Involuntary and Voluntary Mental Time Travel in High and Low Worriers

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*This is an Author's Accepted Manuscript of an article published in Memory, 19:6, 625-640,
available online at: <http://www.tandfonline.com/10.1080/09658211.2011.595722>*

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Abstract

Worry as a trait is an individual's general tendency to become worried. Mental time travel (MTT) is the ability to mentally project oneself into one's personal past or future, in terms of memories of personal past events or projections of possible events in the personal future. MTT can be voluntarily initiated or occur involuntarily. The current exploratory study investigated involuntary and voluntary MTT in the context of trait worry, thereby bringing together studies on worry and MTT. High (N=20) and low (N=16) worriers recorded involuntary and voluntary autobiographical memories and future projections using a structured diary method. We predicted that MTT in high worriers would show signs of cognitive avoidance, such as reduced emotional intensity, more observer perspective, less visual imagery, or coming up with overgeneral or less self-relevant events. We found only partial support for our hypotheses in that high worriers rated personal memories and future projections lower on measures of self-relevance, than did low worriers.

Keywords: Autobiographical memory, involuntary memories, mental time travel, cognitive avoidance, worry.

Involuntary and Voluntary Mental Time Travel in High and Low Worriers

Worry, as a state, has been defined as a chain of thoughts and images, primarily anticipatory in nature and focused mostly on possibilities in the future and the threat they may pose (Matthews & Funke, 2006). Worry as a trait is an individual's general tendency to become worried. When the tendency to become worried is high and perceived as uncontrollable the individual may qualify for a diagnosis of Generalized Anxiety Disorder (GAD; Meyer, Miller, Metzger & Borkovec, 1990; APA, 2000).

One of the most influential theories on worry is the Cognitive Avoidance Theory (Borkovec, Robinson, Pruzinsky & DePree, 1983). According to the theory, worry is a form of cognitive avoidance that functions to dampen the experience of anxious arousal and associated images (Sibrava & Borkovec, 2006). In this way worry is seen as being similar to other types of avoidance behaviour (such as avoiding confrontation with snakes if one is fearful of snakes), in that it prevents the full activation of the fear network, thereby preventing emotional processing from taking place in the fear network and preventing extinction of the person's fear. In this way, worry functions to dampen anxiety in the short term, but maintains it in the long term as it inhibits emotional processing and maintains anxiety-producing cognitions (Borkovec, Alcaine & Behar, 2004). An extension of the theory is the Reduced Concreteness Theory of Worry (Stöber, 1998), which states that the linguistic abstract nature of worry leads to reduced imagery, as abstract thoughts evoke less imagery and less physiological and emotional responses than thoughts of more concrete content. Thus, according to these two theories, it is this abstract, verbal nature of worry that functions as avoidance (Sibrava & Borkovec, 2006). In support of this, research indicates that when shifting from a relaxed state to worrying, thought content becomes proportionately more verbal than imagery based (Borkovec & Inz, 1990; Freeston, Dugas & Ladouceur, 1996) and

patients with GAD provide less concrete descriptions of their major worries compared to controls (Stöber & Borkovec, 2002).

Furthermore, research indicates that people with a pathological tendency to worry (i.e., high worriers), have a general tendency to avoid anxiety and emotion. Indeed, high worriers claim that one of the reasons they worry is to distract themselves from more upsetting topics (Borkovec & Roemer, 1995). There is also experimental evidence showing that high worriers have a tendency to avoid worrisome imagery (e.g., Laguna, Ham, Hope & Bell, 2004). Finally, the tendency to worry (i.e., trait worry) correlates moderately with thought suppression (e.g., Pallesen, Nordhus, Carlstedt, Thayer & Johnsen, 2006) and experiential avoidance (e.g., Roemer, Salters, Raffa & Orsillo, 2005; Salters-Pedneault, Tull & Roemer, 2004), in that the more one tends to worry the more likely one is to engage in thought suppression and experiential avoidance.

Here we examine if high worriers have a similar tendency to engage in avoidance of emotional experiencing when they recollect (and relive) events from their personal past and imagine (and prelive) events from their personal future – an ability termed Mental Time Travel (Wheeler, Stuss & Tulving, 1997).

Mental Time Travel (MTT) is considered to be the hallmark of episodic memory (Tulving, 2002; Wheeler et al., 1997). An emerging view in the literature is that autobiographical memory may have evolved primarily because it enables us to envision our future (e.g., Schacter, Addis & Buckner, 2007; Schacter & Addis, 2007). This view has been supported by both neuroimaging and behavioural studies showing that remembering past events and imagining future events is largely based on the same neural networks (e.g., Addis, Wong & Schacter, 2007; Botzung, Dankova & Manning, 2008; Okuda et al., 2003; Szpunar, Watson & McDermott, 2007), is affected in similar ways in response to a variety of

experimental manipulations (e.g., Larsen, 1998; d'Argembeau & Van der Linden, 2004; Addis, Wong & Schacter, 2008; Berntsen & Jacobsen, 2008) and shows similar deficits in mental disorders such as depression and schizophrenia (Williams et al., 1996; D'Argembeau, Raffard & van der Linden, 2008). However, important differences have also been found between the two. For instance, it has been found that future projections generally are more idyllic than autobiographical memories, and are rated higher on measures of self-relevance and perspective, whereas autobiographical memories are rated higher than future projections on measures of sensory qualities (see Berntsen & Bohn, 2010 for a review).

MTT can be either voluntarily initiated or occur spontaneously (Berntsen & Jacobsen, 2008). When voluntarily initiated, an individual consciously acts to remember an event from his or her past, or consciously imagines him- or herself in a possible future scenario, whereas when involuntary, the memory or future projection spontaneously 'pops up' in the individual's consciousness. Studies comparing voluntary and involuntary autobiographical memories have found that involuntary memories more frequently refer to specific episodes, are considered as less relevant to life story and identity, and come with more emotional impact as compared with their voluntary counterparts (Berntsen, 2009, for a review). These differences most likely reflect different retrieval mechanisms – i.e., an associative retrieval versus a controlled, top-down search. However, voluntary and involuntary MTT is assumed to reflect the operations of the same underlying memory system, which fits with findings showing that high versus low levels of PTSD exert similar effects on the characteristics of involuntary versus voluntary memories (Rubin, Boals & Berntsen, 2008; see Berntsen, 2009, for a review).

