

KOÇ UNIVERSITY  
GRADUATE SCHOOL OF SOCIAL SCIENCES & HUMANITIES

AUTOBIOGRAPHICAL MEMORY PROCESSES RELY ON SCRIPTS:  
HOW DO SCRIPTS DEVELOP AND AFFECT AUTOBIOGRAPHICAL RETRIEVAL?

BY

BERİVAN ECE

A dissertation submitted for the degree of Doctor of Philosophy at

Koç University

August 2014

KOÇ UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES & HUMANITIES

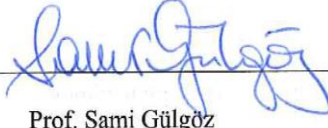
This is to certify that I have committed this copy of a Ph.D. dissertation by

Berivan ECE

and have found that it is complete and satisfactory in all respects,

and that any and all revisions required by the final examining committee have been made.

Committee members:



Prof. Sami Gülgöz



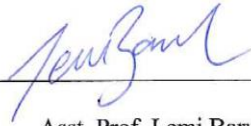
Prof. Aylin Küntay



Asst. Prof. Tilbe Gökşun



Assoc. Prof. Mine Mısırlısoy



Asst. Prof. Lemi Baruh

## Thesis Abstract

The purpose of the current dissertation was to examine effects of highly scripted frequent life events on lifespan autobiographical remembering in addition to investigate how life events become typical and scripted further affecting memory for repeated events. For that aim, three individual studies were conducted. The first one applied a novel manipulation by instructing the participant to exclude the most frequently reported life events in their reports. This novel manipulation resulted in the disappearance of the regularly observed reminiscence bump in the lifespan distribution of autobiographical memories. Suppression of typical life events also weakened the bump in the life script distribution. Thus, it was argued that characteristics of typical life events themselves may have a role in the emergence of the reminiscence bump by corresponding to that particular period of life as a result of certain biological and social constraints. The second study, questioned the possibility of inhibition in the results of the first study. More specifically, the disappearance of the bump might have resulted from an overall inhibition of the life events from the bump period as the events to be excluded were mainly coming from that period. Different from the first study, no manipulation was applied. Rather, exactly the same list of events was removed after the data collection. Once more, the robust reminiscence bump disappeared in the distribution of life scripts and autobiographical memories. Thus, the second study supported and extended the findings of the first study by showing that they were not an artifact of inhibitory processes. Finally, the third study examined memory for repeated event in a special sample with two different event types with different repetition rates. Dancers reported memories of competitions and shows and further rated their report with respect to several event qualities (e.g., importance, emotional valence). Results displayed that with repetition competitions and shows became as ordinary as watching a movie for dancers as they were similar in all event qualities at the time of retrieval. Furthermore, events remembered first were rated higher in all event qualities than the ones

reported third. Likewise, event qualities displayed a steady decline with the passage of time between encoding and retrieval. The mechanisms underlying the retrieval of particular instances among several repeated instances were discussed based on the relevant theoretical approaches. Overall, the present dissertation contributed to autobiographical memory research by showing the impact of characteristics of typical life events on the emergence of the reminiscence bump and exploring the possible mechanisms active during retrieval of recurring events.

## Tez Özeti

Bu doktora tezinin amacı tipik yaşam olaylarının otobiyografik anıların ve yaşam akışlarının dağılımı üzerindeki, özellikle anı tümseği üzerindeki, etkisini ve tekrarlanan olaylara dair bellek süreçlerini incelemektir. Bu amaçla üç farklı araştırma yapılmıştır. Birinci çalışma daha önce uygulanmamış bir manipülasyon uygulanarak tipik yaşam olaylarının engellenmesinin anı tümseği üzerindeki olası etkisini hem otobiyografik anılar hem de yaşam akışları için incelenmiştir. Bu manipülasyon sonucunda iki olay tipi için de anı tümseğinin kaybolduğu gözlemlenmiştir. Buna dayanarak, tipik yaşam olaylarının kendi bir takım biyolojik ve sosyal özellikleri sonucu belirli hayat periyotlarında yaşanmaya daha eğilimli olduğu, bunun da anı tümseğinin oluşmasında etkili olabileceği öne sürülmüştür. İkinci çalışmada ise ilk araştırmadaki sonuçların ket vurma veya engelleme süreçlerinin bir sonucu olup olmadığı araştırılmıştır. Birinci çalışmada uygulanan manipülasyonun anı tümseği dönemine denk gelen olaylara genel olarak ket vurmuş olma ihtimali incelenmiştir. İlk çalışmadan farklı olarak ikinci araştırmada veri toplama sırasında hiçbir manipülasyon uygulanmamış, aynı tipik yaşam olayları veri toplandıktan sonra veritabanından çıkarılarak analiz edilmiştir. Sonuçlar bu tipik yaşam olayları çıkarılınca hem yaşam akışı hem de otobiyografik anıların dağılımlarında anı tümseğinin bir kez daha kaybolduğunu göstermiştir. Böylece birinci araştırmanın sonuçlarının ket vurma süreçlerinden kaynaklanmadığı gösterilmiştir. Son olarak, üçüncü araştırmada özel bir örneklem grubu ve farklı tekrarlanma oranlarında iki olay tipi kullanılarak tekrar eden olaylara dair bellek süreçleri incelenmiştir. Bu amaçla, dansçılar üç yarışma, üç gösteri ve bir adet sinema anısı belirtmiş ve her anıyı bir takım olay özellikleri (örn., önem, duygusal yük ve yoğunluk) açısından değerlendirmişlerdir. Sonuçlar yarışma ve gösteri anılarının dansçılar için zaman içerisinde tekrar edildikçe sinemada film izlemek kadar sıradan hale geldiğini göstermiştir çünkü hatırlanma sırasında bu üç olay tipi birbirinden hiçbir özellikte farklılık göstermemiştir. Ayrıca, ilk hatırlanan olaylar üçüncü sırada

hatırlanan olaylara göre hemen hemen bütün olay özelliklerinde daha yüksek değerlendirilmiştir. Benzer şekilde olay özellikleri anının yaşandığı zaman ile araştırma sırasında hatırlandığı an arasında düşüş göstermiştir. Sonuçlar tekrar eden olayların hatırlanmasına dair farklı kuramlar çerçevesinde tartışılmıştır. Bütünüyle bakıldığında, bu doktora tezi tipik yaşam olaylarının kendi özelliklerinin anı tümseğinin ortaya çıkmasındaki olası rolünü göstererek ve daha önce yetişkinlerde yeterince araştırılmamış olan tekrar tekrar yaşanan olaylara dair bellek süreçlerini inceleyerek otobiyografik bellek araştırmalarına katkıda bulunmuştur.

## Acknowledgements

First and foremost, I would like to state my deepest gratitude to my advisor Prof. Sami Gülgöz for his unique guidance throughout my Ph.D. journey. It has been an honor to be his first Ph.D. student. With his enthusiasm and inspiration, he provided me encouragement, sound advice, great teaching, and good company during this journey. I appreciate all his valuable contributions of time, ideas, and funding to make my Ph.D. experience productive and distinctive.

I would like to show my gratitude to the other members of my thesis committee, Prof. Aylin Küntay, Assoc. Prof. Mine Mısırlısoy, Asst. Prof. Tilbe Göksun, and Asst. Prof. Lemi Baruh for their valuable support, and helpful suggestions. Moreover, I would like to thank Prof. Gün R. Şemin for his accompany in my research at both Koç University and Utrecht University. Finally, I would like to thank Prof. Zeynep Aycan for her patience, professional advices and consistent support every time I consulted.

The managing team of *Koç University Research in Autobiographical Memory* (KURAM) lab, Sezin Öner and Ezgi Aytürk, has contributed tremendously to my personal and professional time during my Ph.D. work. They have been a source of friendships as well as collaboration. It was my pleasure to work with all the undergraduate and graduate students took part in our research projects in KURAM lab.

I am deeply indebted to my family for their unconditional love, understanding, and encouragement whenever required. They supported me in every sphere of life and in every decision I took. Thank you.

*Berivan Ece*  
*Koç University*  
*August 2014*

*To those who live beyond the scripts*



## CONTENTS

### PREFACE

INTRODUCTION.....	1
CHAPTER 1.	
The Impact of Suppressing the Typical Life Events on the Reminiscence Bump.....	5
Abstract.....	6
Introduction.....	7
Major theoretical accounts of the reminiscence bump.....	8
Present study.....	10
Method.....	12
Participants.....	12
Materials.....	12
Procedure.....	13
Results.....	14
Discussion.....	24
Conclusion.....	29
CHAPTER 2.	
Removing Typical Life Events Eliminates the Reminiscence Bump.....	31
Abstract.....	32
Introduction.....	33
Present study.....	35
Method.....	38
Participants.....	38
Materials.....	38
Procedure.....	39
Results.....	40
Discussion.....	50
CHAPTER 3.	
Memories of Stepping into the Same River Twice.....	56
Abstract.....	57
Introduction.....	58
Autobiographical memory for repeated events.....	59
Scripts, event repetition, and memory.....	60
Theoretical background.....	63
Present study.....	66
Method.....	70
Participants.....	70
Materials.....	70
Procedure.....	71
Results.....	72
Discussion.....	80
CONCLUSION.....	86
REFERENCES.....	90

## INTRODUCTION

The major focus of the current dissertation is autobiographical remembering. In that respect, three chapters are presented focusing on the role and formation of scripts in autobiographical memory, which basically involves remembering our personal past (Conway, Wang, Hanyu, & Haque, 2005). The first chapter describes a study examining the role of typical life events on lifespan distributions of life scripts and autobiographical memories in general and the emergence of the reminiscence bump in particular. The second chapter contains a follow-up study building upon the results of the first study with a modification in the methodology with respect to the manipulation applied. The third chapter, on the other hand, focuses on autobiographical memories for repeated events. This final study aims to fill the gap in the literature regarding the memory processes for recurring life events, that are the sources of scripts, rather than the type of events often used in autobiographical memory research, namely, first-time, last-time, transitional, or life changing events. The central focus of each chapter will be outlined briefly.

Previous studies of autobiographical remembering throughout the lifespan revealed a highly consistent retrieval pattern with three basic features (Janssen, Chessa, & Murre, 2005; Rubin, Rahhal, & Poon, 1998; Rubin, Wetzler, & Nebes, 1986). The first characteristic of the distribution of events across the lifespan is the *childhood amnesia*, where the retrieval of personal memories before the age of four is severely limited (Bruce, Dolan, & Philips-Grant, 2000; Loftus, 1993; Pillemer, 1998; Usher & Neisser, 1993). The second characteristic is the *reminiscence bump*, which refers to the advantaged retrieval of memories from the period between the ages of 15 and 30 (Fitzgerald & Shifley-Grove, 1999; Janssen & Murre, 2008; Rybash & Monaghan, 1999). Finally, the third one is *recency* which is the privileged recall of memories from recent years (Rubin, 1982; Rubin, & Schulkind, 1997; Rybash, 1999). The

first two chapters of the current dissertation specifically focus on the reminiscence bump phenomenon.

The basic claim of the first chapter is that the reminiscence bump is just an artifact of the frequently reported events' characteristics themselves. In other words, most frequently reported autobiographical memories or life scripts may correspond to the reminiscence bump period as a result of certain biological and social constraints related to these events. Rather than any special type of cognitive processing during the bump period, as claimed by some researchers, it is quite likely that the events which are more readily accessible, hence frequently reported, are more likely to be experienced in that particular period of life. To explore this possibility, we first determined the top ten events reported by Turkish participants in previous research (Ece-Usta, 2010; Erdoğan, Baran, Avlar, Taş, & Tekcan, 2008). With a novel manipulation, participants were provided with this list of top ten life script events and were asked to report either autobiographical memories or life scripts other than the ones in the given list. If the reminiscence bump were a byproduct of higher accessibility of these typical life events, then, the bump should fade away when these events were not reported. However, if the bump were unaffected despite this manipulation, we could conclude that the emergence of the reminiscence bump was not a function of the characteristics of the typical life events, nor their correspondence to the bump period.

Research in the second chapter aimed to test a potential limitation of the study presented in Chapter I. This possible limitation was that instructing participants to exclude the life events in the given list may have biased them in two possible ways. It might have primed them for a particular period of life, in this case the bump period, since majority of the events in the list corresponded to that period. Second, it might have inhibited the recall of life events from the relevant life period rather than priming. The first alternative was eliminated as the

typical bump was not observed in the results. We should have obtained the bump if the participants were primed for that period. However, it was not possible to make a statement about the possibility of inhibition on the basis of our research design and findings presented in Chapter I. For that reason, we decided to investigate the effect of removing the very same life events from participants' reports without using any manipulation during data collection in a follow-up study. Thus, participants of this second study reported life scripts and autobiographical memories without a list of events to be excluded. We expected the reminiscence bump to disappear in lifespan distributions of both life scripts and autobiographical memories as a result of removing the most typical ten life events.

In the third chapter, an exploratory study on autobiographical memory for repeated events is presented. The primary purpose was to contribute to the limited research on autobiographical memory processes for recurring life events in adults. Most autobiographical memory research has focused on unique experiences such as first-time, last-time or emotional (e.g., saddest and happiest) events (e.g., Berntsen & Rubin, 2002; Demiray, Gülgöz, & Bluck, 2009; Haque & Hasking, 2010; Pillemer, 2001). As the events in the reminiscence bump period benefit from their frequent status in the life script, recalling the contents of these events benefit from the scripts for experienced events during the lifetime. Formation of scripts can be considered a function of repetition through which similarities are extracted as a general event script. In that final study, we selected a group of participants (dancers) and two specific event types (competitions and shows) with different repetition rates. Dancers reported three competitions and three shows they performed. Moreover, as a control event, they reported another recurring event, memories for a movie that they watched in the theater. For each reported memory, dancers further rated event qualities of importance, emotional valence, emotional intensity, rehearsal (frequency of thinking and talking), vividness, confidence, and clarity. Three types of events (competition, show, and movie) differed in terms of their

importance and emotional intensity at the time of encoding such that competitions were rated as the most important while the movie was the least important one. Thus, we had a chance to compare event qualities for different types of repeated events with varying degrees of personal importance and emotional intensity at the time of encoding. We further aimed to explore whether event characteristics differed as a function of the retrieval order. The question was whether the reporting order would be related to the event characteristics. Events reported first were predicted to be higher in event qualities compared to the ones reported second and third.

In sum, the present dissertation focused on autobiographical retrieval by (a) examining the effect of event characteristics of typical life events on the life span distribution of life scripts and autobiographical memories and (b) exploring the retrieval of recurring life events that lead to formation of event scripts.

CHAPTER I

The Impact of Suppressing the Typical Life Events on the Reminiscence Bump

## Abstract

The aim of the study was to explore the impact of suppressing typical life events on the reminiscence bump in life script and autobiographical memory distributions. With an instruction to exclude typical life events, half of 142 participants over 45 ( $M_{\text{age}} = 51.82$ ,  $SD = 4.80$ ) reported *expected life events* and the other half reported *autobiographical memories*. Age at event, importance, emotional valence and intensity ratings were reported for each event. The reminiscence bump disappeared in autobiographical memory distribution. In life script distribution, it disappeared for the intervals between 21- 30 while it reduced for age intervals 16-20 and 31-35. However, these intervals were not significantly different from the preceding and following ones regarding the number of reported events. Characteristics of typical life events and their corresponding lifetime period had a role in the emergence of the reminiscence bump. Results are discussed in terms of multiple accounts of the bump.

*Keywords:* reminiscence bump, life script, life story, autobiographical memory

### **The Impact of Suppressing the Typical Life Events on the Reminiscence Bump**

Autobiographical memory contains our memories of personal past together with the recollection of the self in the past (Conway, Wang, Hanyu, & Haque, 2005). The typical lifespan distribution of autobiographical memories displays three main characteristics: *childhood amnesia*, *reminiscence bump* and *recency* (Janssen, Chessa, & Murre, 2005; Rubin, 1982; Rubin, Rahhal, & Poon, 1998; Rubin, Wetzler, & Nebes, 1986; Rybash, 1999). *Childhood amnesia* is the limited, if any, retrieval of autobiographical memories from the first three years of life (Bruce, Dolan, & Philips-Grant, 2000; Han, Leichtman, & Wang, 1998; Loftus, 1993; Multhaup, Johnson, & Tetirick, 2005; Pillemer, 1998; Usher & Neisser, 1993) whereas the *reminiscence bump* is the overrepresentation of memories from the second and third decades of life (Fitzgerald & Shifley-Grove, 1999; Hyland & Ackerman, 1988; Janssen & Murre, 2008; Rybash & Monaghan, 1999). Finally, *recency* refers to the retrieval of more memories from recent years (Rubin, 1982; Rubin, & Schulkind, 1997a, 1997b; Rubin et al., 1998; Rybash, 1999). In the present research, among these three features, we specifically focused on the reminiscence bump in the life span distribution of both life scripts and autobiographical memories.

