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Ece, Berivan ; Demiray, Burcu ; Öner, Sezin ; Gülgöz, Sami

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Comparison of Earliest and Later Autobiographical Memories in Young and Middle-Aged Adults

Genç ve Orta Yaşlı Yetişkinlerin En Eski ve Daha Sonraki Otobiyografik Anılarının Karşılaştırılması

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ABSTRACT

The current study examined earliest memories of young and middle-aged adults in comparison to a recent autobiographical memory and a free-report one from any life phase. These three types of memories were compared in terms of their memory characteristics such as vividness, emotionality, importance, confidence, and rehearsal frequency. A total of 319 young (18-30 years) and 112 middle-aged (40-65 years) adults completed the online survey. Results showed that earliest memories were rated either similar to or lower than later memories in their memory characteristics. More specifically, they received lower ratings than free-report memories in all memory characteristics whereas they did not significantly differ from recent memories only in importance and emotionality. In addition, free-report memories were highest in emotionality, importance and rehearsal frequency whereas recent memories were highest in vividness and confidence ratings. Compared to young adults, middle-aged adults provided higher ratings for all memory characteristics in general, and they further recalled earliest memories from an older age. Finally, the order of reporting the three types of memories (earliest memory first versus recent memory first) was examined with respect to its potential influence on memory characteristics and dating of the recalled memories. Results displayed no significant effect of the reporting order on memory characteristics. Dating of the earliest and free-report memories, however, was significantly affected by the reporting order. The mean age for earliest memories was higher when it was retrieved following the recent memory compared to the reporting order in which earliest memories are retrieved and reported first. Overall, results indicated that earliest memories are not particularly special compared to later memories (e.g., free-report memories) in terms of their memory characteristics, and they are vulnerable to experimental manipulation such as characterizing the reporting order just like other types of autobiographical memories.

Keywords: Earliest memory, age group differences, midlife

ÖZ

Bu araştırma genç ve orta yaşta yetişkinlerin en eski anılarını, yakın geçmişlerinden hatırladıkları anıları (yakın) ve hayatlarının herhangi bir evresinden hatırladıkları anıları (serbest) karşılaştırmayı amaçlamıştır. Bu üç tip anı (en eski, yakın ve serbest), canlılık, duygusallık, önem, eminlik ve tekrar sıklığı gibi anı özellikleri açısından karşılaştırılmıştır. Toplam 319 genç (18-30 yaş) ve 112 orta yaşta (40-65 yaş) yetişkin internet üzerinden çevrimiçi olarak anketi tamamlamıştır. Bulgular en eski anıların sonraki iki anı tipine kıyasla olay özellikleri bakımından ya benzer ya da daha düşük değerlendirildiğini göstermiştir. Daha detaylı açıklamak gerekirse, en eski anıların serbest anılara oranla tüm olay özelliklerinde anlamlı düzeyde düşük değerlendirilmiş olduğu, yakın anılara kıyasla ise duygusallık ve önem özellikleri dışında geri kalan tüm olay özelliklerinde aynı şekilde düşük değerlendirilmiş olduğu gözlemlenmiştir. Buna ek olarak, serbest anıların duygusallık, önem ve tekrar sıklığı özelliklerinde en yüksek değerleri gösterirken yakın otobiyografik anıların canlılık ve eminlik özelliklerinde en yüksek değerleri gösterdiği görülmüştür. Yaş grupları arasındaki farklılıklar incelendiğinde ise orta yaşta yetişkinlerin genel olarak tüm olay özelliklerinde genç yetişkinlere kıyasla daha yüksek değerlendirmeler yaptıkları ve en eski anılarını daha geç yaşlardan hatırladıkları gözlemlenmiştir. Son olarak, bu üç anı tipinin hatırlanma ya da rapor edilme sırasının (en eski anının ilk anlatılması veya yakın anının ilk anlatılması) olay özellikleri ve hatırlanan anıların tarihinin saptanması üzerinde olası etkileri incelenmiştir. Bulgular, anı tiplerinin rapor edilme sırasının olay özellikleri üzerinde anlamlı bir etkisi olmadığını göstermiştir. Fakat, hatırlanma sırası hatırlanmış olan en eski ve serbest anıların zaman tahminlerini anlamlı düzeyde etkilemiştir. Örneğin, en eski anıların geldiği ortalama yaşın, yakın anılardan sonra çağırıldıklarında ilk olarak en eski anının hatırlandığı duruma kıyasla daha yüksek olduğu gözlemlenmiştir. Genel olarak, bulgular en eski anıların olay özellikleri bakımından diğer anı tiplerine göre çok da özel olmadığını ve rapor edilme sırasının değiştirilmesi gibi deneysel manipülasyonların etkisine diğer anılara benzer şekilde açık olduklarını öne sürmüştür.

Anahtar Kelimeler: En eski anılar, yaş grupları farklılıkları, orta yaş

The earliest age from which adults can recall autobiographical memories varies between three and four years (e.g., Bruce et al., 2005; Dudycha & Dudycha, 1941; Eacott & Crawley, 1998; Wang, 2006). This represents both the offset of childhood amnesia (e.g., Davis, Gross, & Hayne, 2008) and the onset of the autobiographical memory system (e.g., Eacott, 1999). Thus, earliest memories have a conceptually special status in autobiographical memory research, as they seem to reflect a turning point in memory processes in general, and autobiographical memory in particular. Further empirical research is necessary, however, to examine how special or different earliest memories are compared to other autobiographical memories.

The current study empirically examines whether earliest memories are different from later autobiographical memories in three ways. First, it compares earliest memories with two other autobiographical memories (i.e., a recent memory and a freely chosen memory from any life phase) in terms of their phenomenological and psychological characteristics (e.g., vividness) to examine whether earliest memories have different characteristics. In doing so, the current study contributes to the scant research that compares earliest memories with later autobiographical memories (e.g., Cohen-Mansfield, Shmotkin, Eyal, Reichental, & Hazan, 2010; Howes, Siegel, & Brown, 1993; Tylenda & Dollinger, 1987). Second, the current study compares the characteristics of earliest, recent and free-report memories across two age groups (i.e., young and middle-aged adults) to examine whether adults from two different developmental stages recall their memories differently with respect to their characteristics. Finally, the current study examines whether these memory characteristics and the reported date of memories are influenced by temporal context created by an order manipulation: the order in which participants are asked to retrieve their autobiographical memories (earliest memory first, followed by the recent and the free-report memory versus recent memory first, followed by the earliest and the free-report memory). This is a novel test detecting whether memories', especially earliest memories' characteristics and estimated age are vulnerable to experimental manipulation. In sum, the present study contributes to the autobiographical memory literature by investigating earliest memories in comparison to two later memories in terms of various memory characteristics, age group differences, and the order of retrieval in order to explore whether earliest memories are special or different from later autobiographical memories.

Theoretical Accounts of Earliest Memories

Although the ability of long-term retrieval is present very early in childhood (e.g., Peterson, Moores, & White, 2001), the earliest age from which people can recall their earliest memories is between three and four years (Eacott & Crawley, 1998). This is a major dilemma in the earliest childhood memory literature, which has highlighted three major theoretical accounts to explain the onset of the autobiographical memory system and adults' recollections of their earliest memories: cognitive self-account, social interactionist account and the self-memory system account.

The *cognitive self-account* is based on the argument that event memories become autobiographically organized with the development of a *cognitive self* between 18-24 months of age (e.g., Howe, Courage, & Edison, 2003). Infants younger than two years old can retain memories to a certain extent, but they cannot retain them as part of a structured self-system (Conway & Pleydell-Pearce, 2000). Thus, the way these early childhood memories are encoded in that period does not allow them to be recalled at later periods of life. The *social interactionist account* emphasizes the critical role of parent-child interaction and memory sharing experiences in the development of the autobiographical memory system (Fivush, 1994; Tessler & Nelson, 1994). According to this account, adults cannot recall events that are encoded before they have learned the norms of narrating and sharing their memories (Fivush & Schwarzmueller, 1998). These two accounts focus on *encoding* processes as the major reason underlying childhood amnesia: Adults cannot recall memories from the first years of life, as these memories have not been *encoded* autobiographically as part of the cognitive self or in line with narrative norms.

The *self-memory system (SMS) model*, on the other hand, focuses on *retrieval* processes. It proposes that autobiographical memories, including earliest memories, are constructed during retrieval in line with the current goals and needs of the self-based on the demands of the current context (Bluck, Alea, & Demiray, 2010; Conway & Pleydell-Pearce, 2000). According to this model, the lack of autobiographical memories before the age of three stems from the discrepancy between the active goals during encoding in infancy and the active goals during retrieval in adulthood (Demiray & Bluck, 2011). According to the SMS model, earliest memories represent the first events in life that fit with one's current goals. The present study embraces the SMS model (Conway & Pleydell-Pearce, 2000), and uses the SMS model as its theoretical basis to examine earliest memories in comparison with other memories. In opposition to the other two accounts, the SMS model

is well suited to address the three aims of the current study, and explain how and why (1) adults may recall their earliest memories with different characteristics than their later memories, (2) adults from different developmental stages may recall their memories, especially earliest memories, with different characteristics, and (3) the order in which adults retrieve their memories may have an impact on the characteristics and reported date of these memories. The following three sections focus on these issues in detail.