Applying the cognitive avoidance theory of worry to MTT, we can expect high worriers to show attempts at reducing (avoiding) the emotional intensity of their memories

and future projections, compared to low worriers. Following the autobiographical memory literature, such avoidance attempts can involve strategies in terms of (1) increased observer perspective, (2) overgeneral memories, (3) reduced imagery and reliving and (4) reporting memories that are less central to life story and identity (see Figure 1).

Observer Perspective and Overgeneral Memories

A number of studies examining autobiographical memory in the context of emotional disorders have focused on observer perspective and overgeneral memory. In disorders such as social phobia, PTSD and depression, autobiographical memories are often experienced from an observer perspective, seeing oneself from the outside as opposed to the original point of view (field perspective) (e.g., D'Argembeau, van der Linden, d'Acremont & Mayers, 2006; Coles, Turk, Heimberg & Fresco, 2001; Wells, Clark & Ahmad, 1998; Kenny et al., 2009; Kenny & Bryant, 2007; Berntsen, Willert & Rubin, 2003; Cooper, Yuile & Kennedy, 2002; Kuyken & Howell, 2006; Williams & Moulds, 2007). Furthermore, depressed, suicidal patients, dysphoric non-patients, and in some instances trauma survivors, have been found to show difficulties with retrieving memories of specific events, and instead recall summarized descriptions of events, termed overgeneral memories (see Williams et al., 2007 for review).

In the context of emotional disorders, both observer perspective and overgeneral memories have been hypothesized to be, at least partly, due to cognitive avoidance. In terms of perspective, this avoidance account agrees with findings that observer perspective is associated with less emotionality (e.g., Nigro & Neisser, 1983, see Berntsen & Rubin, 2006 for review) and that a change from field to observer perspective leads to a decrease in experiential ratings (e.g., Williams & Moulds, 2008; Berntsen & Rubin, 2006; Robinson & Swanson, 1993). Thus, adopting an observer perspective may be a way of avoiding emotion

(e.g., McIsaak & Eich, 2002, 2004). In accordance with this, Kenny and Bryant (2007) found that avoidant trauma survivors were more likely to remember their trauma from an observer perspective than trauma survivors with lower levels of avoidance. Berntsen, Willert and Rubin (2003) found similar results in a student sample. Similarly, McIsaak and Eich (2004) found that patients with PTSD, who recalled their trauma from an observer perspective, reported less anxiety related to their trauma memories than individuals, who recalled their trauma from a field perspective.

In the case of overgeneral memories, the functional avoidance account (e.g., Williams, 2006) assumes that recall of specific autobiographical memories relies on a hierarchical search, starting with a search description at the more abstract and general levels, and then proceeding the search until a specific memory matching the search description has been generated (see Conway & Pleydell-Pearce, 2000 for a more detailed description). This view assumes that the recollection of the more abstract and general levels may produce less affect than the recollection of specific autobiographical memories, and therefore the memory search stops at the general level in individuals who have a tendency to avoid emotion, as previous recollection of specific events may have been experienced as punishing in the past. This contingency then becomes the basis for passive avoidance of specific autobiographical memories.

Rumination (i.e., repetitive negative thinking about the past, Thomsen, 2006) may be one way avoidance of affect could be achieved through observer memories and overgeneral memories. Use of observer perspective has been found to be associated with the tendency to ruminate (Williams & Moulds, 2007), and studies on overgeneral memories generally find that increased rumination is associated with recalling more general events (e.g., Barnard, Watkins & Ramponi, 2006; Raes et al., 2005, 2006; Schönfeld & Ehlers, 2006; Watkins &

Teasdale, 2001; Watkins, Teasdale & Williams, 2000). Worry and rumination tend to co-occur in the same individual and it has been suggested they share the same processes but involve different content. Worry and rumination show, for instance, similar proportions of verbal thought versus imagery (for review see Watkins, Moulds & Mackintosh, 2005). Indeed, in explaining how rumination may function as avoidance, Williams and Moulds (2008) draw on the Reduced Concreteness Theory of Worry. They propose that the verbal, abstract nature of rumination may keep memory search at the higher, general level in the memory hierarchy, resulting in overgeneral memories. Likewise, the verbal, abstract nature of rumination could lead to observer memories by preventing the encoding of the holistic emotional features associated with an event, resulting in retrieval in the form of an observer memory (Williams & Moulds, 2008).

In light of proposed avoidance functions of overgeneral and observer memories mentioned earlier, as well as proposed avoidance function of rumination during MTT, high worriers might report more observer like memories and future projections than low worriers, as well as more general events. However, as studies generally do not find evidence for overgeneral memories in the anxiety disorders, other than PTSD, it is also likely that we will not find any differences between high and low worriers in terms of the specificity of the events (see Harvey, Watkins, Mansell & Shafran, 2004 for review).

Sensory imagery and Reliving of Autobiographical Memories

The degree of emotion experienced during MTT has also been found to be related to the amount of imagery experienced. Both basic theory on autobiographical memory (Rubin, 2006) and studies on autobiographical memory (e.g., Talarico, LaBar & Rubin, 2004; Berntsen & Bohn, 2010) suggest that the amount of emotional intensity experienced during MTT is associated with the

amount of visual imagery experienced. We may therefore expect that high worriers will report less vivid memories and future projections. This agrees with earlier work showing that a shift from a relaxed to a worried state is associated with less imagery based thought (Borkovec & Inz, 1990). As intensity of emotions during recall of autobiographical memories is associated with increased intensity of most phenomenological reports (Rubin, 2006), we can further expect that high worriers will report memories and future projections with lower ratings on other measures of sensory imagery, such as audition or sense of smell or taste, in order to avoid the emotion possibly associated with such imagery. Such predictions are also in accord with D'Argembeau and Van der Linden's (2006) findings that individuals who use suppressive emotion regulation strategies experience fewer sensory, contextual and emotional details during MTT. Emotional intensity during autobiographical memory recall has also been found to be associated with the degree of reliving experienced during recall of autobiographical memories (Talarico et al, 2004). Therefore, we may expect high worriers, compared to low worriers, to report less reliving during recall of autobiographical memories and less pre-living during MTT into the future.