Reminiscence bump is a remarkably well-documented finding in autobiographical memory research. It was obtained when (a) memories were recalled in response to autobiographical memory fluency task (Demiray, Gülgöz, & Bluck, 2009; Holmes & Conway, 1999), (b) individuals were asked to report their favorite songs, films, and books (Holbrook & Schindler, 1989; Janssen, Chessa, & Murre, 2007), and (c) individuals reported public events (Janssen, Murre, & Meeter, 2008) or cultural life scripts, which are expected life events in a typical life course of a hypothetical person (Berntsen & Rubin, 2004; Erdoğan, Baran, Avlar, Taş, & Tekcan, 2008; Haque & Hasking, 2010; Rubin, Berntsen, & Hutson, 2009). Various theoretical accounts focusing on different factors have been proposed to



explain the reminiscence bump phenomenon: biological/maturational account, cognitive account, self/identity account, life script account, and the life story account. All these accounts are briefly reviewed in the following section.

### **Major theoretical accounts of the reminiscence bump**

*Biological/maturational account* explains the reminiscence bump as a byproduct of the typical development of cognitive abilities from childhood to adulthood and their subsequent decline with aging (Rubin et al., 1998). In other words, cognitive abilities may peak during the second and third decades of life; therefore, events experienced at that time may be encoded and stored better, which then improve further retrieval. This peak in cognitive abilities during young adulthood may be reflected in the overrepresentation of memories from that period in lifespan.

*Cognitive account* argues that memories from the reminiscence bump period are encoded better and rehearsed more often because of the high frequency of *novel* and *distinct* events in that particular period of life (Rubin et al., 1998). The novel information is more resistant to proactive interference due to the absence of similar previous information and these events benefit from the distinctiveness that novelty provides. In line with this argument, Pillemer (2001) emphasized the transitional nature of these events arguing that events experienced during the transition from adolescence to adulthood are mainly novel and distinct events, and added that such transitional events are vivid and long lasting.

*The self/identity account* argues that memories from the reminiscence bump period are recalled better because they are rehearsed more often due to their relevance to the self and identity. In this account, self is considered to have an effect on encoding processes, which further influences, not only the structure and organization of autobiographical memories but also their consequent accessibility (Conway, 1997; Conway & Holmes, 2004). Fitzgerald (1988) had also stated that memories of the reminiscence bump period define who we are, and

for that reason, they are significant. The link between the process of identity formation and the emergence of autobiographical memory has been supported by subsequent developmental research (e.g., Piefke & Fink, 2005). In sum, this account claims that bump events have advantaged encoding and retrieval over events of other life periods because of their stronger link with self and identity.

*Life script account* argues that the reminiscence bump occurs because individuals use cultural life scripts as an outline in the retrieval of autobiographical memories and these life scripts contain disproportionately more events from the bump period (Berntsen & Rubin, 2004). Life scripts are cognitive schemas about an individual's life, representing the culturally determined, important life events that are expected to be experienced within an expected time period (Berntsen & Rubin, 2002, 2004). More specifically, they involve nonpersonal and generic information, have a particular chronological order, and reflect both semantic knowledge and cultural expectations. Studies on life scripts have supported the role of such scripts in the emergence of reminiscence bump and revealed that individuals display more agreement on positive events compared to negative ones (Berntsen & Rubin, 2002, 2004). Further studies have provided consistent findings indicating higher degree of agreement for positive life script events in Turkish (Erdoğan et al., 2008) and Danish (Bohn, 2010) samples.

*Life story account* extends the life script account by adding the life span developmental perspective and claims that developmental tasks of young adulthood may contribute to overrepresentation of memories from the reminiscence bump period (Gluck & Bluck, 2007). In accordance with this perspective, Habermas and Bluck (2000) argued that the ability to establish a coherent life story emerges in adolescence. In that period, individuals begin to take control of their lives as young adults and later they believe that events of the reminiscence bump period are important since they affect who they have become. Gluck and Bluck (2007) reported that what contributes to the emergence of the reminiscence bump at

this time in the lifespan is the perceived control over life events and perceived influence of events on identity development. In short, the life story account contributes to the reminiscence bump research by adding the potential role of developmental features of that period and perceived control of the events to previously suggested factors such as maturational processes, novelty-distinctiveness, self-relevance, and using life scripts as a retrieval strategy.

### **Present study**

The main purpose of the current study was to explore the implications of suppressing the most commonly reported life script events on the reminiscence bump in lifespan distributions of both life scripts and autobiographical memories. The current manipulation, suppressing the typical life script events, may lead to a decrease in the overall agreement on event categories. Individuals may experience difficulty in finding events when they are not allowed to report the most typical ones. Thus, the reported events may not be the ones that are highly frequent and agreed upon, hence, not a regular component of the cultural life script. For that reason, we decided to refer to these events as *expected life events* rather than *life script* events throughout the paper.

In the present study, participants were given a list of ten events that were the most frequently reported life script events (e.g., marriage) in previous studies (Ece-Usta, 2010) and were asked to report either ten expected life events or ten autobiographical memories without including the ones on the list. If we found that the reminiscence bump disappeared when these life script events were excluded, then it might be argued that the characteristics of these most frequent events themselves are critical to the emergence of the reminiscence bump. It is clear that due to certain biological and social constraints, the majority of these typical life script events are more likely to be experienced during the reminiscence bump period compared to other periods of life (Gluck & Bluck, 2007). Whereas it is not biologically

possible to become a parent at the age of five, a life event such as being a parent at the age of 12 may be biologically possible but socially disapproved. Berntsen and Rubin (2004) suggested that cultural life scripts also include the potential timing of normative events. Furthermore, it is possible that the biological and social constraints attached to the typical life script events make them more likely to be experienced in the bump period. If the reminiscence bump is sustained despite the inhibition of the most common life script events, then the nature of the typical life events themselves can no longer be a strong argument to explain the emergence of the bump. Such an outcome would demonstrate that the bump period is really special and privileged in terms of encoding and later retrieval, irrespective of the life events reported. With respect to the primary goal of the present study, we predicted that, as a result of suppression of the typical life script events, the reminiscence bump would not be evident in the distribution of either expected life events or autobiographical memories.

The secondary goal of the current study is to compare the content (i.e., event categories) and event qualities (i.e., importance, emotional valence and intensity) of expected life events and autobiographical memories when the ten most often reported life script events were suppressed. We predicted considerable overlap between the contents of expected life events and autobiographical memories even when these typical life events were suppressed. Furthermore, expected life events and autobiographical memories were expected to differ in their qualities. Since autobiographical memories would be personally experienced events rather than imagined, we predicted that autobiographical memories would be rated more highly in their importance, emotional valence, and intensity compared to expected life events.

## Method

### Participants

A total of 190 Turkish adults completed the online survey. To ensure data quality, participants who did not follow instructions (e.g., reported life events from the exclusion list) or 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 two hours) on the survey, and who were younger than 45 years old were excluded. The final sample consisted of 142 individuals between 45 and 65 years old (84 female) with a mean age of 51.82 ( $SD = 4.80$ ). Half of this final sample reported expected life events and the remaining half reported autobiographical memories. The mean age of participants was 50.65 ( $SD = 4.35$ ) for expected life event and 53.00 ( $SD = 4.97$ ) for autobiographical memory group. Expected life event and autobiographical memory groups had 35 and 49 female participants, respectively. Of the overall sample, 8.5% had a Ph.D. degree, 17.6% had a Master's degree, 59.9% had a Bachelor's degree, 11.3% had a high school degree and 2.8% had a secondary school degree. All participants volunteered to take part in the study and received no compensation.

### Materials

**Life script task.** Life script task was originally developed by Berntsen and Rubin (2004). In this task, participants were asked to report the seven most important events in an expected life course of a *newborn* in their culture together with their expectations about the timing of these events. Life script was operationalized as the events mentioned by at least four percent of participants (Berntsen & Rubin, 2004, Study II). In the present study, we revised the life script task as the expected life events task. The current version is different from the life script task in three aspects. First, participants are required to report *ten* events rather than *seven*. Second, participants are asked to provide events for the expected life course of a

*person* rather than a *newborn*. Finally, they are told to report events that are not among those in the list of ten events provided to them.

**Autobiographical memory task.** This task was almost identical to the task described above except that here, the participants were asked to report ten important life events *they had experienced personally* rather than the *expected events* in a life course of a typical person. In other words, life events reported in this task were autobiographical memories whereas the ones provided in the revised life script task were non-personal, generic and expected events for an ordinary life course of a typical person.

In both tasks, participants were clearly instructed not to list any life events from the given list. The events to be excluded were those reported with high frequencies in two previous studies carried out with Turkish samples (Ece-Usta, 2010; Erdoğan et al., 2008). These included *marriage, having a child, first job, beginning school, college, military service, falling in love, having a grandchild, exams* (e.g., university entrance exam), and *circumcision*. For each reported event, participants provided ratings of importance (0 = *not important at all*; 4 = *extremely important*), emotional valence (-2 = *extremely negative*; +2 = *extremely positive*), and emotional intensity (0 = *not intense at all*; 4 = *extremely intense*) on five-point scales. All the event quality ratings were re-coded to range between 1 and 5 for uniformity and ease of representation, higher values being more important, emotionally more positive and more intense. Finally, the participants reported the age for each event, either the estimated age (for expected life events) or the actual age (for autobiographical memories).

### **Procedure**

The study was conducted online. The authors sent a standard electronic mail requesting colleagues, friends, and other interested parties to participate in the study and to forward the online survey link (Qualtrics, Provo, UT) to others. Depending on the specific survey link sent, this standard e-mail stated that the study was investigating either adults'

expectations about typical life course (expected life event condition) or adults' lifespan personal memories (autobiographical memory condition). After the participants clicked the relevant link, they responded to the demographic questions including age, gender, education, marital status, number of children and occupation. The demographic questions were followed by the life script or autobiographical memory task. Completion of the whole survey took approximately 40 minutes.

### **Results**

A total of 710 expected life events were reported (ten events by each subject). Eight events were excluded from the analyses because (a) they were from the list of ten most frequent events in life scripts, (b) they were considered as rather unrealistic by the authors (i.e., being teleported), or (c) the estimated ages were above the age of 100. The final data consisted of 702 valid cases for the expected life events. A larger number of reported events were excluded from autobiographical memories as there were many from the list to be excluded (e.g., marriage) and many reported general lifetime periods (e.g., my primary school years) rather than a specific memory. The final data consisted of 662 valid autobiographical memories after the elimination of 48 such entries.

All reported life events were categorized by the first author based on the categorization scheme used by Berntsen and Rubin (2004, Study II). They included events reported at least by 4% of the participants in event categories, which led to 36 event categories. Similarly, Erdoğan and her colleagues (2008) reported 27 life events based on the same categorization scheme with a Turkish sample. For our data, this criterion of 4% corresponds to life events reported by at least three participants. However, the authors preferred to use a stricter criterion because there was a considerably higher number of event categories in the present study compared to earlier works (Berntsen & Rubin, 2004; Erdoğan et al., 2008). There are two

main reasons for this. First, both of the other studies above asked participants to report seven events whereas we asked for ten events. Second, the exclusion of the ten most frequently reported events eliminated the events with high agreement and therefore, the variety of events that were reported increased substantially. For that reason, we considered events that were reported by at least 4 participants (5.6%) as life script events. A total of 59 expected life event and 47 autobiographical memory event categories met this criterion. There were 118 expected life events and 126 experienced life events that fell below this criterion. The list of event categories matching the current criterion is listed in Table 1. An independent judge blind to the study aims also coded 25% of the data and an overall agreement level of 84.4% was obtained. More specifically, inter-rater agreement was 82.5% for the expected life events and 86.2% for autobiographical memories. Considering the diversity of the event categories, the agreement between the two independent coders was considered satisfactory.

All reported events were divided into five-year-intervals based on the reported age of the event. There were sixteen intervals of five years including the period from birth to 80 years old. Since the oldest participant in the autobiographical memory group was 63 years old, there were no reported events for the last three intervals in that group. For the expected life events group, a total of seventeen events were reported for the last three intervals (66-80). Thus, the analyses that required the comparison of the two groups excluded the events in these last three intervals.



Table 1. *Frequencies, means and the standard deviations of age at event, importance, emotional valence and intensity for expected life events and autobiographical memories reported at least four times*

Event category	<u>Expected life events</u>						<u>Autobiographical memories</u>					
	f	Age	SD	Imp.	Val.	Int.	f	Age	SD	Imp.	Val.	Int.
Job failure	28	34.5	10.1	4.4	1.5	4.2	14	44.6	7.2	4.6	2.4	4.4
Domestic journey/travel	27	23.9	12.8	3.7	4.0	3.6	13	37.0	9.3	3.9	3.7	3.9
Loss of someone close	26	35.2	17.2	4.4	1.6	4.5	19	29.1	15.8	4.3	1.5	4.2
Own illness	25	38.9	21.3	4.3	1.3	4.0	12	33.1	16.5	4.6	1.9	4.0
Job success	24	35.4	7.8	4.0	4.4	3.8	23	35.0	9.7	4.5	4.3	4.1
International journey/travel	23	24.0	11.3	3.9	4.4	3.8	22	33.6	12.0	4.3	4.3	4.3
Having a hobby/talent	19	26.8	16.1	3.7	4.5	4.0	17	32.3	16.9	4.3	4.5	4.1
Buying a house, car	19	38.7	10.1	3.6	4.2	3.6	22	43.3	9.9	4.4	4.4	4.4
Retirement	18	55.2	4.6	4.1	3.9	3.4	7	45.1	4.1	4.4	4.0	3.9
Financial difficulties	17	36.5	12.5	4.2	1.8	3.8	9	42.9	4.6	4.6	1.4	4.3
Having personal problems	16	25.3	16.4	3.9	1.8	3.9	27	35.4	14.3	4.2	2.0	4.0
Traffic accident	16	24.5	9.3	4.4	1.7	4.3	13	32.2	12.2	4.3	2.2	4.0
Moving to another place	16	29.4	18.6	4.0	3.5	3.7	24	35.4	14.2	4.5	3.7	4.1
Driving license/first car	16	23.7	7.2	3.6	4.3	3.4	12	29.1	10.9	4.1	3.6	4.1
Parental death	15	49.5	8.1	4.7	1.3	4.8	33	37.2	10.5	4.7	1.6	4.6
Divorce	12	38.7	6.3	4.5	2.2	4.6	11	36.9	6.6	4.7	2.2	4.6
Success in sports/art	10	18.8	9.0	4.3	4.6	4.4	4	28.0	16.9	5.0	5.0	5.0
Surgery	9	46.1	14.7	4.3	2.0	4.0	8	41.8	11.1	4.3	2.6	3.5
Charitable work	9	38.8	10.2	4.4	4.8	4.6	6	41.0	7.4	4.5	4.5	4.3
Activities with friends/family	9	23.6	16.4	4.2	4.4	4.2	26	25.5	18.3	3.8	4.1	4.1
Having friends	8	20.6	16.8	4.3	4.4	4.0	4	35.0	20.6	4.8	4.3	4.5
Child's marriage	8	55.1	2.8	4.3	4.6	4.4	7	52.7	3.8	4.7	4.1	5.0
Psychological problems	7	20.1	11.1	5.0	1.0	4.9	5	43.4	8.1	4.6	2.2	4.4
Family conflict	7	26.6	15.1	4.0	2.0	4.1	16	34.3	16.5	4.7	1.5	4.3
Leaving family house	7	23.6	3.5	4.6	4.9	3.7	8	27.1	17.2	4.6	3.4	4.4
Illness of a family member	6	48.5	6.4	4.8	1.2	4.5	37	40.1	11.4	4.6	2.1	4.5
Own job	5	31.0	7.6	4.0	4.2	4.2	8	36.6	11.3	4.4	3.3	3.8
Child's graduation	5	36.0	15.4	3.0	4.4	3.6	18	44.4	5.2	4.7	4.6	4.6
Getting injured	4	13.8	16.2	3.3	1.8	3.0	5	11.0	5.1	2.8	2.8	2.8
Living abroad	4	30.0	4.6	4.0	3.8	3.8	12	32.7	11.0	4.1	3.7	3.8
Grandchild care/school	4	56.5	10.0	4.5	4.8	4.8	4	51.0	5.0	4.8	4.0	4.8
Committing a crime	4	27.0	16.1	4.3	2.0	3.0	5	24.0	8.0	4.6	2.8	4.2
Getting rich	13	44.2	10.1	3.5	4.5	4.2						
Natural disaster	10	37.3	7.4	4.5	2.1	4.3						
Anxiety about physical look	8	28.1	26.7	4.6	3.1	3.5						

