Latent Constructs Model Explaining the Attachment-Linked Variation in Autobiographical
Remembering

Sezin Öner and Sami Gülgöz
Koç University

Author Note

Sezin Öner, Department of Psychology, Koç University; Sami Gülgöz, Department of Psychology, Koç University.

Correspondence concerning this article should be addressed to Sezin Öner,
Department of Psychology, Koç University, Rumelifeneri Yolu 34450 Sarıyer, Istanbul,
Turkey. E-mail: seoner@ku.edu.tr

Abstract

In the current study, we proposed a latent constructs model to characterize the qualitative aspects of autobiographical remembering and investigated the structural relations in the model that may vary across individuals. Primarily, we focused on the memories of romantic relationships and argued that attachment anxiety and avoidance would be reflected in the ways that individuals encode, rehearse, or remember autobiographical memories in close relationships. Participants reported two positive and two negative relationship-specific memories and rated the characteristics for each memory. As predicted, the basic memory model yielded appropriate fit, indicating that event characteristics (EC) predicted the frequency of rehearsal (RC) and phenomenology at retrieval (PC). When attachment variables were integrated, the model showed that rehearsal mediated the link between anxiety and PC, especially for negative memories. On other hand, for avoidance EC was the key factor mediating the link between avoidance and RC, as well as PC. Findings were discussed with respect to autobiographical memory functions emphasizing a systematically, integrated framework.

Keywords: Autobiographical memory, Adult attachment, Phenomenology, Latent constructs,

Latent Constructs Model Explaining the Attachment-Linked Variation in Autobiographical Remembering

Autobiographical memory can be defined as a multimodal representation of personal experiences that typically includes various sensory-perceptual and emotional features as well as subjective evaluations (Rubin, 2006). Autobiographical remembering is not just a recollection of past events, but rather, it is a process composed of independent but interrelated mechanisms operating throughout the duration between encoding and retrieval. How well an event will be remembered is dependent upon how well it has been encoded and retained. In addition to the meaning attributed to the event, the frequency and the nature of rehearsal have substantial roles in the memory experience at the time of retrieval.

Encoding, rehearsal, and retrieval processes in autobiographical memory do not operate in vacuum, but they interact reciprocally with the *self* system in a way to preserve continuity in an individual's life (Bluck, Alea, Habermas, & Rubin, 2005). More specifically, encoding and rehearsal processes, as well as what will be retrieved and in what form, are regulated in accordance with goals or expectations (Conway, 2005). If an event includes self-discrepant information, one may attenuate the personal significance of an event and tend to recall the event less frequently. However, it is also possible for this person to put much effort to think and talk about the event in order to resolve the discrepancy. Therefore, it is very likely that there exist individual differences in encoding, rehearsal, and retrieval processes all of which dynamically interact with the self in the organization of autobiographical memory (Conway, 2005; Holland & Kensinger, 2010).

In the present research, we aimed to understand how individual differences in self-representations interact with distinct memory processes. As an instance of the relationship between such processes and autobiographical memory, we focused on memories of romantic relationships, and considering attachment representations as a relevant individual-differences

factor in relational contexts, we investigated whether attachment anxiety and attachment avoidance have unique effects on memory qualities, reflecting the distinct self-regulatory goals associated with attachment representations.

In the following sections, we overview the latent constructs that constitute key components of autobiographical memory and then we discuss potential functions underlying the individual variation in distinct mechanisms of remembering, focusing especially on the changes in memory processes associated with attachment representations.

The Conceptual Model for the Phenomenology of Remembering

In many studies of autobiographical memory (e.g., D'Ambageau & van den Linden, 2006; Hall & Berntsen, 2008; Berntsen & Bohn, 2009), the common approach has been to consider each memory characteristic individually. Here, we argue that it is important to distinguish these characteristics on the basis of the relevant memory processes to understand the causal connections between these processes. Although each characteristic provides unique information for the memory, examination of individual elements irrespective of the broad context and the commonalities between them may limit our understanding. Therefore, we employed a modeling approach in the current study. Employing a modeling approach enables us to detect systematic changes in remembering, particularly when testing the memory processes in relation to any independent factor (e.g. individual or contextual differences).

In their recent work, Fitzgerald and Broadbridge (2013) emphasized the necessity to identify the measurement structure as well. They proposed a four-factor model in which impact of the event, rehearsal, recollection and belief constitute the higher-order constructs of remembering. The model conceptualized recollection and belief as distinct constructs and tested the features predicting these two components of retrieval. In general, whereas rehearsal specifically predicted the belief regarding the memory, impact of the event was linked to both recollection and belief.

Recollection is an integral component of retrieval and researchers considered emotional and perceptual imagery to be key properties of recollection. In a similar vein, temporal and spatial information act as event markers in memory (Shum, 1998) and aid recollection. Moreover, inclusion of further perceptual (e.g., auditory) details fosters the recollection of the original experience (Noesselt, Bergmann, Hake, Heinze, & Fendrich, 2008). Emotional intensity, as well as, attention processes at the time of encoding form the initial event representation, which is integrated with subjective attributions regarding the experience. Detailed memory representations become the source on which recollection occurs (Rubin, 2006). Similarly, belief judgments rely on recollective experience such that coherence of the retrieved information determines confidence in memory (Rubin, Schrauf, & Greenberg, 2003). In addition to the recollective experience multiple sources of metacognitive information support autobiographical belief. However, although event details may not be accurately remembered, individuals tend to report high confidence for their memories (Talarico & Rubin, 2003, 2007). Other evidence also showed that belief in the occurrence of an event could be altered using social manipulation (Scoboria, Mazzoni, Kirsch, & Relya, 2004). It is also likely that the way memories are narrated has an important role in belief judgments (Habermas & Diel, 2013; Rubin & Siegler, 2004) such that reasoning over experiences leads the memory to be represented as gist information. Even under these circumstances when details are eliminated, the individual may hold strong beliefs regarding that memory experience. In many cases, the memory becomes semanticized, and stored at a conceptual level in the memory system. Therefore, here we argue for the heterogeneity of the belief construct, and rather than being an inherent component of autobiographical remembering, belief reflects the metacognitive processes relying upon the output of the memory experience.

Building on previous work, we propose a model to characterize the latent constructs of memory characteristics in a way to demonstrate how individual-specific factors differentially influence the general structure of remembering. In doing so, we considered mainly the temporal relations among the factors forming the higher-order memory constructs. More specifically, three latent factors were proposed, each of which reflect memory representations at distinct time points. Event Characteristics (EC) factor represents the actual experience and is associated with the time of encoding. Phenomenological Characteristics (PC) factor combines the sensory-affective features associated with the experience of retrieval. Finally, Rehearsal Characteristics (RC) factor is about the repeated recollection and reconstruction of the experience by thinking and talking during the time between encoding and retrieval.