Importance of Event and Relevance to Life Story and Identity

Relevance to the self is a key characteristic of an emotional experience according to the cognitive appraisal theory of emotion (Lazarus, 1982). Extrapolating this view to autobiographical memory, choosing to report less self-relevant memories would be a way of avoiding emotion. This is consistent with studies showing a positive association between current level of emotional distress and how central a negative/traumatic event is perceived to be for life story and identity (Berntsen & Rubin, 2006; 2007). Furthermore, the emotional intensity experienced during MTT has been found to be associated with the degree of self-relevance the event has for the individual, where self-relevance was a summed score of ratings of how important the event was to the individual and how

relevant it was to the individual's life story and identity (Berntsen & Bohn, 2010). Therefore, we may expect high worriers to report events of lower self-relevance as a way of reducing the emotional impact.

Hypotheses and an outline of the current study

To summarize, we expect that high worriers will show more observer perspective, less sensory vivid memories and future projections, reduced self-relevance, and possibly more overgeneral memories and future projections. We suggest that these effects are strategies by which high worriers cognitively attempt to avoid emotional intensity during MTT. Thus, to the extent that these strategies are successful, we would also expect high worriers to show reduced emotional intensity during MTT as well as less impact on mood and reduced re- or preliving during MTT. This proposed cognitive avoidance model of MTT is illustrated in Figure 1.

Previous work on the effects of psychological distress on MTT has mostly focused on voluntary recall of autobiographical memories. Although evidence suggests that autobiographical memories and future projections, involuntary as well as voluntary, show similar breakdowns in psychological disorders, it is important to examine whether this holds for other disorders or psychological traits than previously studied. Therefore, the current study will include involuntary and voluntary MTT into the future as well as the past.

For the future versus past contrast of our study, we expect to replicate main findings from previous studies showing that the construction of future events appears to be more schema-driven, in that future projections are rated less sensory vivid, more relevant to life story and identity, more idyllic and emotionally positive, more frequently seen from an

observer's perspective and less temporally distant than memories of past events (Berntsen & Bohn, 2010, for a review).

For the involuntary versus voluntary contrast we expect to replicate main findings from previous work showing that involuntary past and future events are more specific, come with more mood impact and emotional reaction and tend to be seen as less relevant to life story and identity (e.g., Berntsen, 2009; Berntsen & Jacobsen, 2008).

Following the view that involuntary and voluntary MTT reflect the operations of the same memory system (Berntsen, 2009), we should expect the breakdown by high versus low worriers to show similar effects on the characteristics of both types of processes. Likewise, following the view that future versus past MTT is supported by the same underlying neuro-cognitive system (Schacter & Addis, 2007) we should expect little interaction by high versus low worriers.

Method

Participants

Thirty-six Danish undergraduates (28 females, mean age 23.6 years, range 19-45) participated in the study. Each participant was compensated with a book gift with a value of roughly €40.

Design

The study examines four different forms of MTT in high and low worriers by intersecting voluntary versus involuntary and past versus future as two orthogonal dimensions. Thus, the design is a 2 (high versus low worrier) x 2 (voluntary versus involuntary) x 2 (past versus future) factorial design.

Materials

Pathological Worry. The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger & Borkovec, 1990) was used as a screening measure to identify individuals with high or low levels of pathological worry. The PSWQ is a 16 item self-report questionnaire that measures individual differences in intensity and excessiveness of worry; total scores range from 16 to 80. Participants are asked to rate to what extent statements are typical of them using a 5-point Likert scale. The PSWQ has excellent psychometric properties in both non-clinical and clinical populations (Molina & Borkovec, 1994). The PSWQ has been found to have high internal consistency in college students and anxiety disorder clients ($\alpha = .88$ to $.93$, Brown et al., 1992; Davey, 1993; Meyer et al., 1990) and high test-retest reliability ($r = .72$ to $.93$; Meyer et al., 1990). Non-diagnosed college students have scored an average of 47.65 ($SD = 12.99$; Ladouceur et al., 1992) on the PSWQ, while clients diagnosed with Generalized Anxiety Disorder have scored an average of 67.66 ($SD = 8.86$; Molina & Borkovec, 1994). In this study the PSWQ was administered both before and after the study, with a mean interval of 2 months. The PSWQ in this study demonstrated high test-retest reliability ($r = .90$), and internal consistency (Cronbach's $\alpha = .96$ for pre- and post measure).

For screening purposes, individuals with PSWQ scores 60 and above were selected as high worriers, while those with scores 36 and below were selected as low worriers. The criteria for selecting high worriers were based on a recent analysis suggesting that scores above 62 represent clinical levels of worry in community samples (Behar, Alcaine, Zuellig & Borkovec, 2003). However, we chose to lower the criteria down to 60 corresponding to the upper twenty scores on the scale (60-80) and roughly to the top 20% of the sample¹. The criteria for low worriers mirrored the criteria for high worriers, by defining low worriers as being the bottom twenty scores on the scale (16-36) corresponding roughly to the bottom 20% of the sample.

Depression. The Beck Depression Inventory – Second Edition (BDI-II; Beck, Steer & Brown, 1996) is a 21-item instrument that asks participants to indicate how they have felt over the past fourteen days. Each item assesses a particular symptom of major depression and contains four response options, ranging from 0 to 3, with higher scores indicating a higher level of depressive symptomatology. A total score in the range of 0 to 13 indicates minimal depression, a score between 14 and 19 indicates mild depression, 20 to 28 indicates moderate depression, and a total score between 29 and 63 indicates severe depression (Beck, Steer & Brown, 1996). The BDI-II is characterized by good internal consistency ($\alpha = .91$), test-retest reliability ($r = .93$), and criterion-related validity, strongly correlating ($r = .83$) with structured clinical interview scores (Beck, Steer & Brown, 1996; Sprinkle et al., 2002; Steer, Kumar, Ranieri & Beck, 1998). In this study, the internal consistency for the BDI-II was high (Cronbach's $\alpha = .90$).

Thought Suppression. The White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) is a 15 item self-report questionnaire developed to assess people's tendency for chronic thought suppression. Participants are asked to indicate on a 5-point Likert scale how much they agree with each statement. Internal consistency is high, with alphas ranging from .87 to .89. Test-retest reliability after one week has been found to be very high ($r = .92$) and also high after one month ($r = .69$) (Wegner & Zanakos, 1994). In this study the internal consistency of the scale was high (Cronbach's $\alpha = .93$).

Other measures. Participants also answered the Big Five Inventory (BFI; John, Donahue & Kentle, 1991), and the Short Imaginal Processes Inventory (Short IPI; Huba, Singer, Aneshense & Antrobus, 1982) during the study, the results of those measures will not be used for the purpose of this study.

Procedure

A screening package was distributed in various undergraduate classes at Aarhus University. The screening package included the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger & Borkovec, 1990) and an informed consent form, whereby students could write their contact information if they were interested in participating in a later study.