First sexual intercourse	8	16.8	2.9	4.6	4.3	4.6
Association/club membership	8	29.1	15.4	4.1	4.4	4.3
Getting drunk, first drink	7	19.7	5.3	3.4	2.9	2.7
Being deceived	7	34.1	8.8	4.1	1.4	4.9
Being happy	7	46.7	10.2	4.3	4.6	3.7
Loss of a child	7	33.7	18.6	5.0	1.6	5.0
Beginning walking	6	1.8	1.6	3.8	4.7	4.2
Separation	6	32.8	18.5	4.2	1.8	4.8
Own death	6	75.7	17.6	5.0	2.0	5.0
Fighting/first fight	5	13.6	13.5	3.0	1.8	3.4
Beginning talking	5	1.4	0.6	4.0	5.0	4.2
Getting a beating	5	20.8	11.1	4.4	1.4	4.2
Investment	5	30.6	8.2	3.6	4.6	3.2
School success	5	11.8	7.5	5.0	5.0	4.6
Learning a foreign language	5	20.0	10.2	4.2	4.4	4.0
Child's success/job	5	51.6	4.7	4.8	4.8	4.8
Spousal death	5	62.8	28.7	4.2	1.8	4.2
First performance/exhibition	4	18.3	13.7	4.3	4.8	5.0
Puberty/period	4	14.5	1.3	4.0	2.3	3.8
Writing a book	4	42.5	10.0	4.0	4.8	3.5
Robbery	4	31.3	17.1	4.0	1.8	3.8
Parental divorce	4	21.0	7.8	4.8	1.5	5.0
Riding a bicycle	4	21.0	21.5	4.0	5.0	4.8
Sexual experience	4	21.8	20.4	3.5	4.3	4.0
Making critical decisions	11	26.9	14.7	4.6	3.7	4.0
Child's leaving house	10	49.3	5.9	4.4	4.0	4.3
Loss of a sibling	7	35.0	18.0	5.0	1.1	4.9
Reunion with someone close	7	33.6	14.6	4.9	3.1	4.3
Meeting old friends	6	45.3	4.2	4.5	4.5	4.3
Loss of a grandparent	5	21.8	14.7	4.5	1.7	4.5
Political involvement	5	20.2	5.2	4.4	2.6	4.0
Recovering from an illness	5	42.2	13.2	5.0	4.6	5.0
Running away from home	5	19.2	15.9	4.4	2.0	4.2
Friendship problems	4	34.5	18.7	4.0	1.8	3.8
Summer holiday	4	33.0	11.4	4.8	4.8	4.8
Birthday parties	4	43.0	13.8	3.5	4.3	4.0
Loss of a pet	4	36.0	18.6	4.5	1.5	4.5
Adopting a child	4	36.5	5.2	4.5	4.5	5.0
Living away due to work	4	22.8	16.4	4.8	1.8	4.5

**Reminiscence bump analysis for expected life events.** Analysis of expected life events included all sixteen age intervals ranging from zero to 80 since participants reported events for each interval. Within-subjects analysis of these age intervals yielded significant differences,  $F(15, 1050) = 9.18$ ,  $MSE = .95$ ,  $p < .01$ , for expected life events. Frequency distribution of expected life events by age is displayed in Figure 1. Pairwise comparisons revealed that the three age intervals corresponding to the bump period (16-20, 21-25, and 26-30) were not significantly different from the preceding and following intervals in terms of their mean number of reported life events as we expected. There were more events in the intervals of 16-20 and 31-35 compared to the age interval of 51-55. This was primarily due to the chronological reporting order, where the participants extinguished the list of ten events at earlier ages, not having a chance to report events from later ages. The bump interval (16-30) did not have higher frequency of events when compared with the three age intervals before and the four intervals following the bump intervals.

Pairwise comparisons also indicated that all the intervals between 11 and 55 years old had significantly higher number of expected events than the period after 55 and before ten years old. The frequency and mean number of expected life events per interval are presented in Table 2. This scarcity of expected life events from the last four age intervals (60-80) resulted from the fact that participants tended to report life events chronologically. Analyses based on the reporting order and *age at event* yielded significant correlations not only for expected life events ( $r(702) = .30$ ,  $p < .01$ ) but also for autobiographical memories ( $r(662) = .45$ ,  $p < .01$ ) indicating that both event types were reported chronologically. However, this scarcity of events in later ages was more pronounced for expected life events because participants started with earlier life events (e.g., beginning to walk) and consequently, ten events ran out earlier, before reaching the final age intervals. For autobiographical memories,

on the other hand, they started from a later point in time due to childhood amnesia and finished earlier with their age limiting the time of the most recent event. Thus, with a later start, rather than earlier as in the case of expected life events, participants had a chance to report more recent autobiographical memories.

Table 2. *Frequency and mean number of events per interval for expected life events and autobiographical memories*

Intervals	<u>Expected life events</u>			<u>Autobiographical memories</u>		
	f	M	SD	f	M	SD
0-5	50	0.69	1.49	11	0.18	0.57
6-10	37	0.52	0.98	33	0.54	1.14
11-15	59	0.83	1.25	41	0.62	1.06
16-20	77	1.08	1.24	50	0.70	1.16
21-25	60	0.85	0.86	48	0.66	0.91
26-30	54	0.76	0.90	73	1.03	1.25
31-35	78	1.10	1.21	55	0.77	1.08
36-40	61	0.86	0.99	71	1.00	1.15
41-45	56	0.79	0.94	104	1.42	1.56
46-50	55	0.77	0.90	100	1.38	1.73
51-55	57	0.80	1.17	52	0.70	1.58
55-60	29	0.41	0.67	17	0.24	0.85
61-65	12	0.17	0.45	2	0.03	0.17
66-70	8	0.11	0.32	0		
71-75	6	0.08	0.41	0		
76-80	3	0.04	0.20	0		
Missing	0			5		
Total	702	9.87		662	9.28	

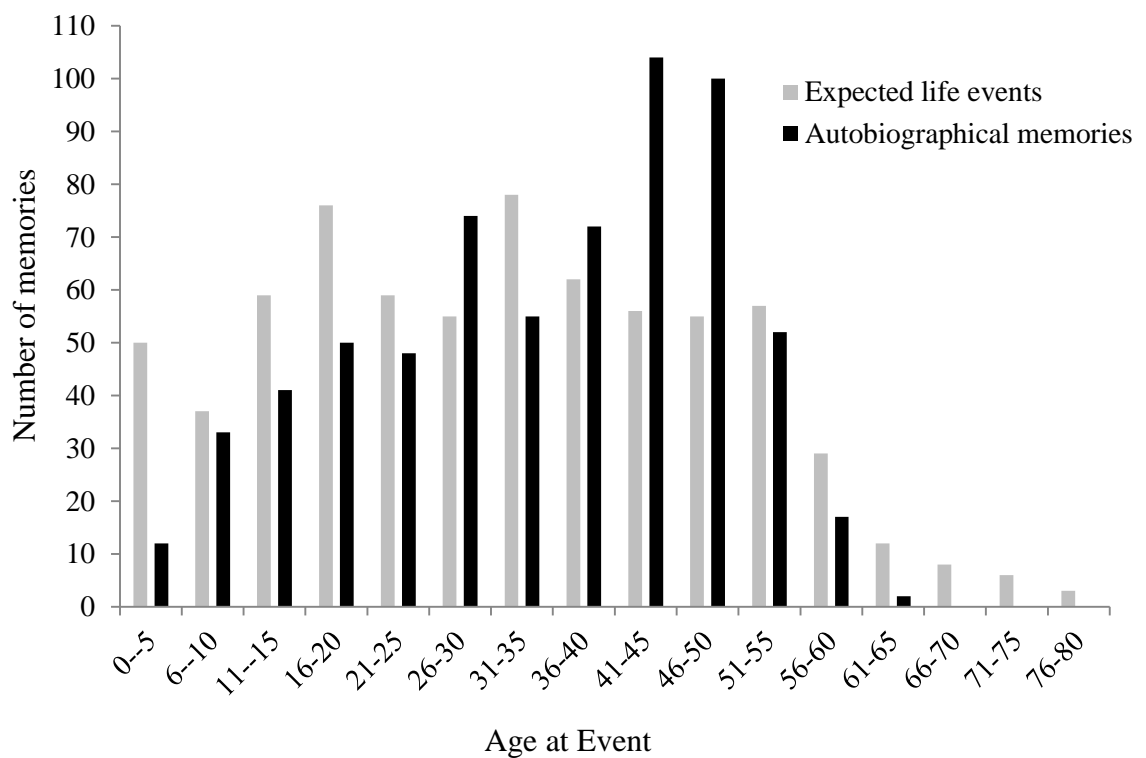


Figure 1. Age and frequency distribution of expected life events and autobiographical memories

**Reminiscence bump analysis for autobiographical memories.** The analysis of autobiographical memories included 13 age intervals (0-65) as the oldest participant in that group was 63 years old. A within-subjects analysis of variance indicated significant differences between these intervals,  $F(12, 840) = 8.71, MSE = 1.46, p < .01$ . Frequency distribution of autobiographical memories by age is displayed in Figure 1. Pairwise comparisons showed that participants reported significantly fewer autobiographical memories from the first five years of their lives compared to the period ranging from the age of 11 to 50 indicating clear childhood amnesia (See Table 2). With respect to the reminiscence bump, the intervals corresponding to the bump (16-20, 21-25, and 26-30) did not differ significantly from the preceding and following intervals in terms of their mean number of reported autobiographical memories. They only differed from the last interval (61-65) from which nine of the remaining 12 intervals differed significantly as well. This finding resulted from the fact

that there were only seven participants over the age of 60 in the autobiographical memory group. The highest number of autobiographical memories was retrieved from the age intervals of 41-45 and 46-50, displaying a robust recency effect considering that the majority of our participants were between 45 and 55 years old. In sum, the distribution of autobiographical memories showed no reminiscence bump but clear childhood amnesia and recency effects when the most frequent life events were not allowed to be reported.

For each autobiographical memory, we calculated the age of the memory as the time between the reported event and the time of testing. The frequency distribution of autobiographical memories based on time since the event is shown in Figure 2. As Figure 2 shows, recency effect was observed for the autobiographical memories such that the majority of the memories were from the last five years. This trend was further analyzed and we observed that there was a significant negative correlation between the number of years since the event and the frequency of the events,  $r(56) = -.73, p < .005$ . The number of memories decreased as age of memory increased, indicating fewer memories for earlier years of life.

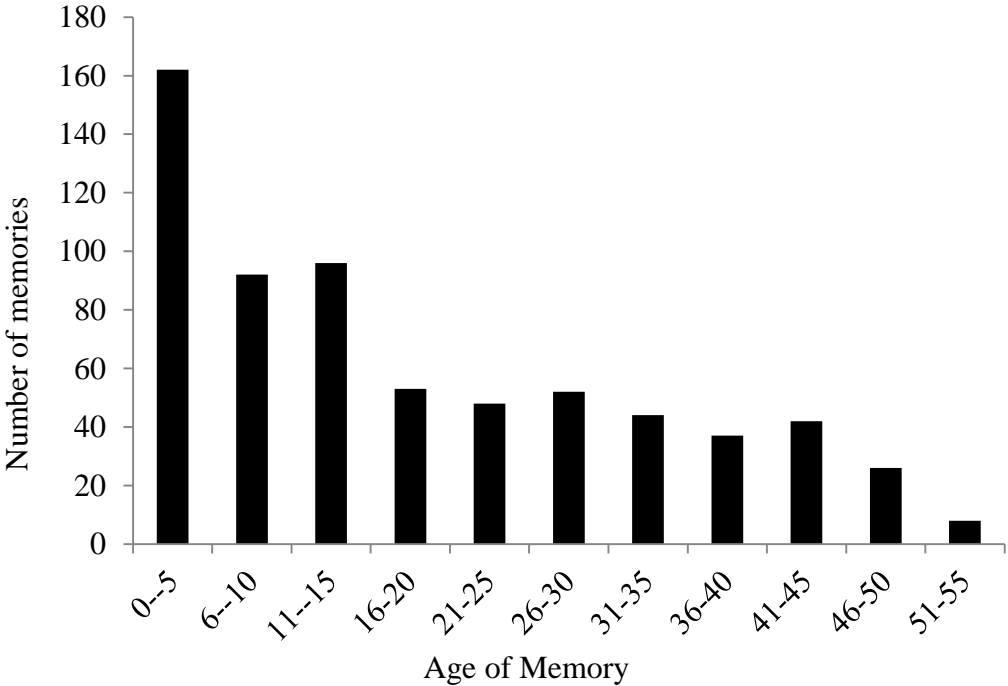


Figure 2. Time since event and frequency distribution of autobiographical memories

Because there was a clear recency effect in autobiographical memory distribution, and because a majority of participants were between the ages of 45-55, we decided to reanalyze the data by controlling for recency effect. We utilized *The Removing the Increased Recall of Recent Events (RIRRE)* model developed by Janssen and his colleagues (Janssen, Galak, & Murre, 2011) to achieve that goal. They argued that the reminiscence bump may be hindered by the recency effect especially when the sample includes adults who are relatively younger (40-55) because the reduction of memories from the period after the bump may overlap with the period of recency for this age group. Since our participant group included adults as young as 45 years old, we decided to apply their model to our data as well. The distribution of autobiographical memories after applying the RIRRE model is shown in Figure 3. This figure displays the distribution of memories according to the age they were experienced normalized by a model of the forgetting curve. Figure 3 clearly shows that the reminiscence bump was still absent after controlling for the recency effect. Even after removing the increased recall of recent events in autobiographical memory data, the number of memories from recent years was still considerably high. In short, after applying the RIRRE model (Janssen et al., 2011) to control for the recency effect, our original findings remained unchanged indicating childhood amnesia and recency but no reminiscence bump in the distribution of autobiographical memories.

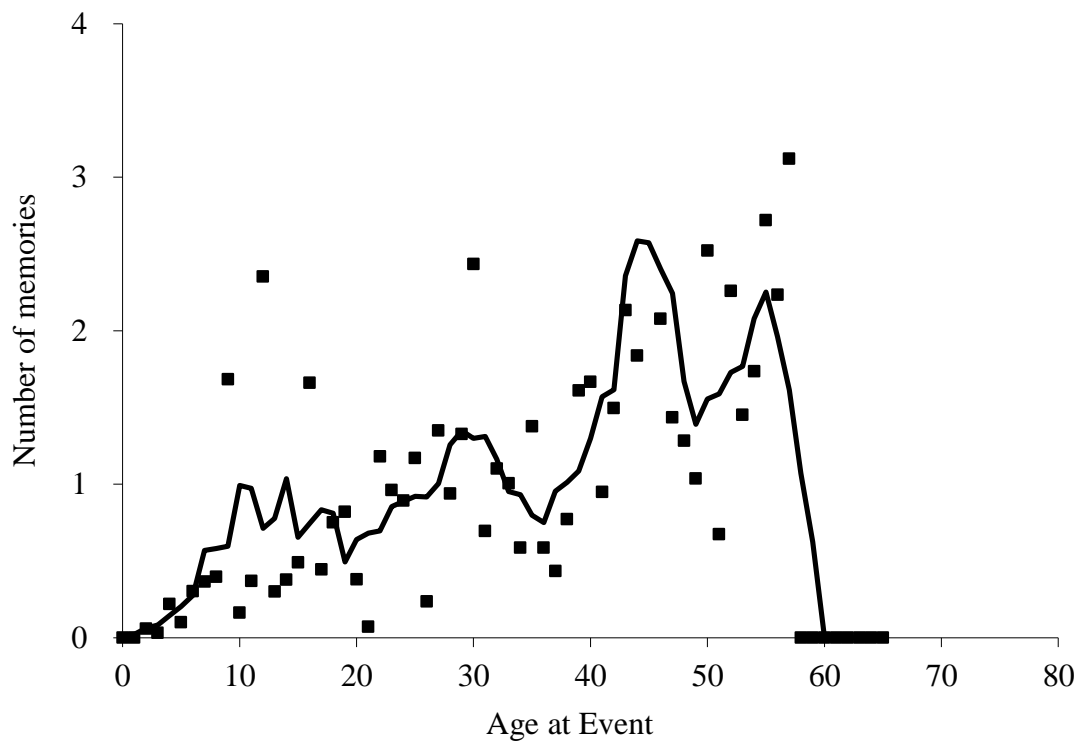


Figure 3. Age distribution of autobiographical memories after applying the RIRRE model (Janssen, Galak, & Murre, 2011)

**Content and event qualities.** Among all the life events reported by at least four participants, there were 59 and 47 different event categories for expected life events and autobiographical memories, respectively. Between the expected events and autobiographical memories, 32 were in the same categories. Thus, 68.09% of autobiographical memory categories were identical to that of expected life events. For these 32 identical categories, a total of 423 expected life events and 451 autobiographical memories were reported.