We argue that the event characteristics (EC) constitute the crucial features that determine the function of the memory in particular contexts. Personally meaningful memories, especially the positive ones, are remembered more frequently by means of both internal talk and sharing with others, which help the individual to maintain self-continuity, and to develop intimacy in social relationships (Wilson & Ross, 2003; Alea & Bluck, 2007). Voluntary rehearsal also serves the function of directing the individual's future behaviors such that by reminiscing about previous experiences and taking lessons from them, the individual may modify future behaviors so as to match with current goal states (Rasmussen, & Berntsen, 2009b). Therefore, the amount of remembering depends on the initial encoding features and subjective meaning of the event, with more frequent remembering resulting in further consolidation and reconstruction of the memory (Walker, Skowronski, Gibbons, Vogl, & Ritchie, 2009). Regarding the phenomenology of remembering, it is important to consider both the event (EC) and rehearsal characteristics (RC). As reported in numerous studies (e.g. Talarico, Labar, & Rubin, 2004; D'scArgembeau, Comblain, & van den Linden, 2003;

Rasmussen & Berntsen, 2013), events that were encoded with more emotional intensity were also remembered more vividly and intensely, and the events that were rehearsed more often tended to be remembered in more detail with more reliving features (Suengas & Johnson, 1988). In congruence with these findings, we predicted that, event characteristics during encoding and the amount of rehearsal in between encoding and rehearsal would contribute to the recollective features at the time of retrieval (Rasmussen & Berntsen, 2009b; Walker et al., 2009).

Autobiographical Remembering in Self Regulation

Self-knowledge is one aspect of autobiographical memory and how we remember our experiences is interrelated with how we define our self (Conway, 2005). Bluck (2003) indicated self function as one of the three functions of autobiographical memory. Autobiographical memory continually interacts with the self and the environment in order to provide a sense of continuity and coherence between past, present, and future (Conway, 2005; Bluck & Habermas, 2000). Self-regulation has been considered to be an important aspect of the self-function (Pasupathi, 2003). Depending on the self-regulatory goals, memory processes may be altered to allow active goal-pursuit (Conway, 2005; Sutin & Robins, 2005) such that in order to regulate the anticipated negative affect, individuals may reduce the emotional intensity associated with the event (Sutin & Rubins, 2008). Similarly, it was also observed that, in order to promote a positive self-view, positive memories are more likely to be maintained and may be perceived as even more positive over time. It is important to note that this observation was more pronounced among high self-esteem individuals, pointing out how individual differences interact with the functions of autobiographical memory (Christensen, Wood, & Feldman Barrett, 2003).

The basic premise of the functional approach is that memories are organized and retrieved in the way they are because they serve particular functions for the individual

(Rasmussen & Berntsen, 2009b; Bluck, Alea, & Demiray). Because ‘what is functional’ differs across individuals, variation in individuals’ goals and expectancies is reflected on encoding, rehearsal, and retrieval processes. We argue that when remembering events of a relationship, attachment styles constitute a major factor that resides within the individual moderating autobiographical remembering.

Conway, Singer and Tagini (2004) argued that, attachment related internal working models (IWMs) that were suggested by Bowlby (1979) are schema-like structures, acting as regulatory agents. They influence the salience of the attachment related information in the memory system or alter the motivational value of retrieval. Through these processes, they provide the individual a self- or relational narrative that is coherent with their attachment representations. On the other hand, the functionality of remembering depends on one’s existing schemata for close relationships. In other words, what will be functional for the individual may vary depending on the levels of anxiety and avoidance in IWMs. Regulatory strategies may operate early in the activation of the attachment system as a form of attentional deployment and cognitive change (Shaver & Mikulincer, 2007), resulting in discounting the significance of the event at the time of the experience. Alternatively, affective responses may be suppressed, and phenomenology of remembering during rehearsal or retrieval is targeted.

Adult Attachment and Self-Regulatory Function

Attachment theory (Bowlby, 1979) suggested that through interactions with significant others, individuals build mental models representing both self and others in relational contexts. These mental models, as Bowlby called *internal working models* (IWMs, Bowlby, 1973, 1979), act as relational schemas through which individuals develop particular beliefs, expectations, and affect-regulatory strategies in attachment relationships. IWMs are characterized by two independent but related constructs of attachment (Brennan, Clark, &

Shaver, 1998; Fraley, Waller, & Brennan, 2000). *Attachment avoidance* refers to the extent that the individual feels uncomfortable with intimacy, leading to indifference and emotional distance in close relationships. The other dimension, *attachment anxiety*, reflects the extent to which the individual feels extreme worry of others' availability and fear of rejection, resulting in overdependence and also heightened vigilance to relational threats.

Considering IWMs to be conceptually similar to cognitive schemas, Mikulincer and Shaver (2007) suggested that these models contain generic information and strategies for self-regulation. Regulatory strategies associated with anxiety and avoidance are typically characterized by hyperactivation and deactivation of the affective states respectively. Although the strategies may differ, both serve self-coherence as well as the reduction in the uncertainty about relational threats. Memory-related processes also function accordingly, such that, for highly anxious individuals, active maintenance of negative information impairs balanced allocation of cognitive resources, leading to selective, but in general intrusive, recall (Mikulincer, Dolev, Shaver, 2004) as well as persistence of memories (Pereg & Mikulincer, 2004; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000). Studies on remembering of relationship-related memories indicated that individuals with high attachment anxiety were faster to recall negative, rather than the positive, experiences with attachment figures (Mikulincer & Orbach, 1995; Gentzler & Kerns, 2006). Also, these memories were accompanied by intense negative affect and intrusive cognitions (Mikulincer et al., 2004).

Attachment avoidance is associated with deactivating strategies which result in denial of attachment needs, avoidance of emotional involvement and intimacy, and discounting attachment-related experiences (Mikulincer & Shaver, 2003, 2007). This could be thought of as *shutting down the system* to avoid the *expected* negative consequences. Memory research on attachment avoidance has demonstrated that it leads to slower and less-detailed recall of relational experiences (Mikulincer & Orbach, 1995). Several other studies addressed the

mechanisms of avoidance-related changes in memory, suggesting the effects of either a pre-regulatory mechanism specific to encoding or a post-regulatory mechanism blocking retrieval (Edelsten, 2006; Edelstein & Gillath, 2008). Kohn, Rholes, and Schmeichel (2012) emphasized the role of mechanisms at the time of retrieval such as active suppression,. However, in another study, when the retrieval motivation was manipulated by rewards, contrasting findings were observed (Fraley & Braumbaugh, 2007). The results showed that highly avoidant individuals experienced substantial difficulty in recalling attachment-related information even when they were given monetary reward for the amount of recall. The discrepancy in these findings may be a function of employing different dependent variables, i.e., latency (Kohn et al., 2012) and amount of detail (Fraley & Braumbaugh, 2007). It is possible that although highly avoidant individuals do retrieve a memory to report, the quality of the retrieval, even for positive experiences, may be poorer compared to low avoidant individuals.

Although there have been a number of studies (Mikulincer & Orbach, 1995; Kohn et al., 2012; Fraley & Brumbaugh, 2007) addressing the notion of attachment representations as schematic guidelines for processing relational information, memory research has primarily focused on the content or valence of the attended or retrieved stimuli. In this study, we focus on qualitative aspects of autobiographical remembering in order to understand the specific mechanisms on which anxiety and avoidance operate.

Present Research

Our primary concern in this study was to identify how individual-specific variables interacted with memory components in the context of relationships. We included anxiety and avoidance as individual-difference factors and tested how they moderated the relationships between characteristics of the event, rehearsal, and retrieval. We chose to examine positive and negative memories separately because there is considerable evidence

for individual differences in the retrieval of positive and negative autobiographical memories (D'Argembeau & Van der Linden, 2006; Rasmussen & Berntsen, 2013; Finnbogadóttir & Berntsen, 2011). After ensuring the validity of the model with expected causal links for positive and negative memories, we then proceeded to testing the role of attachment-related variation in memory processes.