Students who met the screening criteria, achieving a score of 36 and below (indicating a low worrier) or a score of 60 and above (indicating a high worrier) on the PSWQ, were contacted and asked to participate in the study. Each participant was given a screening number, and a document was made containing only screening numbers and worry status. Thereafter a new list was made of screening numbers that should be contacted for participation, one that did not contain any information about worry status. In this way, the experimenter was able to remain blind to the worry status of participants throughout the diary study. 47 undergraduates began the study, 10 (7 low worriers, 3 high worriers) dropped out of the study. One high worrier measured as low worrier at the end of the study and was therefore excluded from all analyses, leaving a final number of 36 participants, 20 high worriers (17 females) and 16 low worriers (11 females).

The PSWQ was administered at screening and again at the end of the study, in order to make sure that the participants had been correctly identified as high or low worriers. The BDI-II and the WBSI were administered at the beginning of the diary. The BFI and the IPI-short form were administered at the end of the diary study. This was done so that participants were not overburdened at any one point with answering self-report measures.

The methods for the diary part were similar to ones in previous structured diary studies of involuntary autobiographical memories (e.g., Berntsen & Hall, 2004) and future projections (Berntsen & Jacobsen, 2008). The diary period was divided into two parts – one for recording

future projections and one for recording memories. Participants were randomly assigned to begin either with the future or the past condition. Order of condition did not influence the main findings; therefore the data is collapsed across the two order conditions. In the future part, participants recorded 8 involuntary future projections, and 8 voluntary (word cued) future projections during an open-ended time period. Participants recorded maximum two future projections of each kind per day. The procedure for the memory part was exactly the same, except for participants recording memories instead of future projections.

The three-steps recording procedure introduced by Berntsen and Hall (2004) was followed. First, immediately after an involuntary future projection had occurred, the participant recorded keyword phrases and ratings in response to a set of questions listed in a small notebook, which the participant was instructed to carry at all times during the diary period. The purpose of this step was to provide an immediate record of the future projection itself, the situational context in which it came to mind, as well as some key characteristics of the future projection. This was done to minimize the extent to which the participants have to rely on retrospection and inferences when filling out a more comprehensive questionnaire later on. This notebook recording takes little time and thus does not interfere much with the participant's ongoing activity. Second, at a self-chosen time later the same day, the participant answered the more comprehensive questionnaire about each involuntary future projection, assisted by the notebook. Third, on the next page in that same questionnaire, the participant removed an adhesive label on the questionnaire, revealing a word cue. The participant was instructed to write down a voluntary future projection from his or her personal future related to that word cue and complete a questionnaire about that voluntary future projection (a subset of the same questions that were answered for the involuntary counterpart). The procedure for

the memory part of the diary was exactly the same, except for participants recording autobiographical memories instead of future projections.

The questions answered for each involuntary and voluntary future projection are presented in Table 1. The questions for memories and future projections were the same, except for temporal reference. The questions were adapted from Berntsen and Jacobsen (2008) and from the Autobiographical Memory Questionnaire (AMQ; described in Rubin, Schrauf & Greenberg, 2003). Questions 10-25 were answered for both involuntary and voluntary memories and future projections. Questions 1-9 were answered only for the involuntary ones as they deal with the circumstances for the involuntary activation of those memories and future projections. The participants were first asked to describe the situation in which the involuntary future projection came to mind (e.g., where they were, what they were doing, their thoughts and mood; Questions 1-6 in Table 1) either open-ended or by indicating their answer on a rating scale. Then, they were asked to describe the future projection in their own words (Question 7). In order to examine whether a future projection was preceded by an identifiable cue in the participant's external or internal surroundings, participants were asked to indicate and classify features that possibly overlapped between the situation in which the future projection came to mind and the content of the future projection, and in the case of overlap to indicate whether cues were external, internal or mixed (Questions 8-9). Thereafter, participants answered questions 10-20 for all future projections, involuntary and voluntary ones. These questions assess various qualities of the future projection, such as sensory qualities, relevance to self, and the participant's age in the projection (see Table 1). Again, the procedure and questions for autobiographical memories were exactly the same, except for temporal reference.

The 8 cue words used to cue voluntary memories and future projections were: *friend, bicycle, view, book, chance, party, school, telephone, snow*. Participants were randomly assigned to receive the cue words in this order or in a reversed order. Order of cue words did not influence the main findings; therefore the data is collapsed across the two order conditions. The cue words are a subset of cue words used in previous diary studies on autobiographical memories (e.g., Berntsen & Jacobsen, 2008). To ensure that the voluntary memories were thematically compatible with the involuntary ones, the verbal cues were generated from the kind of cues that had been found to elicit the involuntary memories in the diary study. The cue words represent thematic categories that match the distribution of the most frequently reported cue categories found in a previous diary study on involuntary autobiographical memories: activities, objects, persons, places, sensory experiences, life theme (Berntsen, 1996).

The instructions for the memories and future projections were the same, except for temporal reference. Participants received both verbal and written instructions for each part of the study (i.e., memories and future projections). A voluntary memory/future projection was defined as a past/future event that is voluntarily brought to consciousness. An involuntary memory/future projection was defined as past/future event that is brought to consciousness with no preceding conscious attempts at generating it. It was stressed that memories and future projections (both involuntary and voluntary) could deal with all kinds of personal experiences, important as well as unimportant, pleasant or unpleasant, temporally close versus distant events etc. The difference between memories/future projections of specific versus summarized events was also explained and exemplified. Participants were told that both types of events could be recorded. The experimenter used emotionally neutral examples as illustrations, such as a memory of doing grocery shopping the previous day or last summer holiday. The examples for future and past recordings were identical except for orientation in

time. For ethical reasons and to ensure compliance, participants were given the right to censor events that they might consider too intimate to record.

After the diary study, the participants were interviewed individually to clarify responses in the diary that possibly appeared ambiguous to the experimenter. Finally, participants were asked whether they had used their right to censor and what they thought the purpose of the study was. Two of the 36 participants mentioned that they thought the study was about how the screening questionnaire was related to what kinds of memories one has, but they had no predictions as to what kind of differences and relationships would be expected and their mean scores did not differ from those of the remaining sample.

Results

First, we describe the characteristics of our samples of high versus low worriers. Second, we examine the cognitive avoidance hypotheses put forward regarding MTT in high and low worriers. Third, we examine possible differences between autobiographical memories and future projections; compare involuntary and involuntary mental time travel; and examine possible interactions between the three independent factors in our design (high vs. low worriers; past vs. future; involuntary vs. voluntary).

