing and shouting, and I backed off all the way in to the kitchen and I'm crying and he's swearing

and then eventually he leaves the kitchen, goes up to my big brother's room and I think that's the memory.

Do you want to say anything else?

No.

1. The family was in the living room.
2. It was dark outside.
3. Mom and dad were sitting on a sofa.
4. The two young children were crying.
5. My big brother Tom was there.
6. I was on the other sofa.
7. The TV was on.
8. Mom asked Tom to make orange juice for the children.
9. Tom refused.
10. Tom leaved the room.
11. Tom went to his bedroom.
12. Mom asked me to make juice.
13. I also said no.
14. My stepdad was quiet to that point.
15. He suddenly exploded.
16. He started shouting.
17. He started swearing.
18. I backed all the way in the kitchen.
19. I was crying.
20. He eventually left the kitchen.

Old: none

New: 2,3,6,7,8,9,10,11,12,13,14,18,19,20

Both: 1,4,5,15,16,17

Inconsistent: 8 (not mom, but dad)