For negative memories, we expected that both attachment anxiety and avoidance would be positively associated with both event characteristics and rehearsal characteristics, which would, in turn, be reflected upon the phenomenological characteristics. However, we expected a larger effect of attachment anxiety and avoidance for positive memories since these memories conflict with the existing schemas. In that sense, they might be rehearsed less and discounted, resulting in poorer memory quality at retrieval.

In addition, we argued that the amount of rehearsal might be the mediating variable between memory age and phenomenological characteristics as the duration between encoding and retrieval affects the potential to rehearse. Therefore, particularly for negative memories, we expected less rehearsal with increasing time after an event, resulting in decreases in sensory imagery at recall. On the other hand, positive memories may serve the function of self-coherence or social bonding (Bluck et al., 2010; Demiray & Bluck, 2011; Rasmussen & Berntsen, 2009a), and therefore the fading effect of time on phenomenological characteristics may be reduced.

Method

Participants

The participants of the study were 113 (67 female, 46 male) undergraduate students at Koç University who ranged in age between 19 and 24 ($M = 20.88$, $SD = 1.11$). Forty-seven percent of the sample ($N = 48$) were currently in a romantic relationship and indicated the mean duration of their relationship as 22.52 months ($SD = 22.16$). The remaining participants

($N = 57$) reported that they had been in a romantic relationship previously with a mean duration of 15.05 months ($SD = 14.82$). The remaining 8 participants were excluded because they indicated that they had never been in a relationship.

Measures

Experiences in Close Relationships – Revised (ECR-R; Fraley, Waller, & Brennan, 2000). The ECR-R is a 36-item measure assessing adult romantic attachment in two dimensions (anxiety and avoidance). Attachment anxiety subscale includes 18 items measuring individuals' confidence about the availability of their partners (i.e. "I often worry that my romantic partner doesn't really love me") and attachment avoidance subscale includes 18 items measuring the individual's sense of security in relying on their partners (i.e. "I find it difficult to allow myself to depend on romantic partners"). Participants were given the Turkish adaptation of the scale (Selçuk, Günaydın, Sümer, & Uysal, 2005) and they were asked to think about their overall experiences in romantic relationships by indicating how much they agreed with the given statements on a 7-point scale. The Turkish version of the ECR-R subscales demonstrated high levels of internal consistency (with Cronbach alphas of .87 and .89 for anxiety and avoidance subscales, respectively).

Memory Characteristics Questionnaire (MCQ; Johnson, Suengas, Foley, & Raye, 1988). Participants completed a modified version of MCQ for each memory they had reported. This version included 12, 5-point Likert-type scale, items, where participants rated event characteristics (emotional intensity of the event, consequentiality, self-definition, importance, valence), rehearsal frequencies (involuntary thinking, voluntary thinking, talking), and phenomenology of retrieval (emotional intensity at retrieval, vividness, auditory imagery, and visual imagery).

Procedure

The data were collected using an online survey software, Qualtrics (2013, Provo, UT). Participants first received a short survey consisting of questions about their romantic relationship status. Participants who were or had been in a romantic relationship completed the ECR-R. They were then asked to report a specific, negative (positive) memory they experienced in their current (if they were not in one, previous) romantic relationships in as much detail as possible. After they reported the memory, participants rated the MCQ items and proceeded to the subsequent memory report. This request was repeated three more times such that in total, they reported two negative and two positive memories. The order of positive and negative memories were counterbalanced such that half the participants reported them in the PNP order and the other half reported their memories in reverse order (NPNP). The study was completed in approximately 45 minutes and all the participants received course credit in exchange for their participation.

Results

Data from 12 participants were excluded from the sample (4 female, 8 male) because they provided less than 2 usable memories (i.e., they could not remember any events or they provided irrelevant memories). The final sample consisted of 93 participants who showed similar demographic characteristics as the excluded cases ($ps > .05$).

Comparison of memories based on valence and type

The first set of analyses was on memory qualities to examine whether there were any differences between a) first reported and second reported memories, b) memories of positive and negative valence, and c) memories for current and previous relationships. A separate three-way mixed ANOVA was conducted for each event characteristic, with memory type as the between-subjects factor and valence and order as the within subjects factors. Table 1 presents the means and standard deviations of memory characteristics at each level. The effect of order was found to be significant for event importance, $F(1, 91) = 11.90$, $MSE =$

4.99, $p = .001$, and event intensity, $F(1, 91) = 16.68$, $MSE = 12.12$, $p < .001$. Those memories reported first ($M = 3.71$, $SD = .09$) were judged to be more important than second memories ($M = 3.35$, $SD = .09$) and the emotional intensity at the time of the event was rated higher for first memories ($M = 4.46$, $SD = .06$) than second memories ($M = 4.23$, $SD = .07$). As the instructions required more important and emotional events to be reported first, this result was expected. Valence of the event led to a difference in the importance of the event, $F(1, 91) = 14.67$, $MSE = 14.71$, $p < .001$, current emotional intensity, $F(1, 91) = 13.36$, $MSE = 17.14$, $p < .001$, and the ratings of visual reliving, $F(1, 91) = 4.94$, $MSE = 3.76$, $p < .029$, and vividness, $F(1, 91) = 5.36$, $MSE = 5.40$, $p < .023$, as well as involuntary rehearsal, $F(1, 91) = 8.60$, $MSE = 8.62$, $p = .004$. The effect of relationship type was significant for most characteristics, such that for memories of current relationships, individuals reported higher emotional intensity at retrieval, $F(1, 91) = 14.54$, $MSE = 42.37$, $p < .001$, higher vividness, $F(1, 91) = 6.90$, $MSE = 17.73$, $p = .01$, importance, $F(1, 91) = 5.76$, $MSE = 14.45$, $p = .018$, .05, and more frequent involuntary rehearsal, $F(1, 91) = 6.96$, $MSE = 22.33$, $p = .01$, compared to memories of previous relationships. The interaction between relationship type and valence was found to be significant for current emotional intensity, $F(1, 91) = 16.79$, $MSE = 21.55$, $p < .001$. Tukey's HSD test indicated that positive memories of current relationships ($M = 3.76$, $SD = 1.12$) were remembered with higher emotional intensity than both negative memories of current relationships ($M = 2.92$, $SD = 1.29$), and positive ($M = 2.71$, $SD = 1.23$) and negative memories ($M = 2.65$, $SD = 1.21$) of previous relationships.

Latent Constructs Model of Autobiographical Remembering

In order to identify the mechanisms underlying the phenomenology of remembering, we first tested the structure of the conceptual model of remembering. Next, we explored how distinct memory mechanisms operate in relation to attachment variables. In doing so, we

tested a mediation model with structural equation modeling, which revealed anxiety- and avoidance-specific mechanisms involved in remembering memories of relationship events.

As a preliminary analysis, we examined the relationships among the variables that were tested in the model. As presented in Table 2 for negative memories and in Table 3 for positive memories, correlations were moderate to high in magnitude. In the next step, we tested the three latent constructs of autobiographical memory, which distinguished encoding, rehearsal and retrieval processes. We first conducted confirmatory factor analyses (CFA) to ensure whether the measurement model with three latent constructs fits the data and further investigated the structural relations that characterize autobiographical remembering.

Considering different functions of positive and negative memories for individuals with different attachment representations, we tested measurement and structural invariance across memory types, which enabled us to make meaningful comparisons in subsequent analyses for the complex model.