Characteristics of High versus Low Worriers in the Present Study

The two administrations of the PSWQ before and after the diary correlated highly with each other ($r = .90$) indicating that it is a reliable measure. Nevertheless, participants in both groups scored on average lower on the PSWQ at the end of the diary, and this difference was significant in the group of high worriers, $t(19) = 3.08, p < .01$. Seven high worriers no longer met the criteria ($PSWQ \geq 60$) at the end of the diary and measured in the middle range of the

PSWQ at the end of the diary. However, these seven high worriers did not differ from other high worriers on any important measure². Furthermore, as mentioned in the procedure section one high worrier measured as a low worrier at the end of the diary, and was therefore excluded from all analyses.

There was no age difference between the two groups, $t(34) = .57$. The gender distribution in the two groups was not significantly different, $\chi^2(1, N = 36) = 1.36, p > .05$. High worriers ($M = 9.47$; $SD = 8.54$) scored significantly higher on the BDI-II than low worriers ($M = 4.14$; $SD = 2.91$), $t(31) = 2.53, p < .05$. High worriers ($M = 57.45$; $SD = 11.11$) scored higher on the WBSI than did low worriers ($M = 39.13$; $SD = 11.94$), $t(34) = 4.72, p < .001$.

Effects of Trait Worry on Mental Time Travel

A total of 1152 events were recorded, 288 for each of the four event categories (voluntary vs. involuntary; memory vs. future projection). Because these event data were clustered around 36 participants, most of the statistical analyses are based on means calculated for each participant.

To examine how characteristics of voluntary and involuntary memories and future projections may interact with trait worry, a series repeated measures ANOVAs were conducted, with two within-subjects factors (involuntary vs. voluntary; memory vs. future projection) and one between-subjects factor (high worrier vs. low worrier). Table 2 shows the means and standard deviations of all the dependent variables in the six conditions, whereas Appendix B shows main effects and interactions.

Importance of Event and Relevance to Life Story and Identity. High worriers, compared to low worriers, rated their memories and future projections (both voluntary and involuntary) lower

on questions that measure self-relevance of the event. In particular, high worriers rated their memories and future projections lower on importance for their life than did low worriers, $F(1,34)=4.65, p < .05$ ($\eta_p^2 = .12$). There was a trend for high worriers rating their memories and future projections lower on relevance for their life story than did low worriers, $F(1,34)=4.02, p = .05$ ($\eta_p^2 = .11$). There was also a trend for high worriers to rate memories and future projections lower on centrality to their identity than low worriers, $F(1,34)=3.76, p = .06$ ($\eta_p^2 = .10$). The effect sizes for the three questions measuring self-relevance were of medium size (Cohen's d ranging from .51 to .52). Thus, in accordance to our hypothesis it appears that high worriers either viewed their events as less relevant for their self, or recorded events that are less self-relevant.

Looking at the distribution of answers (on the rating scale of 1 to 7) to the questions measuring self-relevance, *life story*, *identity* and *importance*, high worriers were more inclined to select the low extreme '1' on the rating scale (= 'not central'). Table 3 shows the percentage of high and low worriers selecting '1' on the rating scales for the three variables. This tendency was further explored statistically, using cross-tabs on new dummy coded variables. The tendency to choose '1' on each question was dummy coded as 1, whereas other answers were coded as 0, and missing values as 99. High worriers were significantly more likely to choose '1' on the rating scales for the three questions, except in three instances where there was a trend in the same direction (see Table 3).

We hypothesized that if the lower scores by high worriers on the three self-relevance questions represent avoidance, it would be likely that this tendency would be correlated with the intensity ratings of the memories and future projections, as one would expect individuals with a tendency for avoidance to avoid thinking about intense events (e.g., Searle & Meara, 1999; Mikulincer & Orbach, 1995). We found that the mean for intensity was highly correlated with the means for the summed score³ for life story, identity and importance,

within each of the four event categories (past-future, voluntary-involuntary). The correlations range from .65 to .69. Thus, participants who rated their events lower on questions that measure self-relevance also had lower ratings on the questions that measure emotional intensity. This could be interpreted as agreeing with the idea that retrieving less important events may be a way to avoid intense emotions.

Other Hypotheses Related to Cognitive Avoidance. Contrary to our hypotheses, high worriers did not report more observer like events compared to low worriers, $F(1,34)= 1.61, p > .05$ ($\eta_p^2 = .05$). As future projections have been found to be rated more observer-like compared to memories, we redid the analysis looking at memories only and found a trend for high worriers to report more observer like memories compared to low worriers, $F(1,34) = 3.31, p = .08$ ($\eta_p^2 = .09$).

High worriers did not report less specific events compared to low worriers, $F(1,34)= 3.15, p > .05$ ($\eta_p^2 = .09$). High worriers did not report less (p)reliving of events compared to low worriers, $F(1,34)= .56, p > .05$ ($\eta_p^2 = .02$). Furthermore, high worriers did not report events that were lower on visual imagery (*see*) compared to low worriers, $F(1,34)=.51, p > .05$ ($\eta_p^2 = .02$). Neither were there any differences between high and low worriers on other sensory measures such as *hear*, $F(1,34)=1.99, p > .05$ ($\eta_p^2 = .06$), *smell/taste*, $F(1,34)=2.15, p > .05$ ($\eta_p^2 = .06$), or the measure '*in words*', $F(1,34)=.07, p > .05$ ($\eta_p^2 = .00$).

Contrary to our hypotheses, high worriers did not report less emotional intensity during MTT compared to low worriers, $F(1,34)= .96, p > .05$ ($\eta_p^2 = .03$). Likewise, there were no differences between high and low worriers on positive mood impact, $F(1,34)= .54, p > .05$ ($\eta_p^2 = .02$), or negative mood impact, $F(1,34)= .87, p > .05$ ($\eta_p^2 = .03$).

Other measures. No differences were found between high and low worriers on distance travelled measured in years, $F(1,34) = 1.02, p > .05$ ($\eta_p^2 = .03$), how often the event had been

rehearsed, $F(1,34) = 0.00, p > .05$ ($\eta_p^2 = .00$), or how coherent the memory or future projection was, $F(1,34) = .25, p > .05$ ($\eta_p^2 = .01$). Likewise, there were no differences between high and low worriers on valence, $F(1,34) = 2.37, p > .05$ ($\eta_p^2 = .07$), or the length of event descriptions measured in number of words, $F(1,32) = 1.02, p > .05$ ($\eta_p^2 = .03$).