A total of 1120 events (584 expected life events and 536 autobiographical memories) were reported by at least four participants. Comparison of these two types of events revealed significant differences for importance, ( $F(1, 1116) = 30.99, MSE = 21.99, p < .001$ ) and emotional intensity, ( $F(1, 1116) = 13.52, MSE = 11.09, p < .001$ ) but not for emotional valence,  $F(1, 1116) = .51, MSE = 1.26, ns$ . More specifically, autobiographical memories were considered as more important ( $M = 4.42, SD = 0.66$ ) and more intense ( $M = 4.25, SD =$



0.77) than expected life events ( $M = 4.14$ ,  $SD = 0.98$  and  $M = 4.05$ ,  $SD = 1.01$ , respectively). In emotional valence, however, autobiographical memories ( $M = 3.07$ ,  $SD = 1.53$ ) were not different than expected life events ( $M = 3.14$ ,  $SD = 1.63$ ).

We also compared the ages that the participants experienced or expected to experience the life events they reported. The analysis indicated significant differences in *age at event* between expected and experienced life events ( $F(1, 1116) = 11.97$ ,  $MSE = 2974.88$ ,  $p < .01$ ). Expected life events were reported from younger ages ( $M = 32.36$ ,  $SD = 17.33$ ) compared to autobiographical memories ( $M = 35.62$ ,  $SD = 13.86$ ). The factors underlying this finding may be twofold. First, individuals reported expected life events starting with very early years of life (e.g., being born, beginning to walk or talk) whereas they tended to report very few autobiographical memories from early years. Consequently, the mean age of expected life events may be reduced by such earlier life events compared to autobiographical memories. Second, as we discussed above, the distribution of autobiographical memories displayed a recency effect. Our data had such pronounced recency effect that we observed it even after applying the RIRRE model to remove the increased recall of recent memories. When combined with the childhood amnesia, this robust recency effect contributed to the higher mean age of autobiographical memories in the current study.

### Discussion

Our primary aim was to explore the impact of suppressing the typical life events on the reminiscence bump in lifespan distributions of expected life events and autobiographical memories. Suppressing some categories of events was a novel manipulation that had not been applied in previous studies. With this manipulation, we demonstrated that, reminiscence bump totally disappeared in the distribution of autobiographical memories and it faded to a great extent in the distribution of expected life events when the participants were not allowed to report highly frequent life events. As a secondary aim, the content and event qualities of

expected life events and autobiographical memories were compared. In addition to the considerable degree of overlap in their content, results showed that autobiographical memories were evaluated as more important and emotionally more intense compared to the expected life events but they were not different in terms of emotional valence.

The age distributions of expected life events and autobiographical memories were analyzed individually. When the distribution of expected life events was examined, the number of reported events in the age intervals corresponding to the reminiscence bump period was similar to the preceding and following intervals. Thus, suppressing the typical life events weakened the regular reminiscence bump especially for the period between the ages of 21 and 30. Furthermore, participants consistently reported fewer expected life events for the period between 60 and 80 years old. This might result from the fact that participants reported both expected life events and autobiographical events in a chronological order from birth to death. Autobiographical memories were reported from later ages because of childhood amnesia whereas very early life events (e.g., beginning to walk) were reported as expected life events. Thus, when the participants had to report a total of ten events in both conditions, the ten events were consumed earlier for the expected life events due to the earlier starting point, resulting in fewer reported events for later ages.

For autobiographical memories, findings clearly reflected both childhood amnesia (Bruce et al., 2000; Pillemer, 1998; Usher & Neisser, 1993) and recency effects consistent with earlier studies (Rubin, 1982; Rubin, & Schulkind, 1997a, 1997b; Rubin et al., 1998). Recency effect was observed even after an attempt to control for it by applying the RIRRE model (Janssen, et al., 2011). The suppression of the typical life events, majority of which were likely to correspond to the bump period, might have boosted the number of memories reported from the following years leading to an enhanced recency effect in our data. With respect to the reminiscence bump, the number of autobiographical memories recalled from the

period between the ages of 16 and 30 did not differ from the preceding and following age intervals. Thus, the consistently observed reminiscence bump in the life span autobiographical remembering disappeared as a result of suppressing typical life events. As predicted, autobiographical memories from the second and third decades of life were not overrepresented in the life span distribution of autobiographical memories when adults over 45 were instructed not to report the most typical life events.

The results indicated a remarkable degree of correspondence between expected life events and autobiographical memories in terms of their content. Among autobiographical memories, 68% were identical to the expected life events. Life events that were provided as autobiographical memories but not as expected life events were more specific personal events such as loss of a sibling or adopting a child. With respect to their timing, expected life events seemed to be coming from later ages compared to autobiographical memories. However, this pattern resulted from (a) childhood amnesia, (b) recency observed for autobiographical memories, and (c) the presence of very early expected life events (e.g., being born). In other words, presence of more recent events and absence of very early events increased the mean ages for autobiographical memories whereas the presence of early life events decreased the mean ages for expected life events.

There were differences between the expected life events and the autobiographical memories in importance and emotional intensity but not in emotional valence. This finding is consistent with the fact that autobiographical memories are real personal experiences whereas expected life events are estimations about a typical life course. Regarding the null findings for emotional valence, it is possible that individuals agree on the emotional tone of an event irrespective of whether it is a real or an expected event. For example, events like parental death or traffic accident may be judged as negative without necessarily being personally experienced. However, importance and intensity judgments may be more likely to depend on

the actual and personal experiences. Individuals would rate the very same event as more important and intense when they experience that event personally as compared to when they make estimations about a hypothetical person. Therefore, individuals clearly differentiate between the judgments of the phenomenology of expected life events and autobiographical memories despite the noticeable correspondence in their content. This finding may also indicate that when the participants are asked about an arbitrary individual, they do not necessarily consider their own lives.

Results of the present study have different implications for the theoretical accounts proposed to explain the reminiscence bump. For example, if the bump was a byproduct of the maturational processes and linked to the peak in cognitive abilities during young adulthood as suggested by the *biological/maturational account*, then the bump should remain unaffected by the current manipulation. Individuals should recall more events from this biologically advantaged period independent of the nature of the events reported. However, the bump clearly disappeared in the autobiographical memory distribution. Even though the cognitive abilities peak at this period of the lifespan, these abilities are not the key factors in the emergence of the reminiscence bump.

The *cognitive account* focuses on the characteristics of life events by emphasizing their novelty, distinctiveness, and transitional nature (Pillemer, 2001; Rubin et al., 1998). These event characteristics are claimed to affect encoding and later accessibility of life events. Concurrently the social and biological constraints affect the timing of events that are novel, distinct and transitional. In general, human biology and the society have prescribed the same period as the bump for change, new experiences, and distinct events whereas consistency is expected at later times. For example, becoming a parent, dating several people, or an adventurous vacation may be novel, distinct, and transitional events but they are biologically

and socially constrained. This results in these events being experienced at a particular period of life.

The *self-identity account* argues that events of the bump period had advantaged retrieval since they are rehearsed more often due to their relevance to the self and identity (Conway, 1997; Conway & Holmes, 2004). Our results are in line with this account because all the suppressed life events were highly self-relevant, and suppression of such events (e.g., marriage, having a child) resulted in the disappearance of the reminiscence bump.

The *life script account* argues that cultural life scripts, which contain disproportionately more events from the bump period, guide autobiographical remembering (Berntsen & Rubin, 2004). Current results supported this account because the bump disappeared in the lifespan retrieval of autobiographical memories when these life script events were not reported. Furthermore, life span distributions of expected life events and autobiographical memories were not only affected by our manipulation but they also displayed a noteworthy overlap in their content. This high degree of correspondence even after suppressing the typical life events suggests that life scripts are utilized as guidelines in autobiographical remembering irrespective of the typicality of the events reported.

The *life story account* emphasized the potential role of developmental tasks of the lifetime period in the advantaged recall of the events from young adulthood (Gluck & Bluck, 2007). Current results indicated that the very nature of typical life events may have a critical role in the emergence of the reminiscence bump. In other words, event characteristics, such as possible biological and social constraints, may make these events more likely to fall into the bump period as suggested by the life story account (Gluck & Bluck, 2007). Consequently, scripts in individuals' memories may be affected by these event characteristics especially regarding the possible timing of these events. It should be noted that, life scripts may influence the life span distribution of autobiographical memories when they are used as a

retrieval strategy as suggested by the life script account. However, life scripts are likely to be formed on the basis of life stories to begin with. Thus, it can be argued that life stories affect the development of life scripts, which in turn affect the lifespan retrieval of life stories by serving as an outline. On the other hand, current data may suggest that expected events are detached from personal experiences for two reasons. First, the reported expected events include several early childhood events that are not available as personal experiences. Second, there are significant differences between characteristics attributed to expected events and the characteristics of autobiographical experiences.

In the present research, the majority of the suppressed life events (e.g., marriage, first job) came from the reminiscence bump years. Therefore, suppressing the events from this period, as in our manipulation, might have had the effect of an overall inhibition of other life events from the bump period. Although, there were events from earlier (e.g., beginning to primary school) and later (e.g., having a grandchild) periods of life, they were low in number compared to the ones corresponding to the bump period. Future research may examine the possibility of generalized inhibition of life events from the bump period as a result of this novel manipulation. This potential inhibition can be also explored by instructing individuals to exclude events from other periods of life in their reports. Thus, future research with list of events to be excluded from different periods of life (e.g., late midlife), in addition to the bump, may be helpful to better understand the possible inhibition.

### **Conclusion**

The present study contributed to the reminiscence bump literature by applying a novel manipulation and showing that the bump was affected by the suppression of typical life events for both expected life events and autobiographical memories. In line with the life story account (Gluck & Bluck, 2007); characteristics of these typical events had a role in the emergence of the bump by virtue of being part of a cultural script and of being related to a

particular period. Furthermore, the correspondence between expected life events and autobiographical memories were noteworthy in terms of their content. With respect to event qualities, autobiographical memories were considered as more emotionally intense and important than life scripts while they were not different from expected life events regarding their emotional valence. Overall, the present findings failed to support the biological/maturational account of the reminiscence bump while supported the cognitive, self/identity, life script and life story accounts.

Next chapter describes a follow-up research aiming to explore the potential effect of possible inhibition processes on the results of the current study presented. It is clear that there is no priming for the events of the bump period as no regular bump was observed. However, present design does not allow us to make a similar conclusion for the effects of potential inhibition of the bump events as a result of giving a list of events to be excluded. For that reasons, the study presented in the next chapter was conducted with a different research design to investigate the role of inhibitory processes, if any.

CHAPTER II

Removing Typical Life Events Eliminates the Reminiscence Bump



## Abstract

In a previous study, Ece and Gulgoz (2014) presented participants with a list of top ten life events and asked them to report expected or experienced life events other than these ten. This manipulation eliminated the reminiscence bump for both expected and experienced life events. We aimed to explore whether giving a list of events to be omitted might have led to inhibition of the events from the bump period. A total of 44 adults over 60 ( $M_{\text{age}} = 62.8$ ,  $SD = 2.8$ ) reported life scripts and autobiographical memories without any manipulation. The same ten life events were removed after data collection. The reminiscence bump disappeared for both life scripts and autobiographical memories. Results indicated that the findings of Ece and Gulgoz (2014) were not an artifact of inhibitory processes but the outcome of the manipulation indicating that event characteristics and associated constraints may affect the reminiscence bump.

*Keywords:* reminiscence bump, life script, autobiographical memory, life events

### **Removing Typical Life Events Eliminates the Reminiscence Bump**

Research on lifespan autobiographical remembering has indicated that individuals tend to retrieve more memories from the period of young adulthood compared to other lifetime periods. This well-documented retrieval pattern is named the *reminiscence bump* (Fitzgerald & Shifley-Grove, 1999; Gluck & Bluck, 2007; Hyland & Ackerman, 1988; Janssen & Murre, 2008; Rubin & Schulkind, 1997; Rybash & Monaghan, 1999; Schrauf & Rubin, 1998; Thomsen & Berntsen, 2008). Interestingly, several studies have demonstrated that reminiscence bump is not peculiar to autobiographical remembering but was obtained in the lifespan distributions of public events (Janssen, Murre, & Meeter, 2008) and cultural life scripts as well (Berntsen & Rubin, 2004; Erdoğan, Baran, Avlar, Taş, & Tekcan, 2008; Haque & Hasking, 2010; Rubin, Berntsen, & Hutson, 2009). It is even observed in remembering favorite books, songs and films throughout one's lifetime (Holbrook & Schindler, 1989; Janssen, Chessa, & Murre, 2007). The present study specifically focused on that robust finding of the reminiscence bump in the lifespan distributions of not only autobiographical memories but also cultural life scripts.

There is a growing body of research on lifespan autobiographical remembering in general and the reminiscence bump in particular. Consequently, several theoretical accounts have been proposed to explain the bump phenomenon. For example, *biological/maturational account* states that the reminiscence bump is a typical element in the lifespan development of cognitive abilities with age-related peaks and declines (Rubin, Rahhal, & Poon, 1998) whereas *cognitive account* states that memories from young adulthood are encoded better and rehearsed more often because of their novelty and distinctiveness (Rubin et al., 1998). *Self/identity account*, on the other hand, proposes that the key factor in the advantaged recall of memories from young adulthood is their higher relevance to the self and identity (Fitzgerald, 1988). Thus, self is claimed to have an impact on encoding and subsequent

accessibility (Conway, 1997; Conway & Holmes, 2004). Actually, it is emphasized that autobiographical memory is related to the self (Brewer, 1986), and is specific, long lasting and important for one's self-concept (Harley & Reese, 1999) since it enables the sense of self-continuity and self-coherence together with the reconstruction of one's own life history (Piefke & Fink, 2005).

Two accounts of the reminiscence bump, *life script* (Berntsen & Rubin, 2002, 2004) and *life story accounts* (Gluck & Bluck, 2007), are of particular significance for the present study as we investigated the reminiscence bump not only in autobiographical remembering but also in the lifespan distribution of life scripts. Life scripts are cognitive schemas of transitional life events and their expected timing in a typical life course (Berntsen & Rubin, 2002, 2004). Clearly, these scripts are based on the assumption that each society has particular age norms affecting both expectations and behaviors regarding the normative life events (Berntsen & Rubin, 2004). According to the *life script account*, lifespan autobiographical retrieval is guided by the cultural life scripts which are usually predominated by life events from the second and third decades of life (Berntsen & Rubin, 2004). Therefore, life events from young adulthood are overrepresented in the lifespan distribution of autobiographical memories when these life scripts are used as a retrieval strategy or serve as templates. The *life story account* extends the life script account by further stating that developmental tasks of lifetime periods may also have an effect on the lifespan distribution of autobiographical memories (Gluck & Bluck, 2007). For example, young adults begin to take control of their lives at this time. In that respect, events of this particular period may be considered more critical in terms of whom they have become (Gluck & Bluck, 2007). In short, several theoretical accounts have aimed to explain the reminiscence bump phenomenon on the basis of different factors. There are supporting and conflicting findings for each account; hence, each one has its own weaknesses and strengths. In the present study, findings will be

discussed in terms of their compatibility with all the aforementioned theoretical accounts of the reminiscence bump.