Characteristics of Earliest Memories Compared to Later Memories

The majority of studies on earliest memories ask participants to report their earliest memory from life, to date this memory, and to rate it in terms of some memory characteristics without a focus on other memories (e.g., Kihlstrom & Harackiewicz, 1982; Mullen, 1994). One important memory characteristic examined with earliest memories is emotionality. Some researchers have reported that the majority of earliest memories do not include any emotional information (Howes et. al., 1993; Mullen, 1994), while others observed moderate levels of emotionality in these memories (Wang, Conway, & Hou, 2004). Eacott (1999), on the other hand, argued that the recall of earliest memories is usually linked to strong emotions. Earliest memories have been rarely compared with memories from other periods of life in terms of emotionality (Howes et. al., 1993). For example, Tylanda and Dollinger (1987) compared earliest memories with a recent significant memory and found that earliest ones were emotionally less important than recent memories. In terms of emotional valence, findings are contradictory. Earliest memories are rated as either pleasant or positive (Kihlstrom & Harackiewicz, 1982; Williams & Bonvillian, 1989) or negative (Cowan & Davidson, 1984; Harpaz-Rotem & Hirst, 2005; Howes et. al., 1993; Usher & Neisser, 1993). In terms of emotional intensity, these memories are not high, but their intensity tends to increase as the age at earliest memory increases (Harpaz-Rotem & Hirst, 2005; Wang, 2001; Wang et. al., 2004). In sum, earliest memories seem to be either less emotionally loaded or no different than later memories.

With respect to perceptual information, vision is the most commonly studied sensory modality in earliest memory research (Kihlstrom & Harackiewicz, 1982; Westman, Westman, & Orellana, 1996). When earliest memories are compared with later ones, there is no consensus on whether they should be perceptually richer or poorer. Johnson, Foley, Suengas and Raye (1988) claimed that earliest memories should not be rich in perceptual information. In line with this claim, West and Bauer (1999) found no

difference between earliest memories and memories after age seven. Howes, Siegel, and Brown (1993), however, showed that memories from before age two contained more color, imagery and spatial properties than memories from above two. In contrast, Westman and Orellana (1996) reported that the clarity of visual aspects was higher in memories from elementary school and high school than in earliest memories, which had the lowest clarity of sensory components. Finally, earliest memories were reported to have moderate levels of vividness by Wang, Conway, and Hou (2004). In sum, due to these mixed results, it would be misleading to conclude that earliest memories are special in terms of their vividness or perceptual richness.

The importance of earliest memories attracted less research attention compared to emotionality and vividness. Limited research shows that earliest memories do not carry high personal significance (Wang et al., 2004), they are less associated with current adult self-characteristics such as environmental mastery (Demiray & Bluck, 2011), and they are perceived as less personally meaningful when compared to memories from later periods of life (West & Bauer, 1999).

Finally, two widely studied memory characteristics have not been examined with earliest memories: confidence in memory and frequency of rehearsal. First, individuals may deliberately *remember* experiencing a past event or they may only *know* that the event occurred, although they cannot remember it clearly (e.g., Gardiner, 1988; Tulving, 1985). Individuals may be less confident or accurate about their earliest memories compared to more recent memories. Second, people rehearse certain memories more frequently than others (Walker, Skowronski, Gibbons, Vogl, & Ritchie, 2009). The present study explored both of these memory characteristics in earliest memories and later memories to better understand how these memories differ from each other.

In sum, current findings in the literature show that earliest memories are not particularly special, but that they rather seem to be ordinary with moderate levels of emotionality and vividness, and low personal importance. These findings are neither compatible with the special status attributed to earliest memories, nor effective in explaining why these memories are still memorable in adulthood. The current study aims to shed more light on this issue by examining earliest memories in comparison to recent and free-report memories with respect to emotionality, vividness, importance, confidence in the reality of memory, and rehearsal frequency in two different age groups.

Age Group Differences in Memory Characteristics

Though the SMS model (Conway, Singer, & Tagini, 2004) presents a significant relation between current self-goals and autobiographical memory, it does not elaborate on the impact of development on this relation. Life span developmental psychologists show that the self-changes across the adult life span with its changing developmental tasks, goals and characteristics (e.g., Baltes, Lindenberger, & Staudinger, 1998; Ebner, Freund, & Baltes, 2006). Thus, the characteristics of one's memories should vary depending on where one is in the life span (Bluck et al., 2010). Despite the vast body of research on autobiographical memory in early childhood, young adulthood and late life, there is a lack of research on middle-aged adults' autobiographical memories (Dixon, De Frias, & Maitland, 2001). Lack of research on midlife is mainly due to its historical conceptualization as a stable phase (approximately between ages 40-60) that lacks problems worth psychological study in general (Staudinger & Bluck, 2001), and memory problems in particular. Although declines in episodic memory start to occur during midlife (Craik, 2000), these declines are not as dramatic or interesting as the changes in autobiographical memory in late life (Dixon et al., 2001). Furthermore, most studies showing declines in episodic memory in midlife are laboratory studies that examine performance in the recall of words, sentences, stories or pictures (Craik, 2000). Thus, there is a need for further research on how middle-aged adults recall different types of memories from their lives (e.g., earliest versus recent) and rate them compared to other age groups in terms of phenomenological and psychological characteristics. Only two studies have examined the earliest memories of middle-aged adults, and these studies had different aims than the current study aims: Demiray and Bluck (2011) did not examine memory characteristics and Multhaup, Johnson, and Tetirick (2005) investigated only the age of earliest memories.

Many life span developmental psychologists consider midlife as the peak of life, which is a time of higher self-esteem (Robins & Trzesniewski, 2005), higher conscientiousness and lower neuroticism (e.g., Soto, John, Gosling, & Potter, 2011), higher achievement and generativity in various life domains compared to young adulthood (e.g., Freund & Ritter, 2009). It is when individuals experience highest levels of psychological well-being with high autonomy, environmental mastery, personal growth and purpose in life (Ryff, 1991; Ryff & Keyes, 1995). It is also the period when most people start to engage in life review and life reflection that involve reminiscing

about, evaluating and meaning making from personal experiences (e.g., Erikson, 1959; Jung, 1971; Neugarten, 1968). All of these positive characteristics and developmental gains in midlife, especially the life reflection activity may lead middle-aged individuals to recall their memories in a qualitatively different way than younger individuals. If they reminisce about and reflect on their memories more often than young adults, they may rate their memories higher in terms of psychological and phenomenological characteristics. In sum, the current study contributes to the literature and fills this gap in the adult life span by examining middle-aged adults' both earliest and later memory characteristics. It compares middle-aged adults with young adults to explore potential age differences in how people recall their earliest and later memories.

The Effect of Retrieval Order on Dating Memories

As the SMS model states, autobiographical memories are reconstructed each time they are retrieved, which makes them open to modifications and errors (Conway & Pleydell-Pearce, 2000). Earliest memories may be among those that are most vulnerable, as they involve a long time lag between encoding and retrieval. With an increasing time lag, errors come to the scene especially in the dating of events such as the *telescoping* error (Rubin & Baddeley, 1989; Thompson, Skowronski, & Lee, 1988). The telescoping error can occur in two ways: either *forward* by assigning a more recent date to an actually earlier memory or *backward* by dating an originally later event as earlier (Gottfredson & Hindelang, 1977; Janssen, Chessa, & Murre, 2006). Different factors may lead to the telescoping error. For example, Prohaska and colleagues (1998), and Rubin and Baddeley (1989) argued that the telescoping error might result from the procedures used to collect memories from participants and from the question format. Question format has been found to be influential on the reported age of earliest memories as well (Jack & Hayne, 2007). Finally, Wang and Peterson (2014, 2016) investigated dating of earliest memories longitudinally in children samples and concluded that earliest memories could be earlier than we think due to certain dating biases or errors like telescoping. In short, reconstructive nature of recollection can make dating of earliest memories vulnerable to errors just like any other memory retrieval.

The current study claims that the dating of autobiographical memories may be influenced by temporal context: The order in which participants are asked to retrieve their memories (earliest memory first, followed by the recent and the free-report memory versus recent memory first, followed by the earliest and the free-report memory) should

influence the reported age during the recollected events. That is, following the retrieval of a recent memory, earliest memories may be reported as more recent than they actually are (forward telescoping): Recalling a later event first may prime a particular life period which may affect the accuracy of dating other memories from another period. Similarly, the retrieval of recent memories may be influenced by the retrieval of earliest memories before them. When preceded by an earliest childhood memory, a recent memory may be mistakenly dated as earlier than it actually is (backward telescoping): Remembering the earliest memory first may prime this early period of life, and lead one to date an originally later event as earlier (Gottfredson & Hindelang, 1977; Janssen, Chessa, & Murre, 2006). Similarly, the dating of the free-report memories might be affected by which memory precedes it (i.e., earliest versus recent).

In sum, research shows that autobiographical memories, particularly earliest memories are vulnerable to experimental manipulation such as changing the question format (e.g., Jack & Hayne, 2007). Manipulating the reporting order of memories may influence the average age obtained for all memories, including earliest memories. “What is the earliest age from which adults can recall memories?” is the most important and commonly studied question in the earliest memory literature and the current study aims to investigate if the answer of that question, namely dating processes of earliest memories, can be affected by experimental manipulation. The present study also examines the potential effect of the order manipulation on memory characteristics, but this investigation is exploratory.

The Present Study: Hypotheses

The present study has three major aims. The first aim is to compare earliest memories with later memories (i.e., recent and free-report memory) in terms of emotionality, vividness, importance, confidence in the reality of memory, and rehearsal frequency to examine how earlier memories differ from later memories.

Hypothesis 1a. Previous research indicated that earliest memories had moderate levels of emotionality and vividness, and low levels of importance compared to later memories (e.g., Tylenda & Dollinger, 1987; West & Bauer, 1999). For that reason, we hypothesize that earliest memories will receive lower ratings in memory characteristics of importance, emotionality, rehearsal frequency, confidence, and vividness compared to both recent and free-report memories.

Hypothesis 1b. Recent memories tend to have an advantage in terms of vividness and confidence because of the shorter time lag between the encoding and the retrieval of the event (i.e., recency effect; Atkinson & Shiffrin, 1968). Free-report memories, on the other hand, may have a different advantage. More specifically, individuals tend to report highly important, emotional and frequently rehearsed events when they are instructed to report events from their lives (Ece & Gülgöz, 2017). On the basis of such earlier findings, we hypothesize that compared to recent memories, free-report memories will receive higher ratings in importance, emotionality and rehearsal frequency, but lower ratings in vividness and confidence in the reality of memory.