Trait worry and involuntary mental time travel. Repeated measures ANOVA conducted for questions that relate only to involuntary events revealed that high worriers were in a significantly less positive mood than were low worriers prior to experiencing an involuntary memory or future projection, $F(1,34) = 5.40, p < .05$ ($\eta_p^2 = .14$). Thus it seems that high worriers are generally in a less positive mood than low worriers, a finding that fits well with their higher score on the BDI-II. Finally, there was a trend for high worriers, compared to low worriers, to report that no cue preceded their involuntary memories and future projections, $F(1,34) = 3.86, p = .06$ ($\eta_p^2 = .10$).

Effects of Temporal Direction and Retrieval Mode on Mental Time Travel

As can be seen in Table 2 and Appendix B, the findings regarding past versus future MTT were largely consistent with previous work: Past events were more specific, partly more sensory vivid, referred to temporally more distant events, involved more field perspective and were longer in terms of number of words as compared to future events (all $ps < .05$). In contrast to previous work (Berntsen & Jacobsen, 2008; Berntsen & Bohn, 2010), future events were not found to be more central to life story and identity. However, previous studies have not included trait worry as a condition, which in this study had the strongest effect on measures of self-relevance and may thus have obscured any effects of temporal orientation on these measures. Also contrary to previous work, future projections were not found to be more

positive than memories ($p = .14$). However, as there was a trend in that direction, the lack of significant findings may be due to the fact that the design used in this study is more complicated than used in previous studies.

The present study also replicated previous work as to how past versus future events were activated in the involuntary condition (Berntsen & Jacobsen, 2008; similar analyses are not relevant for the voluntary condition as here MTT was always initiated by a word cue). Autobiographical memories were more likely to be preceded by an external cue than were future projections, $F(1,34) = 10.48, p < .01$ ($\eta_p^2 = .24$). Future projections, on the other hand, were more likely to be preceded by an internal cue than were memories, $F(1,34) = 5.07, p < .05$ ($\eta_p^2 = .13$). In line with previous studies (e.g., Berntsen & Jacobsen, 2008), the majority of memories and future projections came to mind when the individual was either unconcentrated (44.1% and 43.3% respectively) or strongly unconcentrated (12.8% and 14.3% respectively).

The findings concerning the involuntary versus voluntary condition largely replicated previous work (Berntsen & Jacobsen, 2008): Involuntary memories and future projections were more specific, more sensory vivid, more detailed in terms of number of words used to describe the events, they involved more (p)re-living, were less positive, had more negative mood impact, as compared to their voluntary counterparts, whereas no significant difference was found for positive mood impact (all $ps < .05$).

Not many interactions were observed. A three-way interaction emerged for the variable '*in words*', $F(1,34) = 4.16, p < .05$ ($\eta_p^2 = .11$). Post-hoc tests, using a Bonferroni correction for multiple comparisons, indicated that involuntary events ($M = 2.79; SD = 1.18$) were rated higher on the question *verbal* than their voluntary counterparts ($M = 2.20; SD = .95$), but that for high worriers this difference was stronger for memories than for future projections,

whereas for low worriers this difference was stronger for future projections than for memories. For distance (variable labeled *in years*), there was a significant interaction between the factors involuntary-voluntary and memories-future projections, $F(1,34) = 8.91, p < .001$ ($\eta_p^2 = .21$). Post-hoc tests, using a Bonferroni correction for multiple comparisons, indicated that involuntary memories ($M = 4.05; SD = 4.12$) tended to be closer in time than their voluntary counterparts ($M = 6.89; SD = 3.79$) and that involuntary future projections ($M = 1.80; SD = 3.74$) tended to be closer in time to the present than their voluntary counterparts ($M = 2.76; SD = 3.37$), but that this difference was not as strong for future projections as for autobiographical memories.

Discussion

The goal of this study was to examine MTT in the context of trait worry. We hypothesized that MTT in high worriers would show characteristics of cognitive avoidance. We found only partial support for this, in that we found that high worriers reported events of lower self-relevance, but we did not find support for our other hypotheses that high worriers would report more observer-like events, more overgeneral memories, less vivid memories or less emotionally intense events.

The differences we found between high and low worriers on the self-relevance questions are quite small and need to be replicated in future studies. However, we believe them to be valid for three reasons. First, the effect sizes were quite large (with Cohen's d on average being .52, and η_p^2 on average being .11). Second, we found differences between high and low worriers on MTT characteristics on all the questions that assess the self-relevance of the events, indicating that these differences are not due to chance. Third, our findings are further validated by the fact that the study largely replicated previous findings on involuntary and voluntary MTT into the past and future.

The results for self-relevance can be interpreted in accordance with our proposed cognitive avoidance model of MTT (see Figure 1), in that high worriers scored lower on questions that measure self-relevance and their greater tendency to answer '1' or 'not at all' on these questions compared to low worriers. Further exploration of the data showed that there is a strong positive correlation between scores on the self-relevance questions and ratings of an event's emotional intensity; the higher participants rated their events on emotional intensity the higher were their ratings on questions that measure self-relevance.

Previous studies have found that individuals with high levels of PTSD symptoms or individuals suffering from other types of distress, such as chronic pain, rate past negative memories as central to identity (e.g., Berntsen & Rubin, 2007; Perri & Keefe, 2008). Our findings do not contradict these findings as there are important methodological differences between these studies and the current one. In these previous studies, participants were asked to retrieve and rate highly stressful/traumatic events, whereas in the present study all types of events were permitted to be recorded. Therefore, one possible strategy for avoiding emotional distress might be to focus on less central events, if given the option.

It should be mentioned that the findings for self-relevance offer only indirect support for the proposed avoidance model and can be explained in other ways than in terms of cognitive avoidance. From the current findings, it is not possible to ascertain whether the events high worriers come up with are less important or less significant, or whether they are simply perceived as less self-relevant. For instance, it could be that events reported by high and low worriers were equal in terms of emotional intensity and self-relevance, but that for high worriers, the memories and future projections were, in comparison to their everyday worries, not important or relevant to them. Preliminary findings from another study by the current

authors (Finnbogadottir & Berntsen, in preparation) suggest that this alternative interpretation is plausible. This issue should be addressed in future studies.