We used the structural equation modeling approach (SEM) with AMOS 21.0 Absolute and incremental fit indices were used to assess model fit. Absolute fit indices represent how well the a priori model fits, and among several absolute fit indices, we focused on Root Mean Square Error of Approximation (RMSEA), and Minimum Fit Function Chi-Square. However, with large sample sizes, it is very likely that chi-square value would be inflated and in such cases RMSEA was found to provide more reliable results. When using RMSEA, values below 0.08 were considered fair fit whereas values below 0.05 were considered close fit (Browne & Cudeck, 1992). For the incremental fit indices, we included Comparative Fit Index (CFI) and Non-normed Fit Index of which values above 0.90 indicate good fit (Bentler, 1990). Also, for the comparison of nested models, we used the conventional criteria such that changes in the CFI, NNFI, or RMSEA of 0.01 indicated significant change in the fit of different models (Wideman, 1985).

The variables that are subsumed under Event characteristics (EC), Rehearsal Characteristics (RC), and Phenomenological Characteristics (PC) are shown in the ;Appendix. EC, RC, and PC were not only distinguished by qualitative features of the memory they represented, but they also represented memory processes at different points in time.

Confirmatory Factor Analysis and Testing Measurement Invariance. Confirmatory factor analysis (CFA) of the three-factor model distinguishing EC, RC, and PC, provided substantially better model fit than the single factor model. Change indices revealed that freeing particular covariances would notably change the model fit, therefore, covariances were included in the model for the ones that were theoretically sound, resulting in a decrease in chi-square by about 96.53, leading to $\chi^2 = 108.791$ (38), CFI = .964, NFI = .948, RMSEA = .071 (Model 2). In addition, independent CFAs with positive (Model 3) and negative memories (Model 4) confirmed that the measurement model fits the data well.

Measurement Invariance across memory types. We first established form or pattern invariance (see Table 4, Model MI_a, $\chi^2 = 220.866$ (78) (47), CFI = .930, NFI = .917, RMSEA = .069), indicating similar patterns of item to construct relationships independently of the valence of the memory.

Measurement invariance was further assessed in several more steps (van de Schoot, Lugtig, & Hox, 2012). First, in two steps, we constrained factor loadings (metric invariance), and then also the intercepts (scalar invariance) to be equal across groups. Compared to the pattern invariant model, factor invariance (Model MI_b) did not result in significant change in model fit, $\Delta \chi^2 = 7.745$ (8), CFI = .924, NFI = .891, RMSEA = .067. Scalar invariance in the model (Model MI_c) resulted in significant change in chi-square, however, other fit indices changed modestly. It has been suggested that significant increases in chi-square is expected when many parameters are constrained (Little, 1997), therefore considering CFI, NNFI, and

RMSEA, we accepted the scalar invariance in the measurement model. This indicated that representation of each item in the latent construct was similar for positive and negative memories¹.

Structural Equivalence of the Model of Remembering. The structural baseline model in Figure 1 was tested by keeping the factor loadings invariant across groups. In addition to the estimated links between latent constructs, we added a causal link between the event intensity and the latent factor, PC. Event intensity is a component of EC as a feature inherent in the experience itself, but it also accounts for much of the affective component of the memory, which is linked to not only emotional intensity at retrieval but also the recollective features in general.

Furthermore, in order to eliminate the time-linked variation in memory characteristics, we integrated memory age into the model to investigate whether passage of time differentially influenced the memory quality. We predicted that time was more likely to be associated with RC and PC, rather than event-specific features. The time between encoding and retrieval corresponds to the temporal space that an event can be rehearsed, and if an event is rehearsed more frequently during this period, it is likely for the memory to be recalled better. On the other hand, some experiences may not require frequent rehearsal for a qualitatively good recall (Talarico et al., 2003; Rasmussen & Berntsen, 2013), therefore, we tested whether the relative influence of the passage of time on the latent constructs of rehearsal and phenomenology differed for negative and positive memories.

We estimated six directional pathways and three correlations between error variances in the structural model. The structural equivalence model (see Table 4, Model 5) yielded good fit for both memory types $\chi^2 = 172.404(84)$ (84), CFI = .956, NNFI = .926, RMSEA = .053. Significant covariances between the residual terms of auditory and visual imagery were found only for negative memories, and self-definition and consequentiality correlated

significantly, only for positive memories. All structural pathways were significant, except the link from EC to PC for both memory types. This indicated that event intensity, rather than importance, consequentiality or self-definition, predicted phenomenological characteristics. In addition, independent of the memory valence, RC mediated the link between retrieval phenomenology and memory age, suggesting that memories did not simply become more vague in time but rather less rehearsal resulted in less clear memories.

Structural Model of Remembering Embedded with Individual-Specific Factors.

Having established the equivalence of the structural model for positively and negatively valenced memories, we integrated attachment anxiety and avoidance to the model and proceeded to examine how individual differences in attachment representations influence the pattern of structural relations in the model.

Mediation analyses were conducted to investigate potential interactions between anxiety or avoidance with the EC and MC for their relative effects on PC. Direct and indirect effects were tested with the Bootstrapping method that has been suggested as a more reliable and practical method (Baron & Kenny, 1986, see Shrout & Bolger, 2002, for a detailed discussion). We requested 1000 bootstrap samples, generating bias-corrected percentile-based bootstrap with 95% confidence intervals.

The overall fit of the final model (see Figure 2, Model 6) resulted in adequate fit for the data, $\chi^2 = 220.351(136)$, CFI = .963, NNFI = .928, RMSEA = .040. First, we observed that, for both positive and negative memories, the amount of rehearsal mediated the effect of EC on PC such that although direct links from EC to PC were not significant, indirect effects were found to be significant, even when we controlled for event intensity. When we examined the passage of time for negative memories, the amount of rehearsal mediated the effect of memory age on phenomenology such that the more time passed after an event, the

less it was rehearsed, leading it to be remembered with lower magnitudes in phenomenological characteristics.

Although memory age and causal links between EC, RC, and PC were similar across groups, it was observed that the influence of attachment styles differed depending on the valence. For negative memories, EC mediated the effect of avoidance not only on PC, but also on MC, revealing that avoidance resulted in less personal significance attributed to negative memories, which further resulted in decreased ratings for both rehearsal and phenomenology³. With respect to attachment anxiety, higher levels of anxiety resulted in increased levels of meaning attributed to the event and higher frequency of rehearsal as well as higher ratings in phenomenological characteristics. When we controlled for the compound effects of EC on MC, it appeared that the link between anxiety and PC was mediated by MC, indicating that negative memories were remembered better as they tended to be rehearsed more frequently.

On the other hand, for positive memories, as attachment avoidance increased, individuals attributed less meaning to the event, or reported low levels of emotion at the time of the event, which mediated the effect of avoidance on phenomenology. Different from negative memories, EC only mediated the link between avoidance and phenomenology, not frequency of rehearsal. In contrast to avoidance, anxiety was found to exert a similar influence on positive memories except that attachment anxiety was not linked to EC for positive memories. This finding indicated that individuals with high attachment anxiety did not attribute personal significance to positive experiences despite frequent rehearsal. On the other hand, for these individuals, frequent rehearsal of positive events enhanced their recollection. Estimates for the direct and indirect effects for positive and negative memories were presented in Table 5.

Discussion

In the current study, we aimed to identify the higher-order constructs of autobiographical memory and characterize attachment-related variation on distinct memory components. We emphasized an integrative framework attempting to explain the systematic links between distinct mechanisms underlying autobiographical remembering. In doing so, we first characterized latent constructs to distinguish memory processes corresponding to event-, rehearsal- and retrieval-related features. In the next step, we tested how attachment anxiety and attachment avoidance interacted with each memory process in determining how individuals remember their relationships. Overall, attachment-related goals were reflected on the latent constructs of remembering, but the pattern of the relationships between memory processes and these goals differed for positive and negative memories. In the following sections, we first summarize the conceptual model proposed here, and then we discuss attachment-related variation in qualitative features and how it was manifested on the overall pattern of autobiographical remembering.