The second aim of the study is to investigate age group differences (i.e., middle-aged versus young adults) in the recall of earliest, recent and free-report memories with respect to five memory characteristics. An additional exploratory analysis is the comparison of young and middle-aged adults' reported age during their earliest memories.

Hypothesis 2. Compared to young adults, middle-aged adults are expected to provide higher ratings for all memory types (i.e., earliest, free-report, and recent) in terms of the memory characteristics of importance, emotionality, rehearsal frequency, confidence, and vividness.

The final study aim is to examine whether memory characteristics and the reported date of memories are influenced by the order in which participants are asked to retrieve their memories (i.e., earliest memory first, followed by the recent and the free-report memory versus recent memory first, followed by the earliest and the free-report memory). The examination of order effects on memory characteristics was exploratory; but the effect of order on the date of memories was examined with specific hypotheses:

Hypothesis 3a. The reported age of the person during their earliest memory is expected to be higher when the earliest memory is retrieved right after the recent memory, compared to when the earliest memory is retrieved first, followed by the recent memory.

Hypothesis 3b. The reported age of the person during their free-report memory is expected to be higher when preceded by the reporting of a recent memory, compared to when preceded by the earliest memory.

METHOD

Participants

A total of 552 Turkish adults completed the online survey. To ensure data quality, participants who did not follow instructions (e.g., provided a general memory rather than a specific memory), who did not complete the items properly (e.g., gave the same response to all survey items), who spent too little (less than five minutes) or too much time (more than one hour) on the survey, and who were younger than 18 years or between 30 and 40 years were excluded (a total of 121 individuals). The final sample consisted of 431 individuals divided into two age groups: Young adults (18-30 years) and middle-aged adults (40-65 years). There were 319 young adults (89 male) with a mean age of 24.84 ($SD = 3.09$), and 112 middle-aged adults (39 male) with a mean age of 48.49 ($SD = 6.53$). One percent of the young sample had a Ph.D. degree, 26% had a Master's degree, 43% had a Bachelor's degree, and 30% had a high school degree. Forty two percent of these young adults were either undergraduate or graduate students who did not work, and 38% of them worked full time. Twelve percent were both students and working, whereas the remaining 8% were neither students nor employees (e.g., new university graduates who were looking for jobs). Twenty four percent of the middle-aged adults had a Ph.D. degree, 21% had a Master's degree, 43% had a Bachelor's degree, and 12% had a high school degree. Of the middle-aged adults, 74% were employed full time, and 22% were unemployed or retired. The remaining 4% were students. All participants volunteered to take part in the study and received no compensation.

Materials and Procedure

The authors sent a standard e-mail requesting colleagues, friends, and other interested parties to participate in the study and to forward to others the online survey. The e-mail stated that the study was investigating adults' memories from their lives and that participation would take approximately 30 minutes. After participants electronically signed the informed consent form and completed demographic questions, they started the actual survey. They were asked to recall and write down three autobiographical memories: earliest memory, a recent memory, and a free-report memory from any life phase. Randomly selected half of the sample was asked to recall their earliest memory first followed by a very recent memory, and finally a free-report memory. The other half of the participants was asked to recall a recent memory first, followed by their earliest

memory, and finally a free-report memory (i.e., the free-report memory was always requested as the third memory).

For the earliest memory, participants were asked to take a moment to think back to their childhood and to identify the very earliest event/experience they could recall. Instructions emphasized that the memory should be their own, not an episode that they had seen in a picture or heard about from others. The recent memory instructions were to report the most recent personal event/experience that they could remember (e.g., It could be what they did just before beginning the survey). Finally, the free-report memory instructions were to report any event/experience that occurred any time between the earliest childhood memory and the recent memory. For all three memories, participants were asked to report the first memorable events that came to mind without limitation as to content or valence. They were asked to write in detail what they were doing, thinking, and feeling at the time of these events in a standard text box of 800 characters. This narrative length was determined through pilot testing as appropriate for capturing participants' memory narratives. Examples of earliest, recent and free-report memories are presented in Table 1.

Table 1. Examples of Earliest, Free-report and Recent Memories

Earliest childhood memories

- I received a lot of birthday presents.
- I remember that my brother was going to school.
- I remember having a family photograph.

Free-report memories

- I remember my wedding day.
- I gave birth to my daughter.
- My father died.

Recent memories

- I had dinner with my friends last week.
 - I had a doctor visit.
 - I played with my cat.
-

After writing down a memory narrative, participants were asked to answer six questions about that specific memory. First, they reported the date of the event in months and years (If they did not recall the exact date, they were asked to report their best estimate). Participants, then, rated the importance, emotionality and vividness of the memory. Finally, they reported how confident they felt about their recall of the memory and how frequently they rehearsed the memory by thinking and talking about it. These questions on memory characteristics were presented in random order for each participant. All ratings were made on five-point scales (1 = *not at all*; 5 = *very much*). Once one memory had been recalled and rated, the same procedure was followed for the second and the third memory.

RESULTS

Preliminary Analyses

Preliminary analyses examined potential differences in demographic variables (i.e., sex, education, employment status) to identify any necessary control variables. MANOVAs with major study variables (i.e., importance, confidence, vividness, emotionality and rehearsal) entered as dependent variables and demographic variables entered as independent variables were conducted separately for earliest, recent and free-report memories. For all memory types, there was a significant main effect for sex. For earliest memories, women not only provided higher ratings in emotionality and rehearsal than men but also rated their recent and free-report memories as more important and emotional than men, all $p < .05$. Thus, sex was entered as a covariate in the major analyses. There were no significant education or employment status differences in major study variables.

ANOVAs were conducted separately for earliest, recent and free-report memories to identify demographic differences in the age of the recalled memories. For all memories, there were no sex, education or employment status differences, all $p > .05$. Finally, Pearson's correlations were conducted for all memory characteristics separately for earliest, recent and free-report memories, and are reported in Table 2.

Table 2. Pearson Correlation Coefficients between Memory Characteristics Separately for Earliest, Free-report and Recent Memories

Memory type	Importance	Emotionality	Rehearsal	Confidence	Vividness
Earliest childhood memories					
Importance	-				
Emotionality	.63*	-			
Rehearsal	.25*	.25*	-		
Confidence	.13*	.09	.09	-	
Vividness	.16*	.18*	.22*	.38*	-
Free-report memories					
Importance	-				
Emotionality	.60*	-			
Rehearsal	.48*	.43*	-		
Confidence	.16*	.19*	.28*	-	
Vividness	.21*	.26*	.40*	.46*	-
Recent memories					
Importance	-				
Emotionality	.67*	-			
Rehearsal	.64*	.52*	-		
Confidence	-.03	-.04	.03	-	
Vividness	.09	.01	.05	.21*	-

Note. * $p < .01$ (tablo içindeki asterikler teke indirilip bu değışiklik yapılmalı)

Major Analyses

In order to test the study hypotheses, a repeated-measures MANOVA was conducted to examine whether (1) earliest, recent and free-report memories differed in terms of their characteristics, (2) there were any age group differences in the characteristics of these memories, and whether (3) order of reporting memories influenced memory characteristics and the dating of recalled memories. The dependent variables were five memory characteristics (i.e., importance, emotionality, rehearsal, confidence, and vividness). The within-subjects variable was memory type (i.e., earliest childhood memory, recent memory and free-report memory), and the between-subjects variables were age group (i.e., young versus middle-aged adults) and order of reporting memories (i.e., earliest memory first versus recent memory first). Sex was entered as a control variable.

First, multivariate test results are presented. Results showed a significant main effect for sex, $F(5, 350) = 6.30, p < .001, \eta_p^2 = .08$. Age group showed a significant main effect, $F(5, 350) = 4.03, p < .001, \eta_p^2 = .05$, as well as the order of reporting memories, $F(5, 350) = 5.13, p < .001, \eta_p^2 = .07$. The interaction between age group and order was not significant, $F(5, 350) = 1.38, p = .23$. Results indicated a significant main effect for the within-subjects variable, memory type, $F(10, 345) = 20.82, p < .001, \eta_p^2 = .38$. That is, earliest, recent and free-report memories significantly differed from each other in terms of the set of five memory characteristics. In line with the expectations, there was a significant interaction between memory type and age group, $F(10, 345) = 2.26, p < 0.05, \eta_p^2 = .06$. Young and middle-aged adults significantly differed from each other in terms of the set of five characteristics of memories. Regarding the third study aim, there was no significant interaction between memory type and order of reporting memories, $F(10, 345) = 1.61, p = .10$. Finally, the three-way interaction between memory type, age group and order of reporting memories was not significant, $F(10, 345) = 1.08, p = .38$.¹

Post hoc comparisons of the adjusted means were conducted using Bonferroni correction to examine the location of the significant effects. Earliest, recent and free-report memories were compared in terms of the five memory characteristics to test the hypothesis 1a and 1b. Three patterns of results were obtained: First, earliest ($t(430) =$

1 For simplicity, two-way interactions (i.e., Memory Type x Order, Memory Type x Age Group, Memory Characteristic x Age Group) and three-way interactions (i.e., Memory Type x Age Group x Order, Memory Characteristic x Age Group x Order) that were non-significant (F ranges from 0.54 – 2.65, all $p > .05$) and irrelevant to study aims have not been discussed. The four-way interaction between memory type, memory characteristic, order of reporting and age group was also non-significant, $F(8, 347) = 1.07, p = .39$.