We did not find support for our other hypotheses derived from the model. Contrary to our expectations, we did not find that high worriers would report more observer-like events, more overgeneral memories, less vivid memories or less emotionally intense events. The lack of findings for sensory measures and emotional intensity is particularly surprising, in light of the findings by D'Argembeau and Van der Linden (2006) that individuals who use suppression as an emotion regulation strategy rated their memories and future projections lower on sensory, contextual and emotional measures. However, for perspective, there was a trend for high worriers to report more observer-like memories, but not future projections. Regarding specificity, the findings are in accordance with the general finding that the anxiety disorders, other than PTSD, generally do not involve overgeneral memory. Furthermore, the instructions in this study, allowing participants to report both specific and general events, differ from what is the convention in studies examining overgeneral memory, instructing participants to report only specific events. Furthermore, the fact that we did not find differences between high and low worriers in terms of emotional intensity could be taken to suggest that high worriers were not successful in avoiding emotional intensity by reporting less self-relevant events. The lack of findings for our other hypotheses does, therefore, not necessarily contradict our avoidance hypothesis, as we proposed that low self-relevance was one strategy out of four possible ones, by which high worriers could cognitively avoid emotional intensity. However, the findings may also suggest that high worriers are not engaging in cognitive avoidance during MTT. Together with the findings by D'Argembeau and Van der Linden (2006), the current findings warrant further investigation of avoidance or suppression during MTT in populations likely to be high on avoidance.

Limitations and Conclusion

Although the findings of this study are promising, there are important limitations that need to be taken into consideration. One is that the study did not include participants from the middle of the worry spectrum. As MTT has not been studied in relation to trait worry before, this means that we have no information on how individuals in the middle of the worry spectrum would score on the questions that measure self-relevance. This opens up the possibility that perhaps it is not high worriers that score low on the self-relevance questions, but rather, that low worriers score unusually high on these measures. However, given that scores on questions that measure self-relevance of an event are significantly and positively correlated with an event's emotional intensity, it seems plausible that it is high worriers that deviate from the norm in terms of relating personal events to their self. In order to clarify this, future studies should either include a broader range of participants in terms of worry status, or include the middle group on the worry spectrum.

Another limitation is that the sample in this study is taken from a population of university students and not from a clinical population. This may limit the generalizability of the findings to clinical populations, such as patients with generalized anxiety disorder. This limitation may be an important one, as seven out of the 20 high worriers no longer scored in the pathological range at the end of the study. We do not know the reason for this drop in scores. One possibility is demand characteristics; that these participants believed that the diary was an intervention and that they should measure lower on the worry measure in the end. Alternatively, it may be that these seven participants were under stress during screening,

which no longer was present at the end of the study, and/or that participating in the diary may have had beneficial effects.

Other important limitations to the study are the small sample size, given the complexity of the design, and the uneven gender ratio in the sample. However, the gender distribution in the two groups was very similar, with proportionately slightly more males in the low worrier group compared to the high worrier group.

Despite these limitations the findings of this study open up an interesting venue for research within the worry literature, as they indicate that high worriers rate their personal memories and future projections low on self-relevance. We suggest that this may be a part of their general avoidance pattern. Whether or not distancing oneself in this way from personal events has implications for one's quality of life, we do not yet know and this should be addressed in future studies.

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Author note

The authors thank the Danish Research Council for the Humanities as well as the Danish National Research Foundation for funding.

Footnotes

1. The sample ($N = 228$) here consists of those who wrote their contact information for participation in future studies. A score of ≥ 60 on the PSWQ corresponded to 18.9% of the sample, whereas a score of ≤ 36 corresponded to 21.5% of the sample.
2. In one instance, the seven high worriers ($M = 3.57$; $SD = .65$) measured higher on involuntary autobiographical memories on the measure *in words* compared to the other high worriers ($M = 2.43$; $SD = 1.27$), $t(18) = 2.20$, $p < .05$.
3. We use summed scores for simplicity's sake; the correlations between the means of both intensity and valence with the means of the three questions, *life story*, *importance* and *identity*, are in a similar range.

Table 1.

Questions included in the questionnaire for each involuntary future projection.

-
1. *Where were you when the future projection came to your mind?
 2. *What were you doing?
 3. *Did you think of something else while you were doing this?
 4. *[Concentration] Was your attention concentrated on certain tasks or thoughts? (1 = "strongly unconcentrated"; 7 = "strongly concentrated").
 5. *[Current mood] How was your mood (-3 = "very poor"; 3 = "very good").
 6. Describe in your own words the situation in which the future projection came to mind.
 7. *Describe the future projection.
 8. [Cue categories] Compare the content of the future projection with what had taken place in your thoughts and surroundings right before the future projection came to your mind. Did anything in your surroundings, or anything in your activity, attention, or what had been on your mind repeat itself in the future projection? Check the most salient commonalities (person(s)/place/sensory experience/object/feeling/theme/life theme/activity/wording/no commonalities).
 9. [Internal vs. external cues] Were the commonality/ies only present in your external/physical surroundings, only present in your private thought/feeling, or present in both external and internal surroundings? (external/internal/mixed).
 10. *[Specific] Does this future projection refer to a specific situation in your future? (yes/no).
 11. *(Coherence] The future projection came to mind as a coherent story. (1 = "not at all"; 7 = "to a great extent").
 12. *[Reliving] When the future projection came to mind, it was as if I prelived the episode it was about. (1 = "not at all"; 7 = "to a great extent").
 13. *[See] When the future projection came to mind, I could see in my mind what happened. (1 = "not at all"; 7 = "to a great extent").
 14. [Hear] When the future projection came to mind, I could hear in my mind those sounds that are related to it. (1 = "not at all"; 7 = "to a great extent").
 15. [Smell/taste] When the future projection came to mind, I could sense those odour/taste experiences that are related to it. (1 = "not at all"; 7 = "to a great extent").
 16. *[In words] The future projection came to mind in the form of words. (1 = "not at all"; 7 = "to a great extent").
 17. *[Perspective] When the future projection came to mind, it was as if I predominantly saw what happened from the

- perspective of: (1 = "my own eyes"; 7 = "an observer's eyes").
18. *[Mood impact] The future projection left my mood: (better/worse/unaffected).
 19. [Valence] Is the future projection about a positive or negative event? (-3 = "very negative"; 3 = "very positive").
 20. [Intensity] Is the future projection about an emotionally intense event? (1 = "without intensity"; 7 = "very intense").
 21. [Life story] Would the imagined event become central to your life story? (1 = "not central to life story"; 7 = "very central to life story").
 22. [Importance] Would the imagined event become important for your life? (1 = "not at all"; 7 = "to a great extent").
 23. [Identity] Would the imagined event become central to your personal identity? (1 = "not central for identity"; 7 = "very central for identity").
 24. [Rehearsal] Have you previously thought about this future event representation? (1 = "never"; 7 = "very often").
 25. [Distance] How old are you, when the imagined event takes place? (Age in years).