### **The Present Study**

The primary aim of the present study was to explore the potential impact of the life event characteristics themselves on the reminiscence bump. In other words, the major research purpose was to understand whether the reminiscence bump was independent of the event types or not. For that aim, the most frequently reported event types were removed from an already existing dataset and its effect on the reminiscence bump was examined. In a previous study, Ece and Gulgoz (2014) implemented a novel manipulation by providing participants with a list of top ten life events and instructing them to report events other than these ten. As a result of that manipulation, the reminiscence bump disappeared in the lifespan autobiographical retrieval and it got remarkably weakened in the lifespan distributions of life scripts. It should be noted that providing a specific list of events may have had various consequences. For example, it may prime or inhibit the recall of life events from the reminiscence bump period because the majority of events on the list corresponded to this particular period. It is clear that the given list didn't prime the events from the bump period because the number of events reported from the reminiscence bump period were not enhanced compared to the remaining periods of life. However, that manipulation might have led to an overall inhibition of the events from the bump period as the instruction demanded omission of many events from this period. With this reasoning one can argue that the results of Ece and Gulgoz (2014) might have been a byproduct of generalized inhibition of life events from the reminiscence bump period rather than being a clear effect of their novel manipulation. Since their manipulation had not been applied before, it is not possible to compare its effect across different studies with the same or similar manipulations. To explore this possibility of inhibition, we decided to conduct the present study in which we removed the same list of ten

life events after the data collection without any manipulation during retrieval. If the findings of Ece and Gulgoz (2014) really resulted from the inhibitory processes, we should fail to replicate them in the current study as there would be no inhibition when no list was given during retrieval. More specifically, we should still observe the reminiscence bump after removing the typical life events from an already existing dataset. However, if we observe that the bump disappears after removing the same ten life events, we can conclude that their results were not an artifact of inhibitory processes. Moreover, we can provide further support for the argument that these typical life events are likely to be scripted in that particular period of life (15-30) due to certain biological and social constraints leading to the emergence of the bump (Ece & Gulgoz, 2014; Gluck & Bluck, 2007). In sum, what memory researchers studied as the reminiscence bump for decades may simply consist of these top ten life events themselves per se.

The secondary aim of the present study was to explore the implications of removing top ten life events for the theoretical accounts of the reminiscence bump. Ece and Gulgoz (2014) concluded that their results were supporting all the accounts of the bump but the biological/maturational one. They argued that if the reminiscence bump were a result of biological processes, then it should be independent of the type of the events reported. However, the life events reported when the top ten events were omitted did not display the regular bump. They further argued that their findings were in line with self/identity account since all the events on the given list were highly self-relevant and their prevention affected the structure of the lifespan distribution. Similarly, they added that majority of the events in the list were novel and distinct in nature supporting the cognitive account but further claimed that event characteristics other than novelty and distinctiveness may influence the possible timing of life events. Their results were compatible with the life script account as the suppression of typical life events determined based on the life scripts resulted in the disappearance of the

bump from autobiographical retrieval. The considerable degree of overlap between the content of life script events and autobiographical memories even when the typical events were not reported further supported the life script account. Finally, their results supported the life story account since they demonstrated that typical life events may be more likely to be experienced during young adulthood and developmental tasks of this particular period may affect memory processes for the corresponding life events.

In the current study, participants reported both life scripts and autobiographical memories without any manipulation during retrieval. The most typical life events were removed from the reports of the participants after the data collection. If the bump disappeared when these life events were removed, it can be argued that the characteristics of these events themselves have a critical role in the emergence of the reminiscence bump. If the bump is sustained after removal, however, the bump cannot be explained by the characteristics of these typical events. Rather, it can be argued that there is something special about the bump period beyond the presence of typical life events resulting in advantaged encoding and subsequent retrieval. We predicted a strong decline in the reminiscence bump for the lifespan distributions of both autobiographical memories and life scripts. In other words, we expected to replicate previous results (Ece & Gulgoz, 2014) with a different methodology, even when there was no manipulation during data collection. We argue that the results of Ece and Gulgoz (2014) were indicative of the contribution of typical life events themselves to the reminiscence bump rather than being a byproduct of inhibitory mechanisms. Finally, we expected a remarkable degree of correspondence between current results and that of Ece and Gulgoz (2014) with respect to their compatibility with different accounts of the reminiscence bump. More specifically, we predicted that with the disappearance of the bump after removal of the top ten life events, our findings will be in line with the basic claims of the self/identity,

cognitive, life script and life story accounts but will challenge the biological/maturational account.

## Method

### Participants

The current sample consisted of 44 Turkish adults (24 female) over 60 years old with a mean age of 62.8 ( $SD = 2.8$ ). Of the overall sample, 2.3% had a Ph.D. degree, 4.6% had a Master's degree, 40.9% had a Bachelor's degree, 31.8% had a high school degree, 13.6% had a secondary school degree, and 6.8% had a primary school degree. Short Blessed Test (SBT) was utilized as a screening device to measure orientation, memory, and concentration. None of the participants scored above six, the regular cut off score to identify potential cognitive deterioration; therefore, no participant was eliminated. All participants were native Turkish speakers and were recruited by convenience sampling method. They all volunteered to take part in the study and received no compensation.

### Materials

**Life script task:** The cultural life script task was originally developed by Berntsen and Rubin (2004). In the current research, Turkish version of this cultural life script task was applied with a minor revision. In the original task, participants were asked to report the seven most important events in an expected life course of a *newborn* in their culture. In our revised version, participants were instructed to provide important life events for a hypothetical *person* rather than a *newborn*. Cultural life script was operationalized as the events mentioned by at least four per cent of the participants (Berntsen & Rubin, 2004; Study II). For each reported life event, participants were asked to report the estimated age at the time of the event, importance of the event (1: not important at all and 7: extremely important), and emotional valence of the event (-3: extremely negative and +3: extremely positive). Finally, participants

were asked to report if they had experienced any of the life script events they reported and if they did, their age at the time of the event.

**Autobiographical memory task:** Autobiographical memory task was almost identical to the cultural life script task with the exception that participants were asked to report seven important life events they have personally experienced rather than expected life events for a hypothetical person. In other words, they reported seven autobiographical memories. For each reported autobiographical memory, participants were asked the age at the time of the event, importance of the event (1: not important at all and 7: extremely important), affective valence of the event (-3: extremely negative and +3: extremely positive), perceived control over the event (1: no control at all and 7: complete control), and the effect of the event on who the participant has become (1: extremely low and 7: extremely high).

**Short Blessed Test (SBT):** The six-item Short Blessed Test is preferred as a screening tool because of its well-established reliability, validity, and easy administration. It basically assesses orientation, memory, and concentration (Katzman, Brown, Fuld, Peck, Schechter, & Schimmel, 1983). Each item on SBT has different scoring depending on the number of tasks it requires. Correct answers are given a score of zero while errors are scored ranging from one to five. Final score for each participant is the sum of weighted score that are calculated by multiplying the score obtained for each item based on the weight provided. The maximum total score is twenty eight. Total score of six or lower is considered to be normal while score of ten and over is considered as an indicator for the possible presence of dementia (Katzman, et al., 1983). Thus, lower score means better memory performance and better cognitive functioning.

### **Procedure**

All participants were tested individually by the same researcher in a quiet setting. They were first given the instruction page and asked to read the brief information regarding



the present research. Then, they were required to answer the demographic questions regarding their gender, age, occupation, education and marital status. Each participant received both life script task and autobiographical memory task. Participants were randomly assigned to one of the two different task order conditions. At the end of the session, they were given the Short Blessed Test (SBT). Completion of a session took approximately thirty minutes.

### **Results**

A total of 308 life script events and 305 autobiographical memories were reported. All of these events were categorized by the first author based on the categorization scheme used by Berntsen and Rubin (2004, Study II). On the basis of this coding scheme, we obtained 57 event categories for life script events and 65 event categories for autobiographical memories. An independent judge blind to the study also coded 25% of the data. Inter-rater agreement was 85.2% for the expected life events and 89.4% for autobiographical memories.

The number of event categories reported at least by 4% of the participants was identified based on the criterion applied in previous research (Berntsen & Rubin, 2004, Study II). Only six life script and five autobiographical memory event categories met this criterion. Although the number of event categories meeting this criterion was quite low, their frequencies were considerably high. For example, the six expected life event categories were reported 149 times and the five event categories of autobiographical memories were reported 124 times. Thus, there were 159 life scripts and 181 autobiographical memories that fell below the criterion of 4%.

All reported expected life events and autobiographical memories were also examined in terms of the number of ten typical life script events, which would be removed from the data. Expected life events contained a total of 174 events from the top ten event categories while autobiographical memories had 134 such cases. Thus, the effect of removing the most typical life events on the lifespan distribution of expected life events and autobiographical

memories was examined by analyzing the remaining 134 life script events out of 308 events and 171 autobiographical memories out of 305 events. Interestingly, when the top ten events were removed from the expected life events data, none of the event categories met the criterion of being reported by at least 4% of the participants. In other words, when these typical life events were removed, no other life script event remained in the dataset. For autobiographical memories, only two remaining event categories were reported by at least 4% of the sample when the top ten events were extracted: parental death and child's marriage. In sum, removal of typical life script events dramatically affected the number of event categories meeting the 4% criterion of life script definition.

All reported events were divided into five-year-intervals based on the age at the time of the event. There were fourteen intervals for both autobiographical memories and expected life events in the current research including the period from birth to 70 years old. This resulted from the fact that the oldest participant in the current sample was 70 years old, hence, there were no memories reported for the period above 70 years old. For expected life events, the maximum estimated age at event was 70 years old. Therefore, no further interval was needed for the period over 70 years old. In short, analyses involving comparison of age intervals across expected life events and autobiographical memories contained an equal number of five-year age intervals.

**Reminiscence bump analysis for expected life events.** Analysis of expected life events included all fourteen age intervals ranging from zero to 70 years old. The first line of analysis included all expected life events in order to examine the baseline distribution of these events before the top ten events were removed. Within-subjects analysis of these fourteen intervals displayed significant differences for the expected life events ( $F(13, 559) = 11.30$ ,  $MSE = .64$ ,  $p < .001$ ). Mean differences based on pairwise comparisons are given in Table 1.

Table 1. Mean differences of paired comparisons for expected life events both before and after the removal of typical life event categories

Expected life events	0 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	55 - 60	61 - 65
Before removal of typical life events													
6 - 10	-0.05												
11 - 15	0.55	0.59											
16 - 20	0.09	0.14	-0.46										
21 - 25	-0.55	-0.50	-1.09*	-0.64									
26 - 30	-0.43	-0.39	-0.98*	-0.52	0.11								
31 - 35	0.43	0.48	-0.11	0.34	0.98*	0.86							
36 - 40	0.59	0.64*	0.05	0.50	1.14*	1.02*	0.16						
41 - 45	0.66	0.71*	0.11	0.57*	1.21*	1.09	0.23	0.07					
46 - 50	0.57	0.61*	0.02	0.48*	1.11*	1.00*	0.14	-0.02	-0.09				
51 - 55	0.53	0.57	-0.02	0.43	1.07*	0.96*	0.09	-0.07	-0.14	-0.05			
55 - 60	0.61	0.66*	0.07	0.52*	1.16*	1.05*	0.18	0.02	-0.05	0.05	0.09		
61 - 65	0.55	0.59	0.00	0.46	1.09*	0.98*	0.11	-0.05	-0.11	-0.02	0.02	-0.07	
66 - 70	0.57	0.61	0.02	0.48	1.11*	1.00*	0.14	-0.02	-0.09	0.00	0.05	-0.05	0.02
After removal of typical life events													
6 - 10	0.46												
11 - 15	0.50	0.05											
16 - 20	0.55	0.09	0.05										
21 - 25	0.55	0.09	0.05	0.00									
26 - 30	0.43	-0.02	-0.07	-0.11	-0.11								
31 - 35	0.43	-0.02	-0.07	-0.11	-0.11	0.00							
36 - 40	0.48	0.02	-0.02	-0.07	-0.07	0.05	0.05						
41 - 45	0.57	0.11	0.07	0.02	0.02	0.14	0.14	0.09					
46 - 50	0.48	0.02	-0.02	-0.07	-0.07	0.05	0.05	0.00	-0.09				
51 - 55	0.48	0.02	-0.02	-0.07	-0.07	0.05	0.05	0.00	-0.09	0.00			
55 - 60	0.59	0.14	0.09	0.05	0.05	0.16	0.16	0.11	0.02	0.11	0.11		
61 - 65	0.50	0.05	0.00	-0.05	-0.05	0.07	0.02	0.02	-0.07	0.02	0.02	-0.09	
66 - 70	0.50	0.05	0.00	-0.05	-0.05	0.07	0.07	0.02	-0.07	0.02	0.02	-0.09	0.00

\*. The mean difference is significant at the .05 level.

As seen in the table, the age intervals of the bump period (16-20, 21-25, and 26-30) displayed significant mean differences from the remaining intervals by having higher number of events reported. The bump was most robust for the age interval of 21-25 since this interval was significantly different from all age intervals between the ages of 31 and 70 in addition to the interval of 11-15 in terms of the number of events reported. Likewise, the period between the ages of 26 and 30 significantly differed from the intervals ranging between 46 and 70 years old. This period also differed from the age intervals between 36-40 and 11-15 regarding the number of cases. The interval of 16-20 differed from only three age intervals: 41-45, 46-50, and 55-60. Interestingly, the interval of 6-10, which is not a part of the typical reminiscence bump period, had significantly higher number of reports compared to the age intervals of 36-40, 41-45, 46-50, and 56-60. Frequencies, mean number of events per interval and standard deviation values are given in Table 2.

Table 2. *Frequency, mean number of events per interval and standard deviation values for expected life events before and after removal of typical life event categories*

Intervals	<u>Before removal</u>			<u>After removal</u>		
	f	M	SD	f	M	SD
0-5	35	0.80	1.23	30	0.68	1.18
6-10	38	0.84	0.81	10	0.23	0.64
11-15	11	0.25	0.61	8	0.18	0.58
16-20	31	0.70	0.76	6	0.14	0.35
21-25	58	1.34	0.83	6	0.14	0.35
26-30	53	1.23	0.83	11	0.25	0.58
31-35	16	0.36	0.75	11	0.25	0.65
36-40	9	0.20	0.46	9	0.20	0.46
41-45	6	0.14	0.41	5	0.11	0.32
46-50	10	0.23	0.48	9	0.20	0.46
51-55	11	0.27	0.54	9	0.20	0.46
55-60	9	0.18	0.50	4	0.09	0.29
61-65	11	0.23	0.97	8	0.18	0.66
66-70	10	0.25	1.10	8	0.18	0.92
Total	308	7.02		134	3.05	

The second line of analysis was conducted after removing the ten typical life event categories from the dataset. Although the result of the within subjects analysis was significant,  $F(13, 559) = 2.31, MSE = .39, p < .01$ , none of the pairwise comparisons was significant (See Table 1). Frequency distribution of expected life events according to age both before and after the removal of typical life events is displayed in Figure 1. As clearly seen in Figure 1, the reminiscence bump vanished in the distribution after the typical life events were removed. Although it is possible to talk about an overall consistent decline for all age intervals, the sharpest decline was observed for the bump period. To further investigate these declines in all age intervals, they were compared as pairs in terms of the number of reported cases for each age interval. Results of these paired sample t-tests are presented in Table 3. For the intervals of the bump period (16-20, 21-25, and 26-30), the decrease after removing the typical life events was significant compared to the baseline distribution without any removal. For all the remaining age intervals, this decline was not significant except the interval of 6-10, which also displayed a significant decrease after data removal (see Table 3).

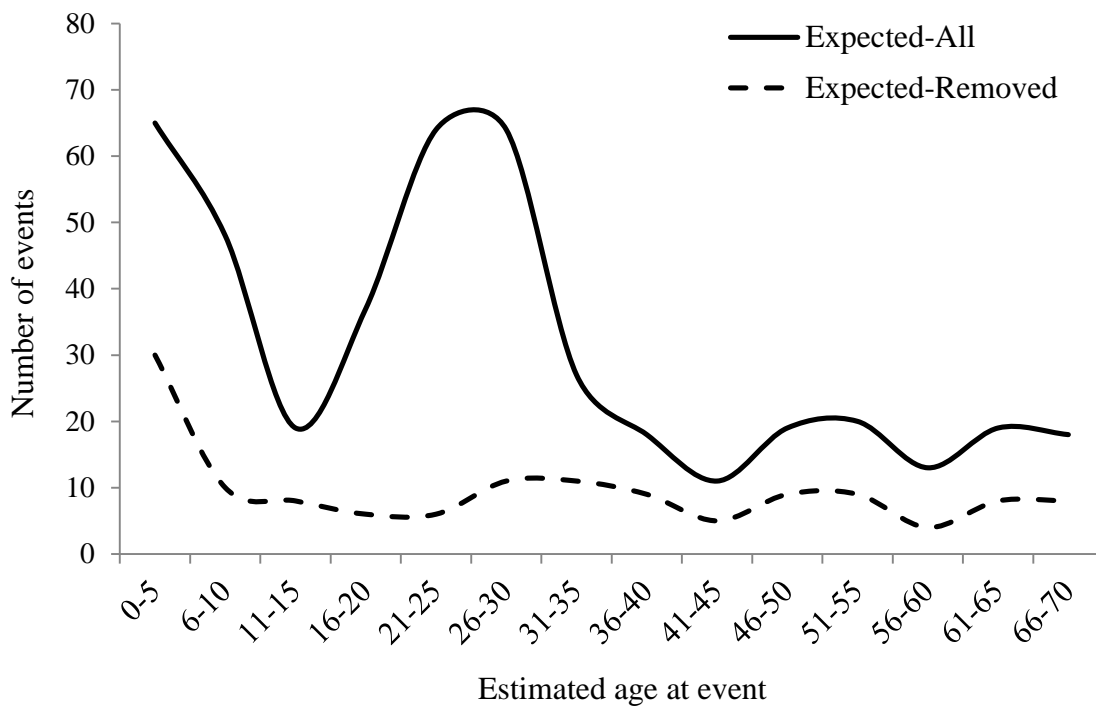


Figure 1. Age and frequency distribution of expected life events before and after removal of ten typical life events

Table 3. Results of paired sample t-tests for both expected life events and autobiographical memories

Intervals	M	SD	t	df	p
Expected life events					
0-5	0.11	0.44	1.70	43	0.10
6-10	0.61	0.58	7.03	43	0.00
11-15	0.07	0.25	1.77	43	0.08
16-20	0.57	0.62	6.03	43	0.00
21-25	1.20	0.82	9.70	43	0.00
26-30	0.98	0.82	7.90	43	0.00
31-35	0.11	0.44	1.70	43	0.10
36-40*	---	---	---	---	---
41-45	0.02	0.26	0.57	43	0.57
46-50	0.02	0.26	0.57	43	0.57
51-55	0.07	0.25	1.77	43	0.08
55-60	0.09	0.47	1.27	43	0.21
61-65	0.07	0.33	1.35	43	0.18
66-70	0.05	0.21	1.43	43	0.16
Autobiographical Memories					
0-5*	---	---	---	---	---
6-10	0.23	0.42	3.56	43	0.00
11-15*	---	---	---	---	---
16-20	0.48	0.55	5.76	43	0.00
21-25	0.95	0.94	6.74	43	0.00
26-30	0.77	0.80	6.38	43	0.00
31-35	0.30	0.59	3.30	43	0.00
36-40	0.05	0.30	1.00	43	0.32
41-45	0.02	0.15	1.00	43	0.32
46-50	0.02	0.15	1.00	43	0.32
51-55	0.09	0.29	2.07	43	0.04
55-60	0.07	0.33	1.35	43	0.18
61-65	0.02	0.15	1.00	43	0.32
66-70*	---	---	---	---	---

\*.The correlation and t cannot be computed since the standard error of the difference is 0.

**Reminiscence bump analysis for autobiographical memories.** The analysis of autobiographical memories included fourteen age intervals (0-70) as the oldest participant in the sample was 70 years old. The within-subjects analysis of these intervals displayed significant differences for autobiographical memories ( $F(13, 559) = 10.64, MSE = .48, p < .001$ ). Mean differences based on pairwise comparisons are given in Table 4.

Table 4. Mean differences of paired comparisons for autobiographical memories both before and after the removal of typical life event categories

Autobiographical	0 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	55 - 60	61 - 65
Before removal of typical life events													
	-0.41												
11 - 15	-0.21	0.21											
16 - 20	-0.55*	-0.14	-0.34										
21 - 25	-0.98*	-0.57	-0.77*	-0.43									
26 - 30	-1.00	-0.59	-0.80*	-0.46	-0.02								
31 - 35	-0.27	0.14	-0.07	0.27	0.71	0.73*							
36 - 40	-0.14	0.27	0.07	0.41	0.84*	0.86*	0.14						
41 - 45	-0.11	0.30	0.09	0.43	0.86*	0.89*	0.16	0.02					
46 - 50	-0.34	0.07	-0.14	0.21	0.64	0.66	-0.07	-0.21	-0.23				
51 - 55	-0.34	0.07	-0.14	0.21	0.64	0.66*	-0.07	-0.21	-0.23	0.00			
55 - 60	-0.27	0.14	-0.07	0.27	0.71	0.73*	0.00	-0.14	-0.16	0.07	0.07		
61 - 65	0.05	0.46	0.25	0.59*	1.02*	1.05*	0.32	0.18	0.16	0.39	0.39	0.32	
66 - 70	0.16	0.57*	0.36*	0.71*	1.14*	1.16*	0.43	0.30	0.27	0.50*	0.50*	0.43*	0.11
After removal of typical life events													
	-0.18												
11 - 15	-0.21	-0.02											
16 - 20	-0.07	0.11	0.14										
21 - 25	-0.02	0.16	0.18	0.05									
26 - 30	-0.23	-0.05	-0.02	-0.16	-0.21								
31 - 35	0.02	0.21	0.23	0.09	0.05	0.25							
36 - 40	-0.09	0.09	0.11	-0.02	-0.07	0.14	-0.11						
41 - 45	-0.09	0.09	0.11	-0.02	-0.07	0.14	-0.11	0.00					
46 - 50	-0.32	-0.14	-0.11	-0.25	-0.30	-0.09	-0.34	-0.23	-0.23				
51 - 55	-0.25	-0.07	-0.05	-0.18	-0.23	-0.02	-0.27	-0.16	-0.16	0.07			
55 - 60	-0.21	-0.02	0.00	-0.14	-0.18	0.02	-0.23	-0.11	-0.11	0.11	0.05		
61 - 65	0.07	0.25	0.27	0.14	0.09	0.30	0.05	0.16	0.16	0.39	0.32	0.27	
66 - 70	0.16	0.34	0.37*	0.23	0.18	0.39*	0.14	0.25	0.25	0.48*	0.41*	0.36*	0.09

\*. The mean difference is significant at the .05 level.

For the age interval of 0-5, the number of cases was lower compared to the other intervals however; the differences reached significance only for the intervals of 16-20 and 21-25 (See Table 5 for frequencies, mean number of events per interval and standard deviations for autobiographical memories). Different from the expected life events, the first line of analysis showed the most obvious bump for the age interval of 26-30 rather than 21-25. The interval of 26-30 was significantly different from eight age intervals among the remaining thirteen: 11-15, 31-35, 36-40, 41-45, 51-55, 56-60, 61-65, and 66-70. The period of 21-25, on the other hand, was significantly different from the intervals of 0-5, 11-15, 36-40, and 41-45 in terms of the number of autobiographical memories reported. Interestingly, there was no bump for the period of 16-20. This period was only different from the first (0-5) and the last (66-70) age interval due to childhood amnesia and recency. As seen in Table 5, the last two age intervals (61-65 and 66-70) displayed significant differences compared to remaining age intervals. Considering the age range of the sample was 60-70, these results may stem from the recency effect, advantaged retrieval of recent memories.

Table 5. *Frequency, mean number of events per interval and standard deviation values for autobiographical memories before and after removal of typical life event categories*

Intervals	<u>Before removal</u>			<u>After removal</u>		
	f	M	SD	f	M	SD
0-5	8	0.18	0.39	8	0.18	0.39
6-10	26	0.59	0.84	16	0.36	0.72
11-15	17	0.39	0.54	17	0.39	0.54
16-20	32	0.73	0.54	11	0.25	0.44
21-25	51	1.16	0.96	9	0.20	0.46
26-30	51	1.18	0.97	18	0.41	0.54
31-35	20	0.45	0.79	7	0.16	0.43
36-40	15	0.32	0.74	12	0.27	0.59
41-45	13	0.30	0.51	12	0.27	0.50
46-50	23	0.52	0.70	22	0.50	0.70
51-55	22	0.52	0.59	19	0.43	0.59
55-60	21	0.45	0.70	17	0.39	0.54
61-65	5	0.14	0.41	5	0.11	0.32
66-70	1	0.02	0.15	1	0.02	0.15
Total	305	6.95		174	3.95	



Second line of analysis was conducted after removing the ten typical life event categories from the autobiographical memory dataset. Although the result of within subjects analysis was significant,  $F(13, 559) = 3.01$ ,  $MSE = .27$ ,  $p < .01$ , only the last age interval (66-70) displayed significant differences regarding the number of autobiographical memories (See Table 4). Distribution of autobiographical memories both before and after the removal of typical life events is displayed together in Figure 2. As seen in the figure, the reminiscence bump disappeared after removing the typical life events. An overall decline was observed for all age intervals as in the expected life event data. Once again, the largest drop was observed for the bump period especially between the ages of 21 and 30. Each age interval was examined regarding the number of autobiographical memories reported before and after removing the typical life event categories. Results of paired sample t-tests are presented in Table 3. Compared to the baseline distribution without any removal, the decline after removing the typical life events was significant for the age intervals of 6-10, 16-20, 21-25, 26-30, 31-35, and 51-55.

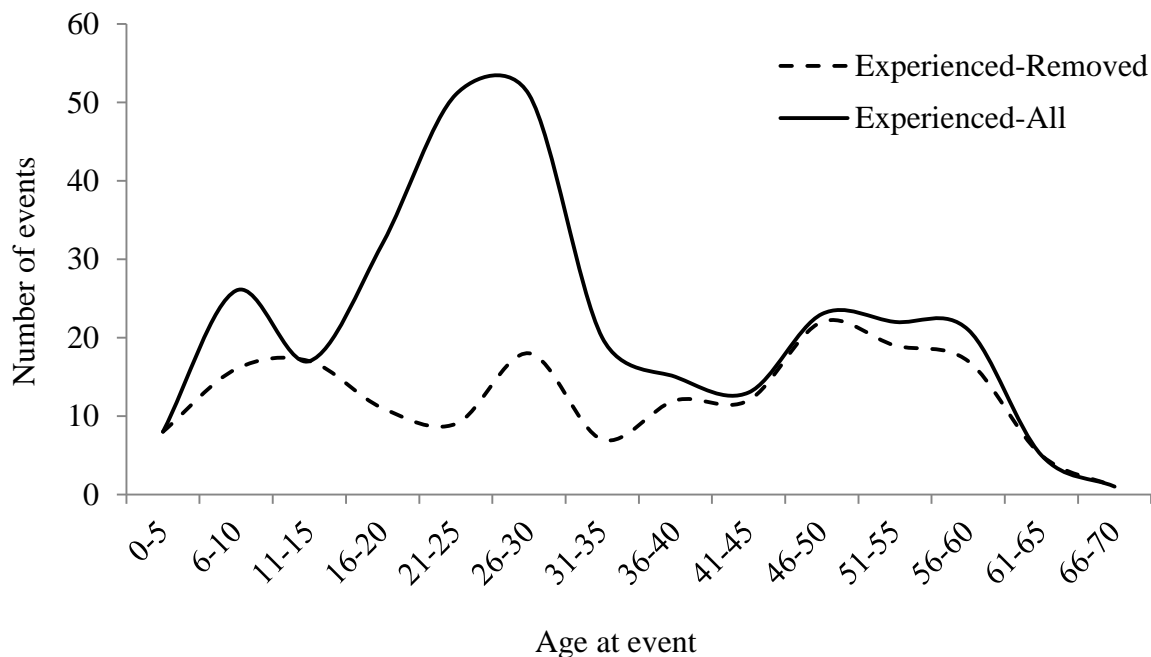


Figure 2. Age and frequency distribution of autobiographical memories before and after removal of most typical events

For each autobiographical memory reported, the age of the memory was calculated as the time between the reported event and the time of testing. The frequency distribution of autobiographical memories according to time since the event is shown in Figure 3 for both before and after removing the typical event categories. Considering the age range of the sample (60-70), it is possible to see the reminiscence bump and the childhood amnesia in the overall data clearly; the recency effect was not that obvious. In their analysis, Ece and Gulgoz (2014) applied *The Removing the Increased Recall of Recent Events (RIRRE; Janssen, Gralak, & Murre, 2011)* model in order to check for the potential impact of the strong recency effect observed in their data. In the present study, we didn't apply this model for two reasons. First, there was no strong recency effect in our results as seen in Figure 3. Second, the RIRRE model is recommended when the sample consists of adults who are barely over 45 because, in that case, there may be some overlap between reminiscence bump effect and recency effect. That risk was not present in the current sample as the sample consisted of adults over the age of 60.

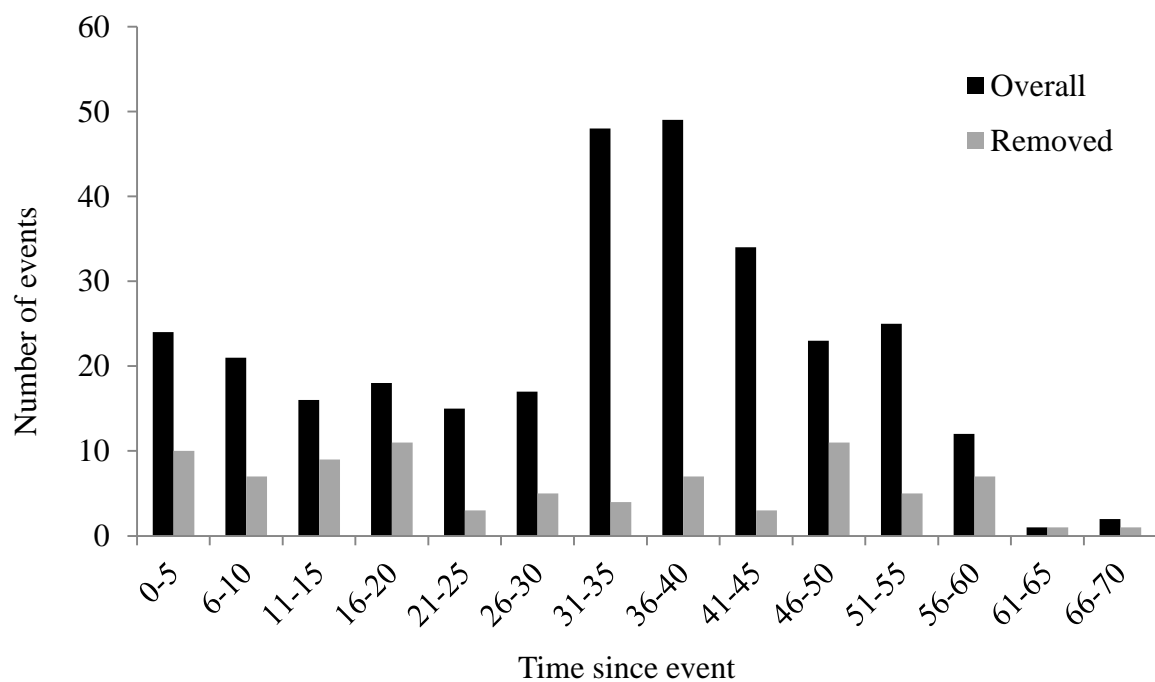


Figure 3. Frequency distribution of autobiographical memories according to time since event both before and after removal

**Expected life events vs. autobiographical memories.** When the typical life events were removed, there were no remaining event categories meeting the life script criterion. In other words, none of the remaining events were mentioned by at least 4% of the sample. For autobiographical memories, there were only two event categories meeting the criterion. Thus, it was not possible to examine the overlap between event categories of expected life events and autobiographical memories.

**Event qualities.** Expected life events and autobiographical memories were compared in terms of their ratings on importance and emotional valence. Results indicated that participants provided higher ratings of importance for their autobiographical memories compared to the expected life events they reported ( $t(304) = -3.08, p < .01$ ). Thus, adults over the age of 60 considered the personally experienced life events ( $M = 6.81; SD = 0.67$ ) as more important than the ones expected for a hypothetical person ( $M = 6.65; SD = 0.81$ ). Moreover, life scripts ( $M = 1.72; SD = 2.15$ ) were evaluated more positively than autobiographical memories ( $M = 1.24; SD = 2.55$ ) in terms of emotional valence ( $t(304) = 2.84, p < .01$ ). The pattern of results remained exactly the same for importance ratings when top ten life events were removed from the data ( $t(83) = -2.80, p < .01$ ). Autobiographical memories ( $M = 6.85; SD = 0.50$ ) had still significantly higher importance ratings than life scripts ( $M = 6.60; SD = 0.81$ ). However, the significant difference between life scripts ( $M = 0.48; SD = 2.70$ ) and autobiographical memories ( $M = -0.21; SD = 2.87$ ) with respect to emotional valence disappeared after the removal of typical life events ( $t(83) = 1.92, p > .05$ ).