1.03, $p > .05$) and recent ($t(430) = 0.78, p > .05$) memories received similar ratings for importance and emotionality but they were rated significantly lower than the free-report memories in these two characteristics, (earliest: $t(430) = 7.52, p < .001$ and recent: $t(430) = 8.63, p < .001$). Second, free-report memories were rehearsed more frequently than recent memories ($t(430) = 5.11, p < .001$), which were rehearsed more often than earliest memories ($t(430) = 4.60, p < .001$). Finally, recent memories received significantly higher ratings than free-report memories in confidence ($t(430) = 2.90, p < .001$) and vividness ($t(430) = 6.02, p < .001$). Moreover, free-report memories were rated higher than earliest memories in confidence ($t(430) = 10.52, p < .001$) and vividness ($t(430) = 14.13, p < .001$). The adjusted and unadjusted means for importance, emotionality, rehearsal, confidence and vividness are presented separately for earliest, recent and free-report memories in Table 3. In sum, supporting Hypothesis 1a, earliest memories received either similar or lower ratings in memory characteristics. More specifically, they were similar to recent memories in terms of importance and emotionality, but received the lowest ratings in rehearsal frequency, confidence and vividness. Finally, fully supporting Hypothesis 1b, free-report memories received the highest ratings in importance, emotionality and rehearsal frequency, but lower ratings in confidence and vividness compared to recent memories.

Table 3. Adjusted and Unadjusted Means for Earliest, Free-report and Recent Memory Characteristics

Memory type	Unadjusted <i>M</i> (<i>SD</i>)	Adjusted <i>M</i> (<i>SE</i>)
Earliest childhood memories		
Importance	3.71 (1.16)	3.80 (0.07)
Emotionality	3.47 (1.24)	3.57 (0.07)
Rehearsal	2.53 (0.76)	2.58 (0.04)
Confidence	4.38 (0.75)	4.43 (0.04)
Vividness	3.60 (0.98)	3.70 (0.06)
Free-report memories		
Importance	4.36 (0.95)	4.41 (0.06)
Emotionality	4.23 (1.06)	4.29 (0.06)
Rehearsal	3.34 (1.02)	3.36 (0.06)
Confidence	4.81 (0.47)	4.83 (0.03)
Vividness	4.20 (0.92)	4.22 (0.05)
Recent memories		
Importance	3.57 (1.18)	3.71 (0.07)
Emotionality	3.33 (1.40)	3.49 (0.08)
Rehearsal	2.81 (1.15)	2.94 (0.07)
Confidence	4.93 (0.32)	4.92 (0.02)
Vividness	4.57 (0.70)	4.56 (0.04)

In order to investigate the second study aim, we compared young and middle-aged adults in terms of the characteristics of their earliest, recent and free-report memories. The adjusted and unadjusted means for all memory characteristics separately for earliest, recent and free-report memories are presented separately for young and middle-aged adults in Table 4. For earliest memories, middle-aged adults gave higher ratings in importance, emotionality, confidence and vividness than young adults, t values ranged between 1.99 – 3.73, all $p < .05$ (i.e., The only memory characteristic that received similar ratings across the two age groups was rehearsal, $t(430) = 0.66, p = .51$). For recent memories, middle-aged adults gave higher ratings in importance, emotionality and frequency of rehearsal than young adults; t values ranged between 1.99 – 3.03, all $p < .05$. Young and middle-aged adults rated their recent memories similarly in terms of confidence and vividness, all $p > .05$. Finally, middle-aged adults rated their free-report memories higher than young adults in importance ($t(430) = 1.96, p < .05$) and emotionality ($t(430) = 2.13, p < .05$). They were not significantly different from young adults in terms of rehearsal, confidence or vividness, all $p > .05$. In sum, mostly supporting Hypothesis 2, middle-aged adults gave higher ratings than young adults for the importance and emotionality for all three types of memories. They gave higher or similar ratings compared to young adults for the other memory characteristics (i.e., rehearsal frequency, confidence and vividness) as a function of the type of memory.

Table 4. Adjusted and Unadjusted Means for Earliest, Free-report and Recent Memory Characteristics in Two Age groups

Memory Type	Unadjusted M (SD)		Adjusted M (SE)	
	Young	Middle-aged	Young	Middle-aged
Earliest childhood memories				
Importance	3.63 (1.16)	3.94 (1.13)	3.67 (0.07)	3.94 (0.12)
Emotionality	3.37 (1.22)	3.76 (1.21)	3.36 (0.07)	3.77 (0.12)
Rehearsal	2.54 (0.76)	2.52 (0.77)	2.55 (0.05)	2.61 (0.08)
Confidence	4.32 (0.76)	4.54 (0.70)	4.34 (0.05)	4.52 (0.07)
Vividness	3.51 (1.00)	3.85 (0.88)	3.49 (0.06)	3.90 (0.09)
Free-report memories				
Importance	4.30 (0.96)	4.51 (0.88)	4.30 (0.06)	4.52 (0.10)
Emotionality	4.16 (1.10)	4.41 (0.91)	4.15 (0.07)	4.42 (0.11)
Rehearsal	3.31 (1.04)	3.42 (0.98)	3.30 (0.06)	3.42 (0.11)
Confidence	4.79 (0.51)	4.88 (0.36)	4.78 (0.03)	4.88 (0.05)
Vividness	4.17 (0.95)	4.28 (0.86)	4.15 (0.06)	4.29 (0.09)
Recent Memories				
Importance	3.51 (1.20)	3.74 (1.11)	3.58 (0.07)	3.85 (0.12)
Emotionality	3.25 (1.43)	3.57 (1.31)	3.29 (0.08)	3.69 (0.14)
Rehearsal	2.73 (1.16)	3.05 (1.12)	2.74 (0.07)	3.14 (0.12)
Confidence	4.94 (0.28)	4.90 (0.40)	4.94 (0.02)	4.90 (0.03)
Vividness	4.59 (0.70)	4.50 (0.70)	4.55 (0.04)	4.56 (0.07)

As part of the second study aim, we also explored age group differences in people's age during their earliest memories. ANOVA results showed that young adults recalled their earliest memories from a significantly earlier age ($M = 3.87$, $SD = 1.52$) than middle-aged adults ($M = 4.38$, $SD = 2.05$), $F(1, 422) = 7.55$, $p = .006$, $\eta_p^2 = .02$.

Finally, the third study aim was to examine whether the order of reporting memories (i.e., earliest memory first versus recent memory first) affected memory characteristics, and the dating of these memories. The effect of order on memory characteristics was tested with the interaction between memory type and order of reporting. As this interaction was non-significant ($F(2, 460) = 1.61$, $p = .10$), we concluded that the order of reporting memories did not have an impact on how adults rated the characteristics of their earliest, recent or free-report memories.

In order to test how the order of reporting memories influenced the dating of these memories, ANOVAs were conducted separately for earliest, recent and free-report memories. For earliest memories, person's age during the event was entered as the dependent variable (rather than the age of the memory itself) to control for age group differences in the age of earliest memories. As expected in Hypothesis 3a, results showed that when the earliest memory was reported first, participants recalled their earliest memories from a somewhat earlier age ($M = 3.67$, $SD = 1.37$) than when the recent memory was recalled first followed by the earliest memory ($M = 4.39$, $SD = 1.93$), $F(1, 421) = 19.33$, $p < .001$, $\eta_p^2 = .04$. For the age of recent memories, there was no significant difference between the two order conditions, $F(1, 427) = 0.86$, $p = .35$. As expected and requested in the study instructions, participants recalled recent memories from the previous three months on average ($M = 0.25$, $SD = 1.57$). Finally, for the age of free-report memories, we controlled for age group to eliminate the age group differences in the age of free-report memories. In line with Hypothesis 3b, results showed that when the earliest memory was reported first (i.e., when the recent memory was recalled right before the free-report memory), participants recalled more recent free-report memories ($M = 7.26$, $SD = 10.00$) than when the recent memory was reported first followed by the earliest memory ($M = 11.50$, $SD = 11.19$), $F(1, 356) = 12.09$, $p = .001$, $\eta_p^2 = .03$.²

2 The same pattern of results was found for both young and middle-aged adults' earliest, recent and free-report memories.

The order of reporting was also explored individually for each age group to detect the potential differences in the pattern of results. The reporting order had a significant effect on the age from which earliest memories were recalled for both young adults ($F(1, 312) = 14.28, p < .001, \eta^2_p = .04$) and middle-aged adults ($F(1, 108) = 4.40, p = .04, \eta^2_p = .02$). More specifically, when earliest memories were reported first, young adults ($M = 3.60, SD = 1.33$) and middle-aged adults ($M = 3.96, SD = 1.48$) reported younger ages for their earliest memories compared to the condition in which they reported their earliest memories as the second memory following the recent one ($M = 34.24, SD = 1.67$ and $M = 4.77, SD = 2.42$, respectively). The reported age of the recent memories was not affected by the reporting order in either young or middle-aged groups. For the free-report memories, results displayed a differential pattern for young adults and middle-aged adults such that reporting order had a significant effect on the age from which free-report memories only for the middle-aged adults ($F(1, 94) = 4.50, p = .04, \eta^2_p = .02$). When preceded by the earliest memories, middle-aged adults reported earlier free-report memories ($M = 27.67, SD = 14.59$) compared to the condition in which their free-report memories were preceded by the recall of recent memories ($M = 33.80, SD = 13.61$). In sum, these additional analyses of provided further support for the effect of reporting order and showed the importance of the critical role of the preceding memory regarding timing.

DISCUSSION

The current study examined earliest memories by comparing them with later memories in terms of various phenomenological and psychological characteristics in two different age groups. The age from which young and middle-aged adults remembered their earliest childhood memories is in line with previous research showing that infantile amnesia wanes between age three and four (e.g., Davis et al., 2008; Eacott, 1999). The age at the time of the earliest memories obtained in the present research is also similar to those observed in other studies conducted with Turkish samples (e.g., Demircan 2012; Ece, Demiray, & Gülgöz, 2019; Göz, Çeven, & Tekcan, 2017; Yıldırım, Soncu-Büyükişcan, Çolak, Akpınar, & Altan, 2018). In general, current findings were in line with the hypotheses: (1a) Earliest memories were rated lower in all memory characteristics than later memories, (1b) free-report memories were higher in importance, emotionality and rehearsal frequency, but lower in vividness and confidence in the reality of memory than recent memories, (2) middle-aged adults generally rated

both earliest and later memories higher on memory characteristics than young adults, and (3a) the age of earliest and (3b) free-report memories differed as a function of retrieval order. Overall, results indicated that earliest memories are not particularly special or different from later memories in terms of memory characteristics, and they are vulnerable to experimental manipulation. Detailed discussion of the results is presented below.