Note: Labels in square brackets indicate variable names in the analyses. For questions marked by an asterisk, keyword phrases and ratings were included in the notebook. Questions 10-25 were also answered for the voluntary (word cued) future projections. Questions for autobiographical memories were the same, except for temporal reference.

Table 2. Means and standard deviations on MTT characteristics for high and low worriers' voluntary and involuntary memories and future projections.

	High worriers								Low worriers							
	Autobiograph. memories				Future projections				Autobiograph. memories				Future projections			
	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD	Involuntary M	Voluntary SD
Specific	.91	.12	.81	.13	.72	.25	.61	.28	.81	.14	.74	.15	.67	.26	.53	.34
Positive impact	.42	.24	.42	.26	.49	.24	.49	.22	.53	.24	.44	.28	.50	.25	.52	.30
Negative impact	.32	.19	.17	.15	.30	.19	.13	.11	.29	.28	.10	.12	.30	.26	.09	.09
Coherency	4.20	1.20	3.76	1.06	4.05	.97	3.57	1.10	4.29	.59	3.82	.91	4.27	.84	3.70	1.08
Pre-/reliving	4.92	1.11	4.49	1.11	4.96	.88	4.39	1.09	4.83	.96	4.25	1.05	4.56	1.05	4.27	1.27
See	5.36	1.04	4.97	.99	5.53	.88	4.88	1.04	5.38	.83	4.90	.82	5.04	.91	4.69	1.13
Hear	3.03	1.37	2.87	1.25	2.99	1.38	2.67	1.00	3.75	1.30	3.04	.97	3.54	1.22	3.20	1.59
Smell/taste	2.03	1.06	1.81	1.04	1.70	.89	1.50	.65	2.51	.89	2.04	.84	2.14	1.01	1.90	.98
Perspective	3.44	1.16	3.74	1.17	4.04	1.44	4.13	1.61	2.79	1.07	3.15	1.33	3.70	1.27	3.92	1.47
In words	2.83	1.21	2.08	.82	2.71	1.37	2.22	.98	2.68	1.05	2.42	.93	2.93	1.09	2.06	1.06
Rehearsal	3.30	1.00	3.41	.90	3.31	1.14	3.31	1.21	3.24	1.11	3.53	.80	3.48	1.29	3.06	1.25
Life story	2.40	.83	2.80	.88	2.76	.96	2.95	.96	3.01	1.28	3.43	1.02	3.18	1.09	3.29	1.08
Importance	2.63	.96	2.67	.90	2.82	1.02	3.13	1.04	3.04	1.16	3.55	1.00	3.38	1.10	3.46	1.20
Identity	2.43	.79	2.61	.78	2.69	.99	2.91	.95	3.07	1.42	3.31	1.12	3.23	1.23	3.17	1.06
Valence	.56	.77	.72	.85	.84	.81	1.12	.52	1.06	.67	1.06	.74	.81	.98	1.34	.68
Intensity	3.35	1.02	3.36	1.01	3.49	1.01	3.18	.88	3.50	1.19	3.74	.86	3.62	1.03	3.47	.98
Distance	3.32	4.09	6.31	3.11	1.89	3.26	2.49	2.59	4.78	4.15	7.47	4.47	1.70	4.22	3.03	4.15

Word count 37.83 10.73 30.11 11.73 30.97 12.05 24.27 8.01 34.90 13.56 28.85 12.81 26.28 10.98 19.93 8.78

Table 3.

The percentage of high and low worriers' with '1'-answers on the rating scales for life story, importance and identity, as well as results from χ^2 -test^t.

	Involuntary						Voluntary					
	Past			Future			Past			Future		
	High	Low	χ^2	High	Low	X^2	High	Low	χ^2	High	Low	χ^2
Lifestory	45,6	35,1	3.22 ^a	43,6	29,9	5.17*	38,1	26,8	4.12*	45,3	26,6	10.67**
Importance	41,9	33,1	3.33	41,8	27,6	6.22*	40,9	26,8	6.21*	40,9	27,3	5.72*
Identity	46,3	35,2	3.61 ^c	43,0	27,6	7.31**	41,9	27,6	6.33*	42,1	25,0	9.22**

Note: ^t $\chi^2(1, N = 293)$, * $p < .05$, ** $p < .01$, ^a $p = .07$, ^b $p = .13$ ^c $p = .06$.

Figure Caption

Figure 1. Cognitive avoidance model of mental time travel. The figure illustrates proposed strategies used to avoid emotional intensity.

Appendix.
Main effects on MTT characteristics for
trait worry, time orientation, and retrieval type.

	Main effects					
	Inv./Vol.		Fut./Past		High/Low	
	F	Eta	F	Eta	F	Eta
Specific	9.70**	.22	21.49***	.39	3.15 ^a	.09
Positive impact	.32	.01	1.81	.05	.54	.02
Negative impact	21.98***	.39	.53	.02	.87	.03
Coherency	10.87**	.24	.85	.02	.25	.01
Pre-/reliving	8.18**	.19	.61	.02	.56	.02
See	11.81**	.26	1.19	.03	.51	.02
Hear	7.02*	.17	.20	.01	2.00	.06
Smell/taste	9.67**	.22	5.47*	.14	2.15	.06
Perspective	2.39	.07	17.24***	.34	1.61	.05
In words	12.27**	.27	.02	.00	.07	.00
Rehearsal	.00	.00	.28	.01	.00	.00
Life story	2.90	.08	1.06	.03	4.02 ^b	.11
Importance	1.95	.05	2.46	.07	4.65*	.12
Identity	.87	.03	1.60	.05	4.76 ^c	.10
Valence	5.41*	.14	2.24	.06	2.37	.07
Intensity	.12	.00	.09	.00	.96	.03
Distance	20.18***	.37	13.31**	.28	1.02	.03
Word count	41.95***	.57	31.36***	.50	1.02	.03

Note: * $p < .05$, ** $p < .01$, *** $p < .001$, ^a $p = .09$, ^b $p = .05$, ^c $p = .06$