Towards a model of autobiographical remembering

In previous research, the common tradition has been to examine memory phenomenology with unique items (Johnson et al., 1988; D'Argembeau et al., 2003; Talarico et al., 2003; Bertnsen & Rubin, 2006) with well-established scales. Evidence so far has indicated that particular items tend to correlate regardless of the type of memory (Rubin et al., 2003 Johnson et al., 1988; Sutin & Robins, 2007) pointing out a common denominator. However, there has not been a consensus on classification of autobiographical memory constructs.

Fitzgerald and Broadbent (2013) considered a theory-driven approach to be more reliable in testing distinct memory constructs and the structural relations among them. They proposed a latent constructs model suggesting that the impact of the event is directly related to the frequency of rehearsal and to metacognitive and affective features of remembering. We

reiterated the need to characterize the higher-order constructs in order to understand the structural relations involved in remembering and argued that encoding, rehearsal, and retrieval, all have their own dynamics both conceptually and temporally. Event-related characteristics (EC) constitute the encoding-related features that represent the event itself. Although subjective ratings might be provided at the time of the retrieval, the event has been already constructed to a large extent, therefore event characteristics refer to a distinct time period than the retrieval. Rehearsal characteristics (RC), on the other hand, correspond to the time between encoding and retrieval, and refer to the frequency of reliving the experience in different forms. As previous evidence suggested, EC are involved in the way that an event is rehearsed such that emotionally more intense, more important, and more consequential events tend to be remembered more frequently, which enable the maintenance of the memory (Walker et al., 2009). Event characteristics, thus, provided the phenomenological baseline for subsequent retrieval (Wilson & Ross, 2003; Walker et al. 2009). Phenomenology of remembering constitutes the sensory or affective elements at the time of the recall. In that sense, it is reasonable to argue that personal significance of an experience (Bluck & Levine, 1998) and the strength of encoding or reconsolidation were related to the retrieval quality (Berntsen & Rubin, 2006; Bernstein & Bohn, 2009) along with the factors that are unique to retrieval (e.g. cognitive load or contextual factors) (Williams et al., 2007).

The model proposed by Fitzgerald and Broadbent (2013) was similar to the one that we currently propose but there are also notable differences. First, we did not include metacognitive elements into a model of remembering since belief about the occurrence and accuracy of an experience involve a subjective judgment that is likely to be supported by diverse sources of information in addition to the extent of detail in memory representation. Reflection on past experiences and metamemory processes contribute to beliefs about memory. In addition, psychological distance from the event (Bluck & Demiray, 2011), as

well as the individual characteristics such as trait dissociation (Merckelbach, & Muris, 2001) or experiential avoidance (Cribb, Moulds, & Cartermay, 2006) may modulate memory-related beliefs. On the other hand, we focused on the phenomenology of component processes (Rubin, 2006), that is, the memory experience at the time of the remembering. These processes may contribute to the beliefs regarding a memory as well but we suggest that belief does not constitute an integral part of the memory.

A second distinction from the work of Fitzgerald and Broadbent (2013) was that we included involuntary remembering as a feature of rehearsal. Since involuntary memories involve event-specific knowledge rich in sensory-perceptual detail (Berntsen, 2009), they enhance recollective experience. Rasmussen and Berntsen (2009b) argued that, different from voluntarily recalled memories, involuntary memories have directive function such that detailed, picture-like event representations in these memories provide clear guidelines for the individual whereas voluntary forms of rehearsal, being regulated by the individuals' current goals, are more open to memory reconstruction. Therefore, we argue for the talking, voluntary and involuntary forms of rehearsal that each has unique functions and emerges in relation to different situational demands. Therefore, being such a significant feature of memory, involuntary remembering was included as a determinant of the rehearsal component. Last, two models differ with respect to how they linked emotional intensity and memory phenomenology. More specifically, current model, proposed event intensity as a factor of Event Characteristics (EC), however, the way it operates is rather different than the remaining features in the same domain. Emotional intensity at the time of experience varies the amount of information that is initially encoded. On the other hand, subjective evaluations of the event are being made after the event has already occurred. Although, emotional intensity is very much related to the personal meaning attached to the event, it has unique contribution in predicting recollection (Talarico et al, 2003; Ford et al., 2008), and therefore,

in the current model, event intensity was directly linked to the phenomenology at the time of the retrieval.

As valence-related differences in memory processes have been documented in previous studies (D'Argembeau et al., 2003; Rasmussen & Berntsen, 2013), we tested the validity of the model for positive and negative memories, which ensured the measurement and structural invariance across memories. As expected, independent of memory valence, emotional intensity, as well as, the personal significance of an event in general resulted in more frequent rehearsal and the amount of rehearsal was positively related to the recollective features at retrieval. However, for negative memories, only emotional intensity, rather than the personal significance per se, predicted the PC. This indicated that, as in the tunnel memory phenomenon (Berntsen, 2002), for negative memories, the effect of emotional intensity is so salient at the time of the encoding that it dominates other features of the event in predicting the memory experience. On the other hand, for positive memories, subjective meaning of the event significantly predicted the phenomenology at retrieval even when controlling for the emotional intensity of the event such that the more emotionally intense, important, consequential, or self-defining an event was, the higher it was rated for vividness, sensory imagery, or emotionality at retrieval. Such valence effects are meaningful from a functional perspective in the sense that positive memories may serve to boost one's sense of self and to preserve social bonds, resulting the subjective value of memory to be maintained over time to remind favorable experiences (Rasmussen & Berntsen, 2009a; Harris et al., 2013). On the other hand, the salience of event intensity could be explained with attempts to disregard the value of negative events over time in order to preserve self-esteem or to regulate negative affect (Alea & Bluck, 2003).

Overall, the proposed model characterized the links between the latent constructs specific to autobiographical remembering. We further argued that depending on the unique

individual goals, particular functions of event-, rehearsal-, or phenomenological- characteristics might be altered. Considering each latent factor representing a distinct memory mechanism in the model, next, attachment linked changes in these mechanism are discussed along with further implications of the model.

Attachment-Linked Variation in Latent Constructs of Remembering

We specifically examined the attachment-linked variation in memories of romantic relationships. As previous research demonstrated, hyperactivating strategies associated with attachment anxiety act as a threat alarm leading to persistent activation of relationship-related fears (see Mikulincer & Shaver, 2007, for extensive evidence). Therefore, we expected high levels of attachment anxiety to be associated with qualitatively rich memories, especially for the negative ones. On the other hand, deactivating strategies, associated with avoidance, operate emotion regulation mechanisms early on and set *protective* boundaries in a way to eliminate the impact of relational experiences (Shaver & Mikulincer, 2007). Accordingly, avoidance was expected to be associated with poor memory qualities in general. However, we expected the direct impact of avoidance to be manifested only on event characteristics, which further mediated the avoidance related changes in rehearsal and phenomenology.