The Comparison of Earliest and Later Memories in Terms of Memory Characteristics

The first study aim was to compare earliest memories with later memories in terms of emotionality, vividness, importance, confidence in the reality of the memory, and rehearsal frequency due to the limited number of studies comparing earliest and later memories (e.g., Cohen-Mansfield et. al., 2010). As predicted, earliest memories were rated either similar to or lower than later memories in these memory characteristics. More specifically, they were not different from recent memories in terms of importance and emotionality, but they were lower in the remaining characteristics. They were rated lower than free-report memories in all memory characteristics.

In terms of importance and emotionality, earliest memories were found to be similar to recent memories, which are dominated by ordinary events from the past few weeks, and rated quite low in importance and emotionality. This shows that earliest memories are not perceived as important or emotional. These findings are in line with previous research showing that earliest memories are not personally very meaningful (Wang et al., 2004), and they are emotionally less important than recent memories (Tylenda & Dollinger, 1987). As presented in Table 1, events reported as earliest and recent memories were quite ordinary ones, therefore it is not surprising that they are attributed low importance and emotionality. Clearly, content analyses of different memory types may shed light on the differences observed in memory characteristics such as emotionality and importance. According to the SMS model, emotions experienced during an event, just like any other perceptual detail, are considered as event-specific knowledge (Holland & Kensinger, 2010). Memories are reconstructed during retrieval based on the current needs and goals of the self (Bluck et. al., 2010), thus, emotions, like any other event-specific knowledge, may affect the construction of memories during retrieval. Previous research revealed that emotional valence of an event has an effect on the retrieval of that event (Berntsen & Rubin, 2002), and its memory's accuracy

(Kensinger, 2009). Current findings show that memories that were perceived as more emotional were also rated as more important (See Table 2). Similarly, Storbeck and Clore (2005) reported that emotional arousal resulted in mnemonic advantage by increasing the importance of the experienced event. In short, emotionality and importance are noteworthy characteristics of autobiographical memories, but they seem to be low for both earliest and recent memories. Despite their low level in these memory characteristics, earliest memories are not forgotten, but still retrieved in adulthood. According to the SMS model, people are able to retrieve their memories as long as the memories somehow fit with the current goals and characteristics of the self (Conway et al., 2004). Earliest memories, which are very remote, show a relation with current self characteristics that is much weaker than the relation of memories from the last year (Demiray & Bluck, 2011), and consequently they are evaluated lower in importance and emotionality. These findings show that earliest memories are not special in terms of their emotionality or importance compared to later memories.

Among the three memory types examined in the current study, earliest memories were the ones with the lowest rehearsal frequency. Rehearsal frequency of an event may be linked to its importance and emotionality: In the current study, rehearsal frequency is positively associated with emotionality and importance for all memory types (See Table 2). It is possible that the low emotionality and importance of earliest memories may be accompanied by their infrequent rehearsal. As a result of infrequent rehearsal, memory traces of these earliest childhood events may get weaker leading to retrieval difficulty (Atkinson & Shiffrin, 1968). In that respect, Walker et al. (2009) reported that different types of rehearsals have different implications for autobiographical memories in terms of retrieval and emotion. In short, it is clear that rehearsal is crucial for the retrieval of memories in general, but earliest memories were the least frequently rehearsed memories in the current study. This shows that earliest memories are not privileged in terms of rehearsal frequency either.

Findings also showed that the vividness and confidence ratings of earliest memories were lower than both free-report and recent memories. The weaker memory traces for earliest childhood events resulting from relatively infrequent rehearsal may further affect the confidence and vividness ratings for these memories. Another explanation is that these two memory characteristics are closely linked to the time lag between the actual experience of the event and its subsequent recall. The time lag is shortest for

recent memories, which helps individuals to recall these memories more vividly, and to be more confident about their recall (recency effect; Rubin & Schulkind, 1997b). The current findings showed a positive association between vividness and confidence for all memory types, including earliest memories, which have the longest time lag. Because of the longer time lag, vividness is weaker for earliest memories resulting in relatively low confidence. The SMS model highlights the importance of the match between memories and the current self goals, for retrieval quality. As aforementioned, earliest memories are less matching with the current goals of the self (Demiray & Bluck, 2011). Thus, earliest memories may be lower in vividness due to the longer time lag between the encoding and retrieval of the event, and their relatively weaker fit with the current demands and goals of the self.

Finally, free-report and recent memories were also compared in terms of their memory characteristics. As predicted, free-report memories were higher in importance, emotionality and rehearsal frequency, but lower in confidence and vividness than recent memories. When compared to earliest memories, free-report memories were rated higher in all memory characteristics. Previous research shows that when adults are asked to recall personal memories from their lives, memories from young adulthood are overrepresented (Rubin & Schulkind, 1997b). This phenomenon, the reminiscence bump, is one of the most robust findings on the life span distribution of autobiographical memories (Demiray, Gülgöz, & Bluck, 2009; Fitzgerald & Shifley-Grove, 1999). Several accounts have been proposed to explain the reminiscence bump such as cognitive account (Pillemer, 2001; Robinson, 1992; Rubin, Rahhal, & Poon, 1998), life script account (Berntsen & Rubin, 2004), identity formation account (Conway & Pleydell-Pearce, 2000; Fitzgerald, 1988, 1996; Holmes & Conway, 1999), and cognitive abilities account (Janssen, Kristo, Rouw, & Murre, 2015; Janssen & Murre, 2008; Rubin et al., 1998). All these accounts are focusing on different characteristics of the life events corresponding to the reminiscence bump period ranging from their novelty and distinctiveness to their link to biological maturation and development of self. In a nutshell, autobiographical memories reported within the reminiscence bump are usually evaluated as highly emotional and important (Brown & Schopflocher, 1998; Rubin & Schulkind, 1997a). Thus, it is possible that when people are asked to recall a free-report memory from any period of their lives, they are more likely to report memories that are highly important and emotional, which are likely to come from the reminiscence bump. Due to their relatively high level of importance and

emotionality, these events may benefit from frequent rehearsal, which further adds to their advantaged status in terms of long-term retrieval and to their stronger memory characteristics compared to other memories. As presented in Table 1, free-report memories reflect mostly important life events (e.g., wedding day) that are also observed in life scripts research (e.g., Thomsen & Berntsen, 2008). On the basis of the SMS model (Conway & Pleydell-Pearce, 2000), we can argue that reminiscence bump memories may be the best fitting ones with the current self-goals. As a result, they may be advantaged in terms of both retrieval and memory characteristics. Earliest memories, on the other hand, may be less representative of the current goals of the self (Demiray & Bluck, 2011), and consequently lower in memory characteristics. Finally, recent memories, although mostly trivial, unemotional and unimportant, may be retrieved due to the shorter time lag between encoding and retrieval compared to the other memories.

In sum, earliest memories do not seem to be special compared to other memories, despite their relatively special status in autobiographical memory literature. The present findings fit well with the SMS model (Conway & Pleydell-Pearce, 2000): All memories are reconstructed during retrieval on the basis of their match with the current goals of the self, and our results showed that memories differ in terms of their characteristics as a function of their degree of fit with the current self. In conclusion, earliest memories, compared to later memories, are not particularly special, at least with respect to emotionality, importance, vividness, rehearsal frequency and confidence in the reality of memory.

Age Group Differences in Memory Characteristics

The second aim of the study was to explore potential age group differences in memory characteristics for both earliest and later memories. As predicted, for all three types of memories, middle-aged adults were more likely to provide higher ratings for memory characteristics than young adults. More specifically, they provided higher ratings than young adults in (a) importance, emotionality, confidence and vividness for their earliest memories, (b) importance, emotionality and rehearsal frequency for recent memories, and (c) importance and emotionality for their free-report memories. That is, they rated all three types of memories higher in importance and emotionality compared to younger adults. Although young adults gave similar ratings for some memory characteristics, they never gave higher ratings than middle-aged adults.

Although there is almost no research on how middle-aged individuals might differ

from adults of other ages in terms of their memory characteristics, there is some work with older adults. Some studies find that older adults' memories are as qualitatively rich in detail (e.g., vividness) and emotion as young adults' memories (e.g., Bluck, Levine, & Laulhere, 1999). Other studies show that older adults' memories are more emotional than younger adults' memories (e.g., Alea, Bluck, & Semegon, 2004). The current findings are also in this direction showing that middle-aged adults remember all three types of memories as more emotional and important than young adults, and in line with the socioemotional selectivity theory (Carstensen, 1995). This life span developmental theory suggests that emotional goals change across the life span (as people have shorter time left to live), with information-gaining being of high priority for young adults, and emotion regulation and the creation of emotional meaning becoming more important with age (Carstensen, Isaacowitz, & Charles, 1999). For example, as people age, they prefer to spend time with emotionally important social partners (Carstensen et al., 1999), and emphasize emotional dimensions more in their mental representations of social partners (Frederickson & Carstensen, 1990). This theory has also demonstrated how aging is related to experiencing fewer negative emotions, and greater attention to and memory for emotional and especially positive stimuli (i.e., positivity effect; Mather & Carstensen, 2005). Furthermore, through the process of life review and life reflection (Staudinger, 2001), middle-aged individuals may be thinking more about their past and analyzing their memories in terms of their emotions and personal significance more than young adults. In line with these previous developmental findings, the current middle-aged sample may be rating all three memories as more emotional and personally important than young adults.