## Discussion

The effect of removing the most typical life events on the reminiscence bump was examined in the lifespan distributions of life scripts and autobiographical memories. Findings clearly indicated that when the most frequently reported life events were removed from an

already-existing dataset, the reminiscence bump totally disappeared in the lifespan distribution of both expected life events and autobiographical memories.

In a previous study (Ece & Gulgoz, 2014), individuals were presented with the list of top ten life events and asked to report events other than the ones on the list. This manipulation resulted in the disappearance of the bump for autobiographical memories and expected life events. More specifically, for expected life events, the early bump period between the ages of 16 and 20 was observed to be more resistant to manipulation. However, this early period didn't display a significant bump compared to preceding and following lifetime periods despite being more resistant. On the basis of these results, it was concluded that characteristics of the life events themselves were critical in the emergence of the reminiscence bump (Ece & Gulgoz, 2014). These most frequently reported life events were more likely to correspond to the reminiscence period (16-30) due to certain biological and social constraints as suggested by the life story account (Gluck & Bluck, 2007). Our major concern with these previous results and conclusion was that providing the list of top ten life events, majority of which were corresponding to the bump period, might prime or inhibit the recall of life events from this particular period of life. The diminished bump demonstrated that there was no priming. However, it was not possible to conclude that no inhibition was involved on the basis of their research design and results. For that reason, we conducted the current research to make sure that these previous findings (Ece & Gulgoz, 2014) were not a byproduct of inhibitory processes but the outcome of the novel manipulation applied.

Different from Ece and Gulgoz (2014), we did not employ any experimental manipulation during data collection in the present research. Rather, the same ten life events used by Ece and Gulgoz (2014) were removed from the dataset after the data collection where expected and experienced events were reported. Results indicated that the effect of removing these typical life events were more pronounced compared to earlier findings in which

participants were prevented from reporting the listed events during retrieval (Ece & Gulgoz, 2014). The reminiscence bump totally disappeared in the lifespan distributions of both expected life events and autobiographical memories. These results strongly supported our predictions that characteristics of these most frequently reported life events were influential in the emergence of the reminiscence bump. Moreover, the current results provided further support for previous findings (Ece & Gulgoz, 2014) by showing that they were not an artifact of inhibitory processes.

The implications of the current findings were not identical for all theoretical accounts of the reminiscence bump. On the whole, results were compatible with the basic arguments of cognitive, self/identity, life script, and life story accounts but incompatible with that of biological/maturational account. To be more specific, the reminiscence bump should be immune to the removal of typical life events if it were a regular part of the typical lifespan cognitive development as claimed by the biological/maturational account. Based on this claim, the better retrieval of the life events from this biologically advantaged period should be independent of non-biological factors such as event type. However, our results clearly contradicted these expectations. Cognitive abilities may peak during young adulthood but this peak is not the key factor underlying the reminiscence bump.

*Cognitive account* argues that novel, distinctive, and transitional nature of life events lead to advantaged encoding and retrieval (Pillemer, 2001; Rubin et al., 1998). Furthermore, majority of life events corresponding to the bump period are remembered better since they have such event qualities. We agree with these basic premises of the cognitive account, however, we further argue that event characteristics other than novelty and distinctiveness may affect the timing of certain life events. For example, having a child may be a novel, distinct and transitional event but typical timing of this event may actually have biological or social roots.

According to the *self-identity account*, events of young adulthood are rehearsed more often due to their relevance to the self and identity, as a result, they are remembered better even at later ages (Conway, 1997; Conway & Holmes, 2004). Our findings support this argument since all the life events which were removed from the dataset were quite self-relevant (e.g., first job, getting married) and their removal eliminated the reminiscence bump.

Lifespan autobiographical retrieval is guided by cultural life scripts according to the *life script account* (Berntsen & Rubin, 2004). It is further suggested that cultural life scripts are predominated by events from young adulthood. For that reason, when these scripts serve as a template, they pave the way for the reminiscence bump. The present findings were in line with this account since the reminiscence bump was no longer present in lifespan autobiographical retrieval curve when life script events were removed from the dataset. As aforementioned, *life story account* was an extension of life script account particularly emphasizing the lifespan developmental perspective (Gluck & Bluck, 2007). According to this account, developmental tasks of life periods and the associated biological and social constraints may play a role in timing of certain life events. Similarly, our results demonstrated that the nature of typical life events per se may have an effect on the reminiscence bump. In sum, our results supported and extended the major theoretical accounts of the reminiscence bump except the biological/maturational one.

The correspondence between expected life events and autobiographical memories were examined after the top ten life events were removed. The most striking finding was that when these events were removed from the expected life events data, there were no remaining events meeting the criteria of life scripts, that is, being mentioned by at least 4% of the sample (Berntsen & Rubin, 2004, Study II). This result indicates that these top ten events are the ones that are typically reported when individuals are asked to report expected life events for a hypothetical person. It is a fact that the majority of life script and autobiographical studies

usually ask for seven to ten life events and consequently come up with these typical ones. However, when people are banned to report them or when these typical events were removed from the data, it is no longer possible to talk about either highly agreed upon life script events or well-established reminiscence bump. For autobiographical memories, two event categories were left when the life events on the list were removed. These two events were parental death and child's marriage. Considering the fact that the current sample consisted of participants over 60 years old, it is not surprising to have these two relatively late life events mentioned by at least 4% of the participants. Moreover, it should be noted that this is the criterion for life scripts and not autobiographical memories.

Expected life events and autobiographical memories were compared in terms of the event qualities of importance and emotional valence. Results indicated that adults over 60 years old evaluated expected life events as less important but emotionally more positive compared to their autobiographical memories. The finding that personally experienced events were rated as more important than life events expected for a hypothetical person is consistent with earlier work (Ece & Gulgoz, 2014). In terms of emotional valence, previous research showed no differences between expected and experienced life events indicating that emotional tone of a life event may be easier to agree upon independent of the personal experience (Ece & Gulgoz, 2014). More specifically, individuals tend to judge life events like loss of a parent or traffic accident as emotionally negative even if they have never experienced them. Current results are partially in line with this argument since both expected life events and autobiographical memories were similar in the valence of the emotions attached to them but differed in the degree of positivity. In other words, overall ratings of both types of life events were positive but expected ones were judged as more positive. Expected events might contain idealized events and this might lead to higher ratings in terms of positivity.

In conclusion, the present study contributed to autobiographical memory research by demonstrating that the reminiscence bump totally disappeared in lifespan distributions of both expected life events and autobiographical memories when the most typical life events were removed. On the basis of these findings, it was suggested that characteristics of these typical events themselves had an impact on the reminiscence bump since they may affect the corresponding lifetime period. In terms of event qualities, autobiographical memories were considered as more important but emotionally less positive than expected life events. Overall, current results challenged the biological/maturational account of the reminiscence bump while providing support for the cognitive, self/identity, life script and life story accounts.

In the first and second chapters, the effect of typical life events on autobiographical remembering and life script distributions were examined. The following chapter focuses on how an event becomes typical or scripted? What is the exact role of event frequency on retrieval processes? Do memory processes differ for repeated vs. single time events or more frequent vs. less frequent events, and how? What happens if a script is formed for a particular event? What is the role of further repetitions, do they still have an effect or not? If they do, do they make memory traces even stronger by rehearsal or just weaken them by leading to interference? It is not possible to answer all these questions on the basis on one study; however, we tried to address some of them as far as our research design and results allowed.



### Chapter III

#### Memories of Stepping into the Same River Twice

## Abstract

The aim of the present research was to explore memory for repeated events. For that aim, memories of dancers for competitions and shows were examined. A total of 67 dancers (28 male,  $M_{\text{age}} = 27.16$ ,  $SD = 4.48$ ) reported three competitions, three shows and a movie as the control event. Several event qualities such as importance, emotional valence and intensity were reported for each event. Effects of event type and retrieval order were analyzed. Three event types were different only in importance and emotional intensity at the time of the experience. At the time of the retrieval, competition and show memories were not different from that of movies for dancers. Retrieval order was associated with event qualities such that first reported events were higher almost in all event qualities than the ones reported as the third. Results are discussed on the basis of different theoretical approaches to remembering recurring events.

*Keywords:* Autobiographical memory, repeated events, memory for recurring events

## **Memories of Stepping into the Same River Twice**

*“No man ever steps in the same river twice, for it's not the same river and he's not the same man.”* – Heraclitus.

We agree with this famous quote by Heraclitus with respect to the fact that individuals almost never experience events exactly the same way in real life. For example, different instances of frequently repeated life events (e.g., holidays or watching a movie) are not exact replicas of each other. Moreover, even the most routine daily events (e.g., having breakfast or driving to work) display little variations within a certain range. Therefore, it is not possible to experience an event twice as totally identical to the first experience. We, however, further argue that it is also very hard to observe or experience a totally unique event because even highly unique events share common features with earlier experiences. In other words, it may not be the same river and he may not be the same man but it may still be possible to have shared components with earlier experiences of stepping in the river. In short, when interpreted in terms of memory processes, each experience of stepping in the river will have its own memory trace making it possible to remember each instance individually. However, these memory traces have various event components (e.g., actions and objects) some of which may be either similar to or different from other instances making this particular memory trace relatively ordinary or unique. These memory processes are of critical importance for the current paper as we aimed to examine the impact of repetition on remembering personal past events.

The primary purpose of this study was to explore autobiographical memory processes for repeated life events in adults. Most autobiographical memory research has focused on unique experiences where the event that has been experienced is different from any that had been experienced before or since that event. Although in each event reported in such research, there is some distinctive component that sets that event apart from the rest, no event

is truly unique. Every event has components that have been experienced before and the uniqueness of the event arises from one or more distinct aspects of the event. Conceptualized this way, the study of autobiographical memory has concentrated on events that are similar to other experienced events except for some distinguishing components. Contrast this with events that are highly similar to each other with little or no distinctive components. We call these events *repeated events* which constitute the larger part of human experience, particularly as people get older. In the current study, we have specifically focused on these types of events with a selected group of participants, dancers, who experience similar events (dancing in the presence of audience), repeatedly with different frequencies (shows and competitions).

### **Autobiographical memory for repeated events**

Autobiographical memory, which is the memory system containing our personal past experiences, has not attracted sufficient research attention with respect to recurring events. The majority of autobiographical memory studies have focused on life events that are generally categorized as first-time, last-time, one-time, traumatic, emotional (e.g., happiest and saddest), and transitional or life changing events (e.g., Berntsen & Rubin, 2002; Demiray, Gülgöz, & Bluck, 2009; Haque & Hasking, 2010; Pillemer, 2001). However, life events from these categories are not highly frequent in everyday life. To be more specific, such events may be quite common at societal level but they are relatively infrequent at individual level within a person's lifetime. Most of the time, we share our autobiographical memories of ordinary life events such as holidays and weekend activities. In that respect, autobiographical memory for frequently repeated life events is a relatively neglected topic of research. The few examples of research exploring the effect of repetition on autobiographical remembering were conducted with children (e.g., Fivush, 1984a; Hudson, 1990; Hudson & Nelson, 1986; Powell & Thomson, 1996). These studies specifically examined the amount of event details and sequencing of the details in children's reports. However, there is not an adequate justification

to generalize the findings based on children's memory performance for recurring events to adults' memory processes.

The scarcity of research on memory for repeated events in adults may have several other implications. First of all, it may be misleading to generalize the research findings based on one-time or unique life events to autobiographical memory processes for more frequently repeated or ordinary life events. Furthermore, by focusing on relatively infrequent life events, we may miss the impact of repetition on remembering personal memories. It may be promising to explore the effect of event repetition on memory by comparing events with different repetition rates. Such repetition is an integral part of the literature on schema and script formation. For that reason, earlier studies on script formation and event repetition relevant to present purposes will be briefly summarized in the next section.

### **Scripts, event repetition and memory**

The origins of the *schema* concept, which is basically a mental framework to organize and interpret information, can be traced back to Piaget (1926) and Bartlett (1932). *Script* is a kind of schema that refers to the abstract knowledge representations entailing information about repeatedly experienced events in terms of event components and their regular sequence (Schank, 1979; Schank & Abelson, 1977). This information based on earlier instances of an event serves as a tool to predict future instances. As argued by Hudson and her colleagues (1992): "Scripts are dynamic and flexible; they allow us to anticipate and predict events in our world" (pg. 483). In addition to prospective judgments, however, scripts may also affect our retrospective evaluations as a result of the constructive nature of human memory. It is a fact that we tend to fill the gaps in our recollections of past events based on the scripts we have in mind for that particular event (Bartlett, 1932; Gallo, 2006; Norman & Bobrow, 1977; Roediger & McDermott, 1995; Schank, 1980; Loftus, 1975; Loftus & Palmer, 1974; Mcrae, Schloerscheidt, Bodenhausen, & Milne, 2002; Weinstein & Shanks, 2010). Thus, scripts

allow us to make not only predictions about upcoming events but also inferences about past events.

Events are composed of different components which may display similarities or variations across different instances (Hudson, Fivush, & Kuebli, 1992). From this point of view, not only a typical instance of an event may have unique aspects within itself but also a unique event may have common components with earlier instances of an event as discussed earlier. To develop a script for a particular event, on the other hand, one needs to select common components between different instances as the repeated events are almost never identical in real-life situations.

Once a script is developed for an event on the basis of the common components across different instances, it becomes critical to determine whether distinct components of that event represent a *variation* or a *deviation*. *Variation* refers to an expected range of differences within the script while *deviation* refers to the changes leading to completely different results than those expectations based on the script (Hudson, et.al., 1992). When an event has deviations, rather than variations, memory traces for this particular event may become stronger because the event components deviating from the script will most probably make this instance more distinct compared to others. Based on the degree of variations and deviations between event components, the similarity between different instances can be considered as a continuum rather than distinct categories. Events with more deviating components may be evaluated as unique or close to unique whereas events with more common and invariant components may be evaluated as ordinary. Furthermore, instances with more common components may be judged as more similar than instances with less common elements. It should be noted that the number of repetitions may be critical in addition to the amount of common components between different instances in perceiving an event as ordinary or unique.

There are numerous questions that can be asked regarding the effect of repetition on event memory: Does memory for repeated events differ from that of single-time events? What happens to memory of an event as a result of repeated experience? Does it get stronger or weaker? Or, does an event become scripted as a result of a certain number of repetitions? If so, how many repetitions are required for script formation? What are the effects of the repetitions once a script is already formed? Do further repetitions reinforce or modify the script, and how? It is not possible to answer all these questions on the basis of a single study but we have tried to address some of them by focusing on event types with different repetitions rates (competitions and shows).

There is no extensive research on potential differences between memories of repeated versus single-time events. Examination of children's report indicated that recurring events were remembered in a different way compared to the events which occurred only once (Connolly & Lindsay, 2001; Connolly & Price, 2006; Fivush, 1984b; Hudson, 1990; Nelson, 1986; Price & Connolly, 2004). Moreover, it is demonstrated that memories of one-time events are sharper whereas memories of repeated events are relatively blurred for both children (Nelson & Ross, 1980; Todd & Perlmutter, 1980) and adults (Linton, 1982).

Event repetition may have differential effects on memory processes. More specifically, the effect of repetition may be different depending on various factors such as the type of event component (e.g., actions vs. objects) or the type of retrieval (e.g., immediate vs. delayed recall). For example, delayed recall is more likely to rely on script-based processes because of the constructive nature of long-term remembering (Bartlett, 1932; Gallo, 2006; Norman & Bobrow, 1977; Roediger & McDermott, 1995; Schank, 1980; Loftus, 1975; Loftus & Palmer, 1974; Mcrae, et.al., 2002; Weinstein & Shanks, 2010). Similarly, repetition may affect the memory for the gist and details differentially. Furthermore, it may even influence different types of details in a different way. For example, McNichol and her colleagues (1999)

examined 6-7-year-old children's memory performance for repeated and single-time events. In that particular study, authors investigated the effect of not only event repetition (one vs. three) but also the kind of details (varying vs. constant) on remembering. They found out that memory for a repeated event was better than memory for a single-time event if the details of the recurring event remained constant across repeated occasions. When the details varied rather than remaining constant, however, memory performance was poorer for a repeated event compared to that of a single event. Thus, the nature of details affected the way repeated events were remembered compared to single-time events. For the constant details, event repetition seemed to serve as a rehearsal mechanism while it led to interference for variant details. Likewise, Farrar and Goodman (1992) demonstrated that event repetition resulted in both strengths and weaknesses in children's memory for recurring events. In sum, there seems to be no strong agreement on the effects of event repetition on memory processes based on the relevant literature and majority of findings are based on children's reports. The following section is devoted to the theoretical approaches that can be involved to better understand the memory processes for recurring events.

### **Theoretical background**

The number of repetition may have a critical role in script formation if one needs to select the common components across different instances of an event to develop a schema. Previous research has indicated that children seemed to develop script-like expectations even following the very first instance of an event (Fivush, 1984; Nelson & Gruendel, 1986; Hudson & Nelson, 1986). Then, what is the function of other repetitions? Do they still contribute to script formation? Or, do they make memory traces stronger by rehearsal or make them weaker as result of interference?

It is possible to conceptualize memory for repeated events on the basis of different theoretical approaches. According to trace theories, each experience has its own unique



memory trace independent of the event frequency (Hintzman, 1984). In case of remembering a recurring event, competing memory traces of similar instances with common components get activated paving the way for interference. Final abstractions are achieved on the basis of the most strongly activated memory traces. Fuzzy trace theory, on the other hand, states that two different memory traces are created at the time of the experience: verbatim and gist (Reyna, Holliday, & Marche, 2002). Verbatim traces contain the distinct features of a recurring event whereas gist traces involve similar features of the event to earlier instances. Thus, what trace theorists argue as the activation of the competing memory traces belonging to similar instances of a repeated event corresponds to the activation of these gist traces in the fuzzy trace theory.

Schema or script-based theories propose that with repetition, different instances of an experience are organized into a unified abstract representation (Nelson & Gruendel, 1981; Schank & Abelson, 1977). To be more specific, we construct abstract knowledge representations of similar events on the basis of repeated experiences (Fivush & Hudson, 1990; Nelson, 1986). These cognitive representations, once formed, lead to certain expectations and predictions for future events (Nelson, 1986; Alba & Hasher, 1983). Furthermore, they affect our recollections by aiding or distorting as a result of constructive memory processes (Bartlett, 1932; Gallo, 2006; Roediger & McDermott, 1995; Schank, 1980; Loftus, 1975). It should be noted that remembering a specific event and having an abstract representation of that event are not mutually exclusive processes (Hudson, et.al., 1992). In other words, one can have a script in mind for an event (e.g., competition) and a clear memory of a specific instance of that event (e.g., 2014 World Championship) at the same time. In short, scripts are abstract knowledge structures of a single unified representation of recurring events while memory traces are formed individually for each particular instance.

Another line of schema or script-based theories propose that we develop the basic script on the basis of the generic knowledge and tag or index any further deviations or distinct features specific to an individual instance. Actually, this explanation has been conceptualized differently by various researchers with different terms such as (a) Script pointer plus tag hypothesis (Schank & Abelson, 1977), (b) Context-plus-index model (Reisser, 1986), (c) Headed records (Morton, Hammersley, & Bekerian, 1985), and (d) Model of general and specific event memory (Hudson, 1986). Interestingly, Frederic Bartlett proposed a similar conceptualization as early as 1932 by arguing that two different schemas were developed for an event: a story schema for the general theme and an additional schema for deviations. To our mind, all these different theoretical approaches are compatible with each other and claim similar processes by concentrating on different aspects. In other words, it is possible to develop these scripts based on recurring experiences and to utilize them for subsequent encoding processes by just tagging any additional variation or deviation within the individual memory trace created for that event. With respect to the fuzzy trace theory, these deviations and variations would be most probably included in the verbatim memory traces considering the fact that gist traces encompass the basic generic knowledge common across different instances.

In this paper, we argue that repetition can make memory traces either stronger by functioning as a rehearsal mechanism or weaken them by leading to interference. Therefore, the effect of event repetition on autobiographical memory is suggested to be twofold. The more similar the repeated experience to earlier ones, the stronger the memory traces will get as a result of rehearsal. For example, for dancers like the ones who participated in the current study, having the same show with the same song on the same stage over and over may strengthen the memory for the song, choreography, and location of this particular show. At the same time, it will become more and more difficult to distinguish between remaining

details of this event such as date or audience. In other words, if there is a *variation* within one instance of an event, memory traces for that variation may be weaker while the gist traces get stronger. However, if an instance involves *deviation* rather than *variation* memory traces for this particular instance may get stronger. For example, a dancer may get injured during a show and need to quit without completing, which is out of script. In this case, memory traces for this instance will get stronger and distinct by additional tags. Even with such remarkable deviations, we can still consider this event as an instance of show script because it still has common components. Even if a dancer is to get injured during the show, s/he practiced for the show in the same way, prepared his/her outfit, and warmed-up as in other instances.

### **Present Study**

The aim of the present study was to explore autobiographical memory processes for repeated events in adults. We should note that it was a quite challenging job to select a particular *repeated* event to examine. Based on our pilot research, we observed that what individuals understood from *repeated* varied enormously. Most typical answers were, having holidays or parties and going to the theater. Some individuals even listed daily events such as having breakfast and dinner or having a shower. However, we were curious about events with higher repetition than holidays and lower repetition than having breakfast. Consequently, we not only decided to restrict the type of the events but also preferred to have a specific sample in order to have more control over the event type and event frequency. For that reason, we investigated the memories of dancers for competitions and shows they performed.

In Turkey, dance-sport has a very short history but the number of dancers from all age groups ranging from juveniles to seniors is steadily increasing. In a typical dance-sport season, at least one national competition is organized every month. In particular months, additional private competitions or international competitions are also organized. Finally, it is possible to go abroad to participate in international competitions because each weekend there

are competitions in different parts of the world. In short, competitions are generally experienced on a regular basis. Shows, on the other hand, may be performed at any time with various repetitions. Sometimes a dancer may have as many as five or six shows in one day or only one show in two months. Thus, shows are experienced on a more variable basis compared to competitions.

We preferred to explore memories of both competitions and shows for two reasons. First of all, these two types of events differ in their frequency. More specifically, dancers usually have more show experiences than competition experiences. This difference in their frequency would add to our understanding of the potential effects of repetition on memory processes for personal memories. Second, other differences between competitions and shows may have implications for memory processes as well. For example, competitions are usually more critical since the result of a competition is important. Because of the expectancies regarding the results, anxiety and stress levels may be much higher during competitions. For shows, however, there is no such expectancy. They are usually more planned, consistent, and optional. Furthermore, dancers select the songs for their shows themselves and may rehearse and perform the same show with the same song throughout the whole season. In competitions, on the other hand, songs are selected by organizers; dancers have no control over the songs to be played. Any song with the appropriate rhythm and tempo can be played. Thus, all these differences in expectancies and control levels may have implications for memory processes by affecting event qualities (e.g., importance, emotional valence, and intensity). Finally, in the current study we asked memories of a movie as the control event in addition to the memories of competitions and shows. By adding an event as frequently experienced and ordinary and one that they are not a participant but an observer, it would be possible to examine whether competitions and shows became as ordinary as watching a movie for dancers by repetition or not.

Dancers reported one movie, three competition, and three show memories. For each reported memory, they rated event qualities of importance, emotional valence, emotional intensity, vividness, confidence, rehearsal (frequency of thinking and talking), and clarity. Importance, emotional valence and emotional intensity were rated for encoding and retrieval stages separately. Competitions, shows and movies were predicted to differ in importance and emotional intensity at the time of the event (encoding) but not at the time of retrieval. More specifically, competitions were expected to be the most important and intense while the movie would be the least important and intense memories. If this hypothesis were confirmed, it would be possible to compare different types of repeated events with varying degrees of personal importance and emotional intensity. For emotional valence at the time of encoding, three event types were expected to be similar because emotional valence judgments are mainly based on knowledge about the events at hand rather than personal experience. In line with this argument, earlier work has indicated that emotional intensity was a stronger predictor of autobiographical memories than emotional valence (Reisberg, Heuer, McEan, & O'Shaughnessy, 1998; Talarico, Labar, & Rubin, 2004). In a recent study on life scripts and autobiographical memories, we observed that individuals rated emotional valence of events quite similarly independent of personal experience (Ece & Gülgöz, 2014). More specifically, an event like parental death was evaluated as negatively valenced without necessarily experiencing personally. Additionally, show memories were predicted to differ from other event types in terms of confidence for two reasons. First, they are experienced more frequently, and second, the number of common components (e.g., song, outfit) repeated exactly in the same way across different instances are higher compared to competitions. Finally, memories of competitions, shows, and movies were expected to be similar regarding the remaining event characteristics of rehearsal (thinking and talking), vividness, clarity,

emotional valence, and emotional intensity at the time of retrieval as well as importance during retrieval.

The difference in the frequencies of competitions and shows makes it possible to examine the effect of different repetition rates on memory characteristics. In that respect, event frequencies were predicted to be correlated with event qualities such that there would be a consistent decrease in memory characteristics as the event frequency increased. Thus, dancers were predicted to rate certain qualities of their recollections lower as the number of their recurring experiences increased.

Music is an integral part of dance which also makes it an inherent component of dance-related memories. For that reason, dancers were asked to report if they remembered their memories together with the associated songs or not. They were predicted to recall the songs of their shows better than that of movies and competitions since shows are prepared in the context of a specific song and they are rehearsed and performed with the same song several times. It was further predicted that dancers would remember songs of movies better than that of competitions. This prediction was based on the fact that movies have the same soundtracks and each time, the same movie is paired with the same song. For competitions, on the other hand, it is never possible to know which songs would be played in advance like shows and the songs are not always the same like soundtracks. Thus, even if their competition choreography is the same, they perform it with different songs, not only across competitions but also across different rounds of the same competition. For that reason, there is room for interference regarding their memories of songs from competitions whereas there is a chance of rehearsal for songs of shows and movies.

Dancers reported memories of three competitions and three shows they performed excluding the first and the last experiences. Since we had more than one memory for each event type, we had a chance to explore the potential effect of retrieval order. Our aim was to

investigate whether the event qualities would display differences as a function the retrieval order and the number of repetitions. Event quality ratings were expected to display a steady decline with the retrieval order such that the first reported events would be rated higher in general. This difference was predicted to be more pronounced for competition memories than show memories since show memories were expected to be less important or more ordinary due to their higher frequency compared to competitions.

## **Method**

### **Participants**

The study was conducted online. Dancers were contacted via email and social media by the authors and were invited to participate in a study regarding how dancers remembered the shows and competitions they performed. They were further asked to share the online survey link (Qualtrics, Provo, UT) with their colleagues and other interested parties if possible. A total of 82 dancers completed the online survey. All participants were required to have at least five competition and five show performances to be eligible for the study. To ensure data quality, dancers (a) who did not meet the criteria (e.g., participated in less than five competitions and shows), (b) who did not follow instructions (e.g., reported their first or last competition), (c) who spent too little (less than ten minutes) or too much time (more than three hours) on the survey, and (d) who were younger than 18 years old were excluded. The remaining sample consisted of 67 dancers (39 female and 28 male) ranging from 18 to 40 years old ( $M = 27.16$ ,  $SD = 4.48$ ). Dancing history of the final sample ranged from three to seventeen years ( $M = 9.36$ ,  $SD = 3.63$ ). They were all native Turkish speakers, volunteered to take part in the study and received no compensation for their participation.

### **Materials**

**Dance history scale.** Participants were asked to report certain details about their dance history such as how long they had been dancing, the number of competitions and shows they

had participated in, and their frequency of practicing. They were further asked whether they were still dancing actively or they had quit competing. Moreover, they were asked to report if they had ever took part in the national team and to specify how many times they had represented the country as a national team if they did. Finally, they rated the centrality of dance in their lives. All questions had multiple choice options and had additional spaces for any additional information.

**Autobiographical memory task.** Participants were asked to report three shows and three competitions they performed in addition to a movie they watched in the theater. For each reported memory, they were asked to state the date and the location of the event. They were also to provide ratings for numerous event qualities: importance, emotional valence and intensity, vividness, confidence, rehearsal (frequency of thinking and talking about the event), and clarity. Among these event qualities, importance, emotional valence, and emotional intensity had two separate ratings for the time of encoding and the time of retrieval. All the other event qualities were relevant to the time of remembering. Finally, they were asked whether they had photographs or videos of the reported event. If they had, they further specified how frequently they were exposed to these photographs and videos.

### **Procedure**

The overall survey consisted of four parts. In the first part, they were asked to respond to demographic questions including age, gender, and education. In the second part, they completed the dance history scale. In the third part, they were asked to retrieve and write down three competitions and three shows they had in addition to one movie they watched in a theater. In the fourth part, events reported in the third part were presented to them one at a time. For each memory, they provided further information such as date and location of the event and rated the event qualities (e.g., importance, emotional valence and intensity).



## Results

Each participant was to report seven autobiographical events: one movie, three competition and three show memories. A total of 67 movie, 201 competition and 171 show memories were reported. The total number of show memories was not equal to the total number of competition memories because ten participants did not rate the event qualities of the shows they had reported. For that reason, all the analyses including show memories were based on 57 participants rather than 67.

The frequencies of competitions and shows were compared. The difference between the number of competitions participated and the number of shows performed was significantly different,  $t(66) = -4.31, p = .001$ . Dancers experienced a significantly higher number of shows ( $M = 47.28, SD = 50.9$ ) compared to competitions ( $M = 20.12, SD = 12.99$ ). This finding is consistent with the fact that dancers usually participate in competitions less often than shows in a typical dance season.

Movie, competition and show memories were compared in terms of the event qualities assessed. Each participant reported three competition and three show memories but only one movie memory. For that reason, means of three reported events were used in the analyses for event qualities of competition and show memories. Results of within-subjects ANOVAs are presented in Table 1. As seen in Table 1, these three event types significantly differed only in two event qualities: importance at the time of encoding and emotional intensity at the time of encoding, as predicted. Pairwise comparisons with Bonferroni correction revealed that importance at the time of encoding ratings were higher for competition memories compared to show memories ( $p = .001$ ). Show memories, in turn, had higher ratings than movie memories ( $p = .019$ ) whereas the difference between competition and movie memories was at chance level ( $p = .053$ ). Although ratings for emotional intensity at the time of encoding displayed exactly the same trend, Pairwise comparisons yielded no significant differences. Memories of

movies, competitions and shows were similar to each other in terms of all the remaining event qualities. Thus, participating in competitions and performing shows seem to be as ordinary as watching a movie for dancers. Three event types were also compared in terms of participants' memory for the associated song. Dancers remembered the songs of their shows significantly better compared the songs of competitions and movies (see Table 1). This finding is not surprising considering the fact that the shows are usually prepared for specific songs and are rehearsed and performed with the same songs repeatedly. In competitions, however, the songs are not selected by the dancers and therefore, they are exposed to them only at that instance.

*Table 1. Comparison of competition, show and movie memories in event qualities*

Event quality	Film		Competition		Show		F	p
	M	SD	M	SD	M	SD		
Encoding importance	3.79	0.72	4.35	0.44	4.08	0.67	4.51	.001
Encoding valence	3.84	0.95	3.91	0.58	4.02	0.76	0.74	.478
Encoding intensity	3.81	1.03	4.14	0.51	3.93	0.74	3.19	.045
Importance	3.52	0.92	3.54	0.67	3.41	0.86	0.45	.637
Valence	3.66	0.81	3.72	0.60	3.82	0.75	0.81	.447
Intensity	3.00	1.19	3.02	0.86	2.87	1.05	0.47	.628
Vividness	3.59	0.94	3.69	0.65	3.88	0.82	2.36	.099
Confidence	3.93	0.72	3.81	0.70	4.02	0.73	1.75	.178
Rehearsal (Thinking)	2.72	1.04	2.84	0.77	2.72	0.79	0.45	.640
Rehearsal (Talking)	2.72	0.79	2.86	0.77	2.70	0.85	0.88	.417
Clarity	3.95	0.99	3.97	0.69	4.12	0.75	1.32	.270
Song retrieval	1.85	0.65	1.59	0.68	3.26	0.94	80.90	.001

Main effects of event type (competition or show), retrieval order (first, second, or third) and their interaction were examined by 2x3 within-subjects ANOVAs for each event quality. The results of these analyses are summarized in Table 2. In order to analyze the three instances of shows and competitions separately, new analyses on these memories were performed