Attachment anxiety and preoccupation with relational memories. It was expected for attachment anxiety to persistently activate the relational schema that biased information processing negatively. In general, high anxiety was associated with more emotional intensity, subjective value attributed to the event, more rehearsal, especially more memory pop-ups, and more intense remembering for both positive and negative memories. However, it is noteworthy that, for positive memories, anxiety was not linked to EC. As also documented by previous research, the reason for this may be that information processing of anxiously attached individuals tended to be biased by negative, but not positive, stimuli (Mikulincer et al., 2004; Edelstein, 2006). Therefore, high attachment anxiety may prevent processing of

positive relational information which would otherwise modify the existing schema. Actually, since negative memories involve more schema-consistent information, they are easily integrated with existing negative relational schemas, however, positive experiences create discrepancies for the self-memory system (Conway et al., 2004). Therefore, whereas these individuals tend to relate negative experiences to their self easily, they are less likely to do so for the positive experiences (Conway et al., 2004).

In addition, rehearsal (RC) mediated the link between anxiety and phenomenology (PC). High attachment anxiety predicted more frequent rehearsal that actually strengthened the memory representation, leading to better retrieval. It is noteworthy that the mediation pattern applied to positive memories as well. The frequency of rehearsal linked with anxiety indicates the extent to which the individual is preoccupied with the relational experiences. For negative experiences, this 'preoccupation' may reflect attempts to protect the self, keeping the individual in a vigilant state for relational threats. It is also possible that individuals may talk about their relational problems, and try to seek support from others to ease anxiety. On the other hand, for positive memories, frequent remembering may serve various functions such as reconciling the positive experiences with the existing negative schemas (Bluck et al., 2010) or preserving social bonds (Alea & Bluck, 2003).

Each rehearsal involves not only reconsolidation but also reconstruction processes, then one might question why highly anxious individuals did not update their schemas despite frequent rehearsal and rich recollection of positive experiences. Previous evidence indicated that individuals with high levels of attachment anxiety are prone to memory errors (Pereg & Mikulincer, 2004; Fraley et al., 2000). Therefore, for these individuals, it is likely that positive information is integrated in a way consistent with the dominant attachment schema, resulting in integration of false information (Simpson, Rholes, & Winterheld, 2010; Mikulincer & Shaver, 2005).

Attachment avoidance and distancing from relational memories. Regarding attachment avoidance, we argued for a pre-regulatory mechanism. In other words, we expected attachment avoidance to directly influence only event characteristics (EC), however, indirect effects were to be examined for potential mediating effects. We found that avoidance correlated any of the negative memory characteristics whereas for positive memories, high avoidance was associated with lower ratings for all indicators of EC (except self-definition) and PC (except auditory imagery). However, with including the estimates for the indirect effects, the model revealed the broader pattern on which avoidance operates. As we expected, for both memory types, avoidance was directly linked only to EC, indicating that individuals with high attachment avoidance tended to disregard the emotional intensity and significance of relational experiences, even the positive ones, which further leads to less frequent rehearsal of these experiences. This supported previous evidence that highly avoidant individuals tend to process relational information in accordance with a fight-slight schema (Ein-Dor et al., 2011). In other words, these individuals take precautions for foreseen negativity, even in positive experiences, which serves the function of attenuating the impact of intimacy-related events (Edelstein & Gillath, 2008; Fraley & Shaver, 2007).

It was not only the EC that were altered, but also, albeit indirectly, avoidance resulted in poorer memory rehearsal and phenomenology of remembering. First, for both negative and positive memories, EC mediated the link between avoidance and PC, indicating that, recollective experience gets poorer to the extent that highly avoidant individuals succeed to decrease the subjective value of the experience. Therefore, highly avoidant individuals initially blocked the level of experience, both cognitively and affectively, at the time of the encoding, and consequently, less important, less consequential and less affective memories were recollected with less emotional intensity and sensory imagery, as it occurs in the retrieval of any autobiographical memory (Talarico et al., 2004; D'Argembeau et al., 2003).

In a similar vein, EC mediated the effect of avoidance on RC for positive memories, but not for negative memories. It appeared that once these individuals with high avoidance attenuate the personal significance of an experience, they do not think or talk about the experience, which leaves no space for further elaboration, even for reconsolidation of a positive experience. This finding was striking when we consider the potential functions of remembering positive memories, in that, for avoidant individuals it is less likely to integrate positive experiences and use them as corrective feedback in their relationships (Bluck & Habermas, 2000; Bluck et al., 2010).

Overall, it appeared that avoidance biased information processing against positive information and therefore these individuals tended to keep relational experiences distant and recalled their memories in a less detailed, less emotional manner. Although consistent evidence was documented in previous research (Fraley et al., 2000; Kohn et al., 2012; Edelstein, 2006), underlying mechanisms of poor retrieval had not been specified. Here, we argued that devaluing positive experiences may serve self-consistency and avoidance from the expected relational threats.

Implications for the Model

Current findings revealed that self-regulation strategies associated with anxiety and avoidance were manifested on autobiographical remembering in distinct patterns. Attachment anxiety intensified the memory experience via rehearsal. Avoidance on the other hand, acted more on encoding, or the event-specific features, and initial biases in perception modified subsequent rehearsal and recollection. It appeared that memory processes are modulated in a way that reflects the underlying regulatory goals of associated with anxiety and avoidance.

These findings are important to understand attachment-related changes in the broader aspects of memory experience other than the valence or the content. Since we worked on memories of romantic relationships, the role of attachment representations as a major

determinant of relationship dynamics was emphasized. However, relationship memories are no different than any other autobiographical memory, therefore the model could be applied to test memory processes in general, which further allows to examine other theoretically relevant individual-specific factors. As studied in previous research, individual differences in trait-rumination (Thomsen, Schnieber, & Olesen, 2011), emotion regulation (John & Gross, 2007; Richards & Gross, 2003), and depressive symptomology (Williams et al., 2007; Kuyken & Brewin, 1995) may lead to specific changes in how memories are encoded, rehearsed or retrieved.

Overall, current model expanded our understanding regarding the mechanisms that characterize autobiographical remembering. Although there have been extensive research investigating the individual differences in autobiographical remembering, only few of them demonstrated the specific routes on which individual difference are reflected upon (Tinti et al., 2014). Considering a broad framework for autobiographical memory, we first underlined the higher-order constructs. In general, event characteristics influence the way memories are rehearsed such that personally meaningful events tend to be rehearsed more often. Also, it is evident that the memory experience at the time of the retrieval depends on both the factors associated with the event and the nature of rehearsal in between encoding and rehearsal. Although the way memory processes are linked may have slight variation depending on the memory type (i.e. positive and negative memories), current model provides a general structure for us to study autobiographical remembering, which could be well applied to any type of event or in integration with any domain of individual differences. In that sense, such an integrative approach complements the general model for autobiographical remembering in consideration with who remembers.

References

- Alea, N., & Bluck, S. (2003). Why are you telling me that? A conceptual model of the social function of autobiographical memory. *Memory, 11*, 165-178.
- Alea, N., & Bluck, S. (2007). I'll keep you in mind: The intimacy function of autobiographical memory. *Applied Cognitive Psychology, 21*(8), 1091-1111.
- Alea, N., & Vick, S. C. (2010). The first sight of love: Relationship-defining memories and marital satisfaction across adulthood. *Memory, 18*(7), 730-742.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238.
- Berntsen, D., & Rubin, D. C. (2006). Emotion and vantage point in autobiographical memory. *Cognition and Emotion, 20*(8), 1193-1215.
- Berntsen, D., & Bohn, A. (2009). Cultural life scripts and individual life stories. In P. Boyer, & J. V. Wertsch (Eds.), *Memory in mind and culture* (pp. 62-82). Cambridge University Press.
- Bluck, S., Alea, N., Habermas, T., & Rubin, D. C. (2005). A TALE of three functions: The self-reported uses of autobiographical memory. *Social Cognition, 23*, 97–117.
- Bluck, S., Alea, N., & Demiray, B. (2010). You get what you need: The psychosocial functions of remembering., In J. H. Mace (Ed.), *The act of remembering: Toward an understanding of how we recall the past* (Vol. 3). John Wiley & Sons.
- Bluck, S., & Habermas, T. (2000). The life story schema. *Motivation and Emotion, 24*(2), 121-147.