The observed age group differences in memory characteristics also support the SMS model (Conway & Pleydell-Pearce, 2000), showing that young and middle-aged adults recall and rate their memories differently due to their different self characteristics, developmental goals and needs (Bluck et al., 2010). As middle-aged adults focus more on emotion-oriented goals and life reflection activities, they give all three memories more personal importance and emotional meaning. In contrast, young adults who are motivated to construct and maintain a self-concept (Rice & Pasupathi, 2010) and to hold knowledge-oriented goals (Carstensen et al., 1999), may be focusing less on their memories, but more on their current and future goals. This age group difference holds for three different types of memories that come from very different points in life, which

bolsters the SMS model interpretation that the current self goals shape how people retrieve all of their autobiographical memories.

In terms of their earliest memories, middle-aged adults gave higher ratings than young adults also in terms of vividness and confidence. Although their earliest memories are much older than young adults' earliest memories (about 45 years old for middle-aged adults versus 20 years old for young adults), they recall these memories more vividly, and they are more confident about their recall than young adults. Similarly, Demiray and Bluck (unpublished raw data) found that middle-aged adults recalled their earliest memories more vividly than young adults, and rated these memories as good representations of who they are more than young adults did. Although the current midlife sample talks and thinks about their earliest memories as often as young adults (i.e., rehearsal), they recall these memories more vividly and confidently than the young. These results indicate that middle-aged adults may be rehearsing their earliest memories in a qualitatively different way (if not quantitatively different) than young adults. In line with their emotion-oriented goals and life reflection activities, they may be thinking about and recalling their earliest memories more deeply.

Finally, young adults recalled their earliest memories from an earlier age ($M = 3.87$) than middle-aged adults ($M = 4.38$). This does not fit with Demiray and Bluck's (2011) finding that young adults ($M = 4.53$) and middle-aged adults ($M = 4.74$) showed no differences between age at earliest memory. Although the current age groups' age at earliest memory is in line with previous research (e.g., Davis et al., 2008), it is unclear what makes middle-aged adults recall more recent earliest memories. Replication studies are necessary to make firm conclusions about age differences in the age at earliest memories.

In sum, the current study contributes to the little research conducted on middle-aged adults' autobiographical memory in general, and earliest memories in particular. Current findings come from three very different types of memories from very different life phases (i.e., earliest, free-report, recent), but they present a common pattern such that middle-aged adults rate them as more important and emotional than young adults. This suggests that those in midlife, due to their current self-characteristics and developmental goals, may have a tendency to rate all of their autobiographical memories as more important and emotional than younger individuals.

The Effect of Retrieval Order on The Dating of Earliest and Later Memories

The final aim of the study was to examine whether memory characteristics and the reported date of memories were influenced by the order in which they were reported: Earliest memory first, followed by the recent and the free-report memory versus recent memory first, followed by the earliest and the free-report memory. First of all, our exploratory analyses showed that there were no significant differences in memory characteristics as a function of order. That is, phenomenological and psychological characteristics of retrieved memories are resistant to an experimental manipulation such as changing the retrieval order. This finding is discussed in more detail below in combination with the effect of retrieval order on the dating of earliest and free-report memories.

Manipulating the retrieval order of earliest and recent memories had an impact on the mean ages provided for both earliest and free-report memories despite having no effect on memory characteristics. As predicted, when earliest memories were reported following a recent memory, the mean age at event was higher compared to the condition in which the earliest memories were reported first. Earliest memories, however, were not the only memory type affected by retrieval order. The mean age of the free-report memories was also lower when preceded by earliest memories, whereas it was higher when preceded by recent memories. Clearly, the temporal context during reporting was influential on the age from which the memories were retrieved. One possible explanation is that reporting an earlier or later memory first may prime individuals for a particular period of life, and memories close to this primed period may be more readily accessible. We further argue that while activation of a certain period may prime certain memories; it may also inhibit the accessibility of others belonging to periods that are not close to the primed time point. Thus, the earliest memories reported may differ as a function of not only the time and the order individuals are asked to retrieve, but also the exact timing of the preceding memory.

The effect of retrieval order was also investigated for young adults and middle-aged adults separately. Both age groups reported later earliest memories when preceded by the recent memories compared to the condition in which earliest memories reported first. That's to say, the pattern of results obtained in the overall sample remained unchanged for earliest memories when analyzed individually for each age group. For recent memories, the pattern was the same again with no significant differences in the

reported ages as a function of the retrieval order. For free report memories, however, the two age groups displayed different patterns. To be more specific, reporting order had no effect on the estimated ages of free-report memories for young adults whereas middle-aged reported earlier reported memories when preceded by earliest memories rather than recent memories. This may result from the fact that the range for the possible estimated ages is narrower for young adults due to their ages. Therefore, the susceptibility to manipulation or flexibility can be higher for the middle-aged adults regarding their age estimations of free-report memories. Future research with different age groups such as adolescents and elderly can shed more light on that age group differences in that particular pattern of results.

Retrieval order had an impact on the mean age of the earliest and free-report memories, but had no effect on memory characteristics. One explanation for this difference may be that reporting the age at which the event was experienced requires dating, hence, may be more vulnerable to the effects of the passage of time compared to memory characteristics. One does not have to date the memory to judge its importance or vividness, but dating may be required to retrieve the age at event. Previous research investigates the effect of the passage of time on dating, showing more errors with increasing time lags between encoding and retrieval (e.g., Barclay & Wellman, 1986; Burt, 1992). Therefore, reported ages for the retrieved autobiographical memories may be influenced by the manipulation of the retrieval order, while memory characteristics remain unaffected due to their independence of dating.

The observed differences in the mean ages for these memories as a function of retrieval order supports the major claim of the SMS model (Conway & Pleydell-Pearce, 2000) that autobiographical memories are reconstructed during retrieval based on the demands of the current context. That is, the temporal context during retrieval may affect and may be affected by the current goals and needs of the self. However, data from multiple sources, in addition to self-report, is required to understand the possible mechanisms underlying this effect. For example, do people retrieve totally different memories when reporting in different temporal contexts or is it just the dating of the memories that is affected by these contextual differences (telescoping error)? We cannot be sure that individuals really remember different later or earlier events as a result of manipulating the reporting order. It is also possible that people remember exactly the same events as their earliest memories in every condition they are asked, but the reported age at event may be affected by the preceding

memory. In other words, what is influenced may not be the reported event itself, but the age attached to that memory or its dating. When preceded by a later event, people may mistakenly date their earliest memories later as a result of the forward telescoping error (Gottfredson & Hindelang, 1977; Janssen et. al, 2006). Likewise, following the reporting of earliest memories, people may date their free-report memories as earlier as a result of the backward telescoping error. Dating errors are especially critical for earliest memories; as such errors seem to increase as the retention interval increases (e.g., Barclay & Wellman, 1986; Burt, 1992; Friedman & Wilkins, 1985).

Differences in the dating of earliest memories as a function of temporal context manipulation point to the fact that we should be careful about broad conclusions regarding such observed differences in earliest memories. For example, Wang (2001) reported cross-cultural differences in the earliest memories of American and Chinese university students such that the earliest memories of Chinese participants were six months later compared to that of Americans. Similarly, American participants' earliest memories came from a significantly earlier age than Taiwanese individuals (Wang, 2006). The current study, however, shows that the dating of these memories is affected even by a simple manipulation such as changing the retrieval order. In addition, the reported age at earliest memories displayed age group differences. Thus, retrieval order and age group are just two of many potential factors, such as culture, that may affect the dating and rating of earliest memories. It may be misleading to attribute observed group differences to a very broad factor like culture and to claim that autobiographical recall is a cultural practice (Wang & Brockmeier, 2002). These differences may be a byproduct of many other aspects such as age, gender, temporal context, socioeconomic status in addition to cultural practices.

Limitations and Future Research

The current study had some limitations. It compared the memories of only young and middle-aged adults. The obtained findings need to be investigated with a full adult life span sample (e.g., emerging adulthood, young adulthood, early midlife, late midlife, late life) to examine differences in memory characteristics across the adult life span. The study employed a cross-sectional design, thus all age group differences are cross-sectional rather than life span developmental differences. One promising future study may use a longitudinal design and include repeated reports of memories from the same individuals over time. With also a different manipulation of temporal context, this study can

examine whether (a) the same events will be reported each time as the earliest ones, and (b) the same events will be dated consistently regardless of the temporal manipulation. This study could also test the consistency of earliest memories as individuals go through different developmental stages. Future research can also gather information about the actual dates of memories from other possible sources (e.g., parents, videos, photos) to find out whether individuals engage in the telescoping error when dating their memories, especially earliest memories. Another limitation of the current study can be the online data collection method. Although participants who did not complete the online survey within a certain amount of time were excluded, there were other factors that could still affect their responses. For example, the context was not standard for each participant and there was no researcher to monitor. Moreover, it is possible that they asked their parents about the events or checked dates from other sources. In sum, novel procedures with higher control, standardization, and manipulations may be developed to distinguish different effects of temporal context on the retrieval and dating of autobiographical memories in general, and earliest memories in particular.

CONCLUSIONS

In conclusion, the present study shows that earliest memories are not particularly special compared to recent and free-report autobiographical memories. They receive lower ratings on various memory characteristics (e.g., vividness) than later memories. With respect to age group differences in memory characteristics, middle-aged adults give higher ratings than young adults for not only earliest memories, but for all memory types. Thus, earliest memories are not special regarding age group differences either. Finally, earliest memories are vulnerable to an experimental manipulation, and the mean age obtained for these memories differ as a function of retrieval order. In sum, the present study contributed to the autobiographical memory literature by comparing earliest memories with two types of later memories (i.e., recent and free-report) in two different age groups (i.e., young and middle-aged adults) with respect to certain memory characteristics (e.g., emotionality) and vulnerability to order effects.

The current study supports the major argument of the SMS model (Conway & Pleydell-Pearce, 2000) that autobiographical memories are reconstructed during retrieval based on the demands and goals of the current self (Bluck et. al., 2010; Conway & Pleydell-Pearce, 2000). Current findings indicate that differences in the characteristics

of earliest, free-report and recent memories may stem from their different degrees of fit with the current self. Free-report memories, which are usually personally important life story events, may be the best fitting ones resulting in higher memory characteristics. Earliest and recent memories, on the other hand, may be matching less with the current self goals, and so may be lower in memory characteristics. Age group differences in memory characteristics also support the SMS model showing that adults from different developmental stages hold different goals that lead them to rate their memories differently. Examining the strength of the match between current self goals and memories may be a fruitful way of understanding their psychological and phenomenological characteristics, age group differences in retrieval and retrieval errors such as dating errors. The SMS model can be used and even further elaborated with future research on these issues.

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References

- Alea, N., Bluck, S., & Semegon, A. B. (2004). Young and older adults' expression of emotional experience: Do autobiographical narratives tell a different story? *Journal of Adult Development, 11*, 235-250. doi:10.1023/B:JADE.0000044527.52470.5d
- Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), *The psychology of learning and motivation: Advances in research and theory* (pp. 89-105). New York: Academic Press. doi:10.1016/S0079-7421(08)60422-3
- Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life-span theory in developmental psychology. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Theoretical models of human development* (pp. 1029-1143). New York: Wiley. doi: 10.1002/9780470147658.chpsy0111
- Barclay, C. R., & Wellman, H. M. (1986). Accuracies and inaccuracies in autobiographical memories. *Journal of Memory & Language, 25*, 93-103.
- Berntsen, D., & Rubin, D. C. (2002). Emotionally charged autobiographical memories across the life span: The recall of happy, sad, traumatic and involuntary memories. *Psychology and Aging, 17*(4), 636-652. doi:10.1037//0882-7974.17.4.636
- Berntsen, D., & Rubin, D. C. (2004). Cultural life scripts structure recall from autobiographical memory. *Memory and Cognition, 32*, 427-442.
- Bluck, S., Alea, N., & Demiray, B. (2010). You get what you need: The psychosocial functions of remembering. In J. Mace (Ed.), *The act of remembering: Toward an understanding of how we recall the past* (pp. 284-307). UK: Blackwell Publishing Ltd. doi: 10.1002/9781444328202.ch12
- Bluck, S., Levine, L. J., & Laulhere, T. M. (1999). Autobiographical remembering and hypermnnesia: A comparison of older and younger adults. *Psychology & Aging, 14*, 671-682. doi:10.1037//0882-7974.14.4.671
- Brown, N., & Schopflocher, D. (1998). Event clusters: An organization of personal events in autobiographical memories. *Psychological Science, 9*(6), 470-475. doi:10.1111/1467-9280.00087

- Bruce, D., Wilcox-O'Hearn, L. A., Robinson, J. A., Phillips-Grant, K., Francis, L., & Smith, M. C. (2005). Fragment memories mark the end of childhood amnesia. *Memory & Cognition*, *33*, 567-576. doi: 10.3758/BF03195324
- Burt, C. D. B. (1992). Retrieval characteristics of autobiographical memories: Event and date information. *Applied Cognitive Psychology*, *6*, 389-404. doi:10.1002/acp.2350060504
- Carstensen, L. L. (1995). Evidence for a life-span theory of socio-emotional selectivity. *Current Directions in Psychological Science*, *4*, 151-156. doi:10.1111/1467-8721.ep11512261
- Carstensen, L. L., Isaacowitz, D., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist*, *54*, 165-181. doi:10.1037//0003-066X.54.3.165
- Cohen-Mansfield, J., Shmotkin, D., Eyal, N., Reichental, Y., & Hazan, H. (2010). A comparison of three types of autobiographical memories in old-old age: First memories, pivotal memories and traumatic memories. *Gerontology*, *56*, 564-573. doi:10.1159/000295113
- Conway, M.A., & Pleydell-Pearce, C. W. (2000). On the construction of autobiographical memories in a self-memory system. *Psychological Review* *107*, 261-288. doi: 10.1037//0033-295X.107.2.261
- Conway, M.A., Singer, J.A., & Tagini, A. (2004). The self and autobiographical memory: Correspondence and coherence. *Social Cognition*, *22*, 491-529. doi:10.1521/soco.22.5.491.50768
- Cowan, N., & Davidson, G. (1984). Salient childhood memories. *The Journal of Genetic Psychology*, *145*, 101-107.
- Craik, F. I. M. (2000). Age-related changes in human memory. In D. Park & N. Schwarz (Eds.), *Cognitive Aging: A primer* (pp. 75-92). Philadelphia: Psychology Press.
- Davis, N., Gross, J., & Hayne, H. (2008). Defining the boundary of childhood amnesia. *Memory*, *16*(5), 465-474. doi:10.1080/09658210802077082
- Demiray, B., & Bluck, S. (2010). [Autobiographical memory and psychological well-being in young adulthood and midlife]. Unpublished raw data.
- Demiray, B., & Bluck, S. (2011). The relation of the conceptual self to recent and distant autobiographical memories. *Memory*, *19*(8), 975-992. doi:10.1080/09658211.2011.626427
- Demiray, B., Gülgöz, S., & Bluck, S. (2009). Examining the life story account of the reminiscence bump: Why we remember more from young adulthood. *Memory*, *17*(7), 708-723.
- Demircan, M. (2012). Does the boundary of childhood amnesia depend on the narrator's age? (Master Thesis). Maltepe University, Istanbul.
- Dixon, R. A., De Frias, C. M., & Maitland, S. B. (2001). Memory in midlife. In M. E. Lachman (Ed.), *Handbook of midlife development* (pp. 248-278). New York: Wiley. doi:10.1016/B0-08-043076-7/01695-8
- Dudycha, G. J., & Dudycha, M. M. (1941). Childhood memories: A review of the literature. *Psychological Bulletin*, *38*(8), 668-682. doi: 10.1037/h0055678
- Eacott, M. J. (1999). Memory for the events of early childhood. *Current Directions in Psychological Science*, *8*(2), 46-49. doi:10.1111/1467-8721.00011
- Eacott, M. J. & Crawley, R. A. (1998). The offset of childhood amnesia: Memory for events that occurred before age 3. *Journal of Experimental Psychology, General*, *127*(1), 22-33. doi:10.1037//0096-3445.127.1.22
- Ebner, N. C., Freund, A. M., & Baltes, P. B. (2006). Developmental changes in personal goal orientation from young to late adulthood: From striving for gains to maintenance and prevention of losses. *Psychology and Aging*, *21*, 664-678. doi:10.1037/0882-7974.21.4.664

- Ece, B., Demiray, B., & Gülgöz, S. (2019). Consistency of Adults' Earliest Memories Across Two Years. *Memory*, 27(1), 28-37. doi:10.1080/09658211.2018.1458321
- Ece, B., & Gülgöz, S. (2017) Is the Road Still Bumpy Without the Most Frequent Life Events? *Applied Cognitive Psychology*, 31(3), 326–339. doi: 10.1002/acp.3330
- Erikson, E. H. (1959). *Identity and the life cycle*. New York: International Universities Press.
- Fitzgerald, J. M., & Shifley-Grove, S. (1999). Memory and affect: Autobiographical memory distribution and availability in normal adults and recently detoxified alcoholics. *Journal of Adult Development*, 6(1), 11-19. doi:10.1023/A:1021668107247
- Fivush, R. (1994). Constructing narrative, emotion and self in parent-child conversations about the past. In U. Neisser & R. Fivush (Eds.), *The remembering self: Accuracy and construction in the life narrative* (pp. 136-157). NY: Cambridge University Press. doi:10.1017/CBO9780511752858.009
- Fivush, R., & Schwarzmueller, A. (1998). Children remember childhood: Implications for childhood amnesia. *Applied Cognitive Psychology*, 12, 455–473.
- Fitzgerald, J. M. (1988). Vivid memories and the reminiscence phenomenon: The role of a self narrative. *Human Development*, 31, 261-27.
- Fitzgerald, J. M. (1996). The distribution of self-narrative memories in younger and older adults: Elaborating the self-narrative hypothesis. *Aging, Neuropsychology, and Cognition*, 3, 229-236.
- Fredrickson, B. L., & Carstensen, L. L. (1990). Choosing social partners: How old age and anticipated endings make us more selective. *Psychology and Aging*, 5, 335-347. doi:10.1037//0882-7974.5.3.335
- Freund, A. M., & Ritter, O. M. (2009). Midlife crisis: A debate. *Gerontology*, 55, 582-591. doi:10.1159/000227322
- Friedman, W. J., & Wilkins, A. J. (1985). Scale effects in memory for the time of events. *Memory & Cognition*, 13, 168-175.
- Gardiner, J. M. (1988). Functional aspects of recollective experience. *Memory & Cognition*, 16, 309-313. doi:10.3758/BF03197041
- Gottfredson, M. R., & Hindelang, M. J. (1977). A consideration of telescoping and memory decay biases in victimization surveys. *Journal of Criminal Justice*, 5(3), 205-216. doi:10.1016/0047-2352(77)90039-3
- Göz, İ., Çeven, Z. İ., & Tekcan, A. İ. (2017). Urban-rural differences in children's earliest memories. *Memory*, 25, 214-219.
- Harpaz-Rotem, I., & Hirst, W. (2005). The earliest memory in individuals raised in either traditional and reformed kibbutz or outside the kibbutz. *Memory*, 13, 51–62. doi:10.1080/09658210344000567
- Heckhausen, J. (2001). Adaptation and resilience in midlife. In M. E. Lachman (Ed.), *Handbook of Midlife Development* (pp. 345-394). New York: Wiley.
- Holland, A. C., & Kensinger, E. A. (2010). Emotion and autobiographical memory. *Physics of Life Review*, 7, 88-131. doi:10.1016/j.plrev.2010.01.006
- Holmes, A., & Conway, M. A. (1999). Generation identity and the reminiscence bump: Memories for public and private events. *Journal of Adult Development*, 6, 21–34.
- Howe, M. L., Courage, M. L., & Edison, S. C. (2003). When autobiographical memory begins. *Developmental Review*, 23, 471-494. doi:10.1016/j.dr.2003.09.001
- Howes, M., Siegel, M., & Brown, F. (1993). Early childhood memories: Accuracy and affect. *Cognition*, 47, 95–119. doi:10.1016/0010-0277(93)90001-C
- Jack, F., & Hayne, H. (2007). Eliciting adults' earliest memories: Does it matter how we ask the question? *Memory*, 15, 647–663. doi:10.1080/09658210701467087