- Bluck, S. (2003). Autobiographical memory: Exploring its functions in everyday life, *Memory*, 11, 1, 113-123.
- Bluck, S., & Levine, L. J. (1998). Reminiscence as autobiographical memory: A catalyst for reminiscence theory development. *Ageing and Society*, 18(2), 185-208.
- Bowlby, J. (1979). *The making & breaking of affectional bonds*. London: Tavistock/Routledge.
- Bowlby, J. (1973). *Attachment and loss. Vol. II. Separation: Anxiety and anger*. London: Penguin Books
- Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult romantic attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46–76). New York: Guilford Press.
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), 230-258.
- Byrne, B. M., Shavelson, R. J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin*, 105(3), 456.
- Cheung, G.W., & Lau, R.S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation models. *Organizational Research Methods*, 11(2), 296–325.
- Christensen, T. C., Wood, J. V., & Barrett, L. F. (2003). Remembering everyday experience through the prism of self-esteem. *Personality and Social Psychology Bulletin*, 29(1), 51-62.
- Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, 53(4), 594-628.

- Conway, M. A., Singer, J. A., & Tagini, A. (2004). The self and autobiographical memory: Correspondence and coherence. *Social Cognition*, 22, 491–529.
- Cribb, G., Moulds, M. L., & Carter, S. (2006). Rumination and experiential avoidance in depression. *Behaviour Change*, 23(03), 165-176.
- D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation strategies. *Consciousness and Cognition*, 15(2), 342-350.
- D'Argembeau, A., Comblain, C., & Van der Linden, M. (2003). Phenomenal characteristics of autobiographical memories for positive, negative, and neutral events. *Applied Cognitive Psychology*, 17(3), 281–294.
- Demiray, B., & Bluck, S. (2011). The relation of the conceptual self to recent and distant autobiographical memories. *Memory*, 19(8), 975-992.
- Dimitrov, D. M. (2006). Comparing groups on latent variables: A structural equation modeling approach. *Work: A Journal of Prevention, Assessment and Rehabilitation*, 26(4), 429-436.
- Edelstein, R. S. (2006). Attachment and emotional memory: investigating the source and extent of avoidant memory impairments. *Emotion*, 6(2), 340–5.
- Edelstein, R. S., & Gillath, O. (2008). Avoiding interference: Adult attachment and emotional processing biases. *Personality and Social Psychology Bulletin*, 34, 171–181.
- Ein-Dor, T., Mikulincer, M., & Shaver, P. R. (2011). Attachment insecurities and the processing of threat-related information: Studying the schemas involved in insecure people's coping strategies. *Journal of Personality and Social Psychology*, 101(1), 78–93.
- Finnbogadóttir, H., & Berntsen, D. (2011). Involuntary and voluntary mental time travel in high and low worriers. *Memory*, 19(6), 625-640.

- Fitzgerald, J. M., & Broadbridge, C. L. (2013). Latent constructs of the autobiographical memory questionnaire: A recollection-belief model of autobiographical experience. *Memory*, 21(2), 230–48.
- Ford, J. H., Addis, D. R., & Giovanello, K. S. (2012). Differential effects of arousal in positive and negative autobiographical memories. *Memory*, 20(7), 771–778.
- Fraley, R. C., Garner, J. P., & Shaver, P. R. (2000). Adult attachment and the defensive regulation of attention and memory: The role of preemptive and postemptive processes. *Journal of Personality and Social Psychology*, 79, 816–826.
- Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, 78(2), 350.
- Fraley, R. C., & Shaver, P. R. (1997). Adult attachment and the suppression of unwanted thoughts. *Journal of Personality and Social Psychology*, 73, 1080–1091.
- Fraley, R. C., & Brumbaugh, C. C. (2007). Adult attachment and preemptive defenses: Converging evidence on the role of defensive exclusion at the level of encoding. *Journal of Personality*, 75(5), 1033–50.
- Gentzler, A., & Kerns, K. (2006). Adult attachment and memory of emotional reactions to negative and positive events. *Cognition & Emotion*, 20, 20–42.
- Habermas, T., & Diel, V. (2010). The emotional impact of loss narratives: event severity and narrative perspectives. *Emotion*, 10(3), 312.
- Hall, N. M., & Berntsen, D. (2008). The effect of emotional stress on involuntary and voluntary conscious memories. *Memory* 16(1), 48–57.
- Harris, C. B., Rasmussen, A. S., & Berntsen, D. (2013). The functions of autobiographical memory: An integrative approach. *Memory*, 21, 1–23.

- John, O. P., & Gross, J. J. (2007). Individual differences in emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation*, (pp. 351-372). Guilford Press.
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, 117(4), 371.
- Holland, A. C., & Kensinger, E. A. (2010). Emotion and autobiographical memory. *Physics of Life Reviews*, 7(1), 88–131.
- Kohn, J. L., Rholes, W. S., & Schmeichel, B. J. (2012). Self-regulatory depletion and attachment avoidance: Increasing the accessibility of negative attachment-related memories. *Journal of Experimental Social Psychology*, 48(1), 375–378.
- Kuyken, W., & Brewin, C. R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology*, 104(4), 585.
- Little, T. D. (1997). Mean and covariance structures (MACS) analyses of cross-cultural data: Practical and theoretical issues. *Multivariate Behavioral Research*, 32, 5376.
- Merckelbach, H., & Muris, P. (2001). The causal link between self-reported trauma and dissociation: A critical review. *Behaviour Research and Therapy*, 39(3), 245-254.
- Mikulincer, M., & Orbach, I. (1995). Attachment styles and repressive defensiveness: The accessibility and architecture of affective memories. *Journal of Personality and Social Psychology*, 68, 917–925.
- Mikulincer, M. & Shaver, P. R. (2007). *Attachment in adulthood: Structure, Dynamics, and Change*. New York: Guilford Press.
- Mikulincer, M., Dolev, T., & Shaver, P. R. (2004). Attachment-related strategies during thought suppression: ironic rebounds and vulnerable self-representations. *Journal of personality and social psychology*, 87(6), 940–56.

- Mikulincer, M., & Shaver, P. R. (2005). Attachment theory and emotions in close relationships: Exploring the attachment-related dynamics of emotional reactions to relational events. *Personal Relationships*, 12(2), 149–168.
- Mikulincer, M., Birnbaum, G., Woddis, D., & Nachmias, O. (2000). Stress and accessibility of proximity-related thoughts: Exploring the normative and intraindividual components of attachment theory. *Journal of Personality and Social Psychology*, 78(3), 509.
- Noesselt, T., Bergmann, D., Hake, M., Heinze, H. J., & Fendrich, R. (2008). Sound increases the saliency of visual events. *Brain Research*, 1220, 157-163.
- Pasupathi, M. (2003). Emotion regulation during social remembering: Differences between emotions elicited during an event and emotions elicited when talking about it. *Memory*, 11(2), 151-163.
- Pereg, D., & Mikulincer, M. (2004). Attachment style and the regulation of negative affect: exploring individual differences in mood congruency effects on memory and judgment. *Personality & Social Psychology Bulletin*, 30(1), 67–80.
- Preacher, K.J., & Hayes, A.F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.
- Qualtrics, Provo, UT, USA. <http://www.qualtrics.com>
- Rasmussen, A. S., & Berntsen, D. (2009a). Emotional valence and the functions of autobiographical memories: positive and negative memories serve different functions. *Memory & Cognition*, 37(4), 477–92.
- Rasmussen, A. S., & Berntsen, D. (2009b). The possible functions of involuntary autobiographical memories. *Applied Cognitive Psychology*, 23(8), 1137-1152.

- Rasmussen, A. S., & Berntsen, D. (2013). The reality of the past versus the ideality of the future: emotional valence and functional differences between past and future mental time travel. *Memory & cognition*, 41(2), 187–200.
- Richards, J. M., Butler, E. A., & Gross, J. J. (2003). Emotion regulation in romantic relationships: The cognitive consequences of concealing feelings. *Journal of Social and Personal Relationships*, 20(5), 599-620.
- Rubin, D. C. (2005). A basic-systems approach to autobiographical memory. *Current Directions in Psychological Science*, 14(2), 79-83.
- Rubin, D. C. (2005). A basic-systems approach to autobiographical memory. *Current Directions in Psychological Science*, 14(2), 79-83.
- Rubin, D. C., & Siegler, I. C. (2004). Facets of personality and the phenomenology of autobiographical memory. *Applied Cognitive Psychology*, 18(7), 913-930.
- Scoboria, A., Mazzoni, G., Kirsch, I., & Relyea, M. (2004). Plausibility and belief in autobiographical memory. *Applied Cognitive Psychology*, 18(7), 791-807.
- Shaver, P. R., & Mikulincer, M. (2007). Adult attachment strategies and the regulation of emotion. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 446–465). New York: Guilford Press.
- Shum, M. S. (1998). The role of temporal landmarks in autobiographical memory processes. *Psychological Bulletin*, 124(3), 423.
- Simpson, J. A., Rholes, W. S., & Winterheld, H. A. (2010). Attachment working models twist memories of relationship events. *Psychological Science*, 21(2), 252–9.
- Selçuk, E., Günaydın, G., Sümer, N., & Uysal, A. (2005). A new measure for adult attachment styles: The psychometric evaluation of Experiences in Close Relationships-Revised (ECR-R) on a Turkish sample. *Turkish Psychological Articles*, 8, 1–11.

- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7(4), 422.
- Suengas, A. G., & Johnson, M. K. (1988). Qualitative effects of rehearsal on memories for perceived and imagined complex events. *Journal of Experimental Psychology: General*, 117(4), 377.
- Sutin, A. R., & Robins, R. W. (2005). Continuity and correlates of emotions and motives in self-defining memories. *Journal of Personality*, 73(3), 793-824.
- Sutin, A. R., & Robins, R. W. (2007). Phenomenology of autobiographical memories: The memory experiences questionnaire. *Memory*, 15(4), 390-411.
- Talarico, J. M., LaBar, K. S., & Rubin, D. C. (2004). Emotional intensity predicts autobiographical memory experience. *Memory & Cognition*, 32(7), 1118-1132.
- Talarico, J. M., & Rubin, D. C. (2007). Flashbulb memories are special after all; in phenomenology, not accuracy. *Applied Cognitive Psychology*, 21(5), 557-57
- Talarico, J. M., & Rubin, D. C. (2003). Confidence, not consistency, characterizes flashbulb memories. *Psychological Science*, 14(5), 455-461.
- Thomsen, D. K., Schnieber, A., & Olesen, M. H. (2011). Rumination is associated with the phenomenal characteristics of autobiographical memories and future scenarios. *Memory*, 19(6), 574-584.
- Van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance. *European Journal of Developmental Psychology*, 9(4), 486-492.
- Walker, W. R., Skowronski, J. J., Gibbons, J. A., Vogl, R. J., & Ritchie, T. D. (2009). Why people rehearse their memories: Frequency of use and relations to the intensity of emotions associated with autobiographical memories. *Memory*, 17(7), 760-773.
- Widaman, K.F. (1985). Hierarchically nested covariance structure models for multitrait multimethod data. *Applied Psychological Measurement*, 9, 126.

Wilson, A., & Ross, M. (2003). The identity function of autobiographical memory: Time is on our side. *Memory*, *11*(2), 137-149.

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

Items	
Event Characteristics	
1. Event Intensity:	I felt intense emotions at the time of the event
2. Importance.	It is an important event in my life.
3. Consequentiality.	This memory has consequences for my life because it influenced my behavior, thoughts, or feelings in noticeable ways.
4. Self Definition	It is one of the events that tells much about who I am
5. Valence*	As I recall them now, I would you rate the emotions I experienced during the event as... (to very negative to very positive)
Rehearsal Characteristics	
1. Talking	Since it happened, I have talked about this event.
2. Voluntary Thinking	Since it happened, I have thought about this event.
3. Involuntary Thinking	Since it happened, the event has come to my mind unintentionally
Phenomenological Characteristics	
1. Current Intensity	I can feel now the emotions that I felt then
2. Reliving	As I remember the event, I feel as though I am reliving the original event.
3. Auditory Imagery	As I remember the event, I can hear it in my mind.
4. Visual Imagery	As I remember the event, I can see it in my mind.

*This item was not included in the model, but was used to check for the valence of the reported memory.

Footnotes

¹We further tested the model in which error variances were also constrained to be equal for both types of memories however at this level, the model diverged significantly from the scalar invariant model, even when we considered the artificial inflations in chi-square due to the number of constraints. This indicated that observed variables, in other words, unique items representing memory qualities, were not measured identically across groups. Measurement invariance at this final step was expected and actually we were primarily concerned for the variation at this level so that we could examine the item-specific differences arising from the individual differences in levels of anxiety and avoidance.

²In order to test the consistency of the measurement model across different memory types, additional analyses were conducted with the data collected in our lab. We used data coming from self-defining, emotional, goal-related memories, all of which were collected with an almost similar procedure. The factor structure, as well as factor loadings were found to be invariant across memory types, $\Delta \chi^2 < 20.090$ ($\Delta df = 8$). Links between the indicators and the latent constructs were found to be significant with the exception of self-definition and importance for goal-related memories. In further analyses, chi-square difference for the model of invariant intercepts was found to be significant, however, the intercepts for the self-definition and importance were not constrained, partial invariance of the intercepts were established. Partial invariance of the intercepts ensures the equality of the comparable elements in the model (Byrne, Shavelson, & Muthen, 1989; Dimitrov, 2006) and for current purposes, model of equal factor loadings was considered sufficient to demonstrate the consistency of the latent construct across different memories.

³Although the effect was moderately significant ($p = .05$), the effect was considered significant since the values corresponding to 95% confidence intervals did not involve a zero point (Cheung & Lau, 2008; Preacher & Hayes, 2008).

Figure Captions

Figure 1. Latent construct model of autobiographical memory

^aThe link was insignificant for negative memories.

Figure 2. Mediation patterns in the autobiographical memory model as a function of attachment styles

^aThe link specifies the total effect involved in the mediation between Avoidance and Phenomenological Characteristics.

^bMediation between Avoidance and Rehearsal Characteristics was found only for negative memories.

^cMediation between Memory Age and Phenomenological Characteristics was found only for negative memories.