- Janssen, S. M. J., Chessa, A. G., & Murre, J. M. J. (2006). Memory for time: How people date events. *Memory & Cognition*, *34*(1), 138-147. doi:10.3758/BF03193393
- Janssen, S. M. J., Kristo, G., Rouw, R., & Murre, J. M. J. (2015). The relation between verbal and visuospatial memory and autobiographical memory. *Consciousness and Cognition*, *31*, 12–23.
- Janssen, S. M. J., & Murre, J. M. J. (2008). Reminiscence bump in autobiographical memory: Unexplained by novelty, emotionality, valence or importance of personal events. *The Quarterly Journal of Experimental Psychology*, *61*, 1847-1860.
- 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*, 371-376. doi:10.1037//0096-3445.117.4.371
- Jung, C. G. (1971). The stages of life. In J. Campbell (Ed.), *The portable Jung* (pp. 2–22). New York: Viking.
- Kensinger, E. A. (2009). Remembering the details: Effects of emotion. *Emotion Review*, *1*, 99–113. doi:10.1177/1754073908100432
- Kihlstrom, J. F., & Harackiewicz, J. M. (1982). The earliest recollection: A new survey. *Journal of Personality*, *50*, 134-147. doi:10.1111/j.1467-6494.1982.tb01019.x
- Lachman, M.E., Ziff, M.A., & Spiro, A. (1994). Maintaining a sense of control in later life. In R. Abeles, H. Gift, & M. Ory (Eds.), *Aging and quality of life* (pp. 216-232). New York: Sage.
- MacDonald, S., Uesiliana, K., & Hayne, H. (2000). Cross cultural and gender differences in childhood amnesia. *Memory*, *8*, 365-376. doi:10.1080/09658210050156822
- Mather, M. & Carstensen, L. L. (2005). Aging and motivated cognition: The positivity effect in attention and memory. *Trends in Cognitive Science*, *9*, 496-502. doi:10.1016/j.tics.2005.08.005
- Mullen, M. K. (1994). Earliest recollections of childhood: A demographic analysis. *Cognition*, *52*, 55-79. doi:10.1016/0010-0277(94)90004-3
- Multhaup, K. S., Johnson, M. D., & Tetirick, J. C. (2005). The wane of childhood amnesia for autobiographical and public event memories. *Memory*, *13*, 161-173. doi:10.1080/09608210344000652
- Neugarten, B. L. (1968). *Adult personality: Toward a psychology of the life cycle*. Chicago: University of Chicago Press.
- Peterson, C., Moores, L., & White, G. (2001). Recounting the same events again and again: Children's consistency across multiple interviews. *Applied Cognitive Psychology*, *15*, 353–371. doi:10.1002/acp.708.abs
- Pillemer, D. B. (2001). Momentous events and the life story. *Review of General Psychology*, *5*(2), 123-134.
- Prohaska, V., Brown, N. R., & Belli, R. F. (1998). Forward telescoping: The question matters. *Memory*, *6*(4), 455-465. doi:10.1080/741942604
- Rice, C., & Pasupathi, M. (2010). Reflecting on self-relevant experiences: Adult age differences. *Developmental Psychology*, *46*, 479-490. doi:10.1037/a0018098
- Robins, R. W., & Trzesniewski, K. H. (2005). Self-esteem development across the lifespan. *Current Directions in Psychological Science*, *14*(3), 158-162. doi:10.1111/j.0963-7214.2005.00353.x
- Robinson, J. A. (1992). First experience memories: Contexts and functions in personal memories. In M. A. Conway, D. C. Rubin, H. Spinnler, & W. A. Wagenaar (Eds.), *Theoretical perspectives on autobiographical memory* (pp. 223–239). Dordrecht, NL: Kluwer Academic.
- Rubin, D. C., & Baddeley, A. D. (1989). Telescoping is not time compression: A model of the dating of autobiographical events. *Memory & Cognition*, *17*(6), 653-661. doi:10.3758/BF03202626

- Rubin, D. C., Rahhal, T. A., & Poon, L. W. (1998). Things learned in early adulthood are remembered best. *Memory and Cognition*, 26, 3-19.
- Rubin, D. C., & Schulkind, M. D. (1997a). Distribution of important and word-cued autobiographical memories in 20-, 35-, and 70-year-old adults. *Psychology and Aging*, 12(3), 524-535. doi:10.1037//0882-7974.12.3.524
- Rubin, D. C., & Schulkind, M. D. (1997b). The distribution of autobiographical memories across the lifespan. *Memory & Cognition*, 25, 859 – 866. doi:10.3758/BF03211330
- Ryff, C. D. (1991). Possible selves in adulthood and old age: A tale of shifting horizons. *Psychology and Aging*, 6(2), 286-295. doi:10.1037//0882-7974.6.2.286
- Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69(4), 719-727. doi:10.1037//0022-3514.69.4.719
- Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big-Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, 100, 330-348. doi:10.1037/a0021717
- Staudinger, U. M. (2001). Life reflection: A social cognitive analysis of life review. *Review of General Psychology*, 5, 148-160. doi:10.1037//1089-2680.5.2.148
- Staudinger, U. M. & Bluck, S. (2001). A view on midlife development from life-span theory. In: M.E. Lachman, (Ed.), *Handbook of midlife development*, (pp 3-39). New York: John Wiley and Sons. doi:10.1016/B0-08-043076-7/01695-8
- Storbeck, J., & Clore, G. L. (2005). With sadness comes accuracy; with happiness, false memory: Mood and the false memory effect. *Psychological Science*, 16, 785–91. doi:10.1111/j.1467-9280.2005.01615.x
- Tessler, M., & Nelson, K. (1994). Making memories: The influence of joint encoding on later recall. *Consciousness and Cognition*, 3, 307–326. doi:10.1006/ccog.1994.1018
- Thompson, C. P., Skowronski, J. J., & Lee, D. J. (1988). Telescoping in dating naturally occurring events. *Memory & Cognition*, 16, 461-468. doi:10.3758/BF03214227
- Thomsen, D. K., & Berntsen, D. (2008). The cultural life script and life story chapters contribute to reminiscence bump. *Memory*, 16(4), 420-435. doi:10.1080/09658210802010497
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychologist*, 40, 1-12. doi:10.1037/h0080017
- Tylenda, B., & Dollinger, S. J. (1987). Is the earliest childhood memory special? An examination of the affective characteristics of autobiographical memories. *Journal of Social Behavior and Personality*, 2, 361-368.
- Usher, J. Z., & Neisser, U. (1993). Childhood amnesia in the beginnings of memory for four early life events. *Journal of Experimental Psychology: General*, 122, 155-165. doi:10.1037//0096-3445.122.2.155
- 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. doi:10.1080/09658210903107846
- Wang, Q. (2001). Cultural effects on adults' earliest childhood recollection and self description: Implications for the relation between memory and the self. *Journal of Personality and Social Psychology*, 81(2), 220–233. doi:10.1037//0022-3514.81.2.220
- Wang, Q. (2006). Earliest recollections of self and others in European American and Taiwanese young adults. *Psychological Science*, 17, 708–714. doi:10.1111/j.1467-9280.2006.01770.x
- Wang, Q. & Brockmeier, J. (2002). Autobiographical remembering as cultural practice: Understanding the interplay between memory, self and culture. *Culture & Psychology*, 8(1), 45-64. doi:10.1177/1354067X02008001618

- Wang, Q., Conway, M. A., & Hou, Y. (2004). Infantile amnesia: A cross-cultural investigation. *Cognitive Sciences, 1*, 123–135.
- Wang, Q., & Peterson, C. (2014). Your earliest memory may be earlier than you think: prospective studies of children's dating of earliest childhood memories. *Developmental Psychology, 50*, 1680–1686. doi:10.1037/a0036001
- Wang, Q., & Peterson, C. (2016). The fate of childhood memories: Children postdated their earliest memories as they grew older. *Frontiers in Psychology: Cognition, 6*. doi: 10.3389/fpsyg.2015.02038
- West, T. A., & Bauer, P. J. (1999). Assumptions of infantile amnesia: Are there differences between early and later memories? *Memory, 7*, 257-278. doi:10.1080/096582199387913
- Westman, A. S., & Orellana, C. (1996). Only visual impressions are almost always present in long-term memories, and reported completeness, accuracy, and verbalizability of recollections increase with age. *Perceptual and Motor Skills, 83*(2), 531-539. doi:10.2466/pms.1996.83.2.531
- Westman, A. S., Westman, R. S., & Orellana, C. (1996). Earliest memories and recall by modality usually involve recollections of different memories: Memories are not amodal. *Perceptual and Motor Skills, 82*, 1131-1135. doi:10.2466/pms.1996.82.3c.1131
- Williams, R. L., & Bonvillian, J. D. (1989). Early childhood memories in deaf and hearing college students. *Merrill-Palmer Quarterly, 35*, 483-497.
- Yıldırım, E., Soncu-Büyükhahin, E., Çolak, M., Akpınar, S., & Altan, B. (2018). Childhood Amnesia: Factors Related to the Age of First Childhood Memory. *Studies in Psychology, 38*(2), 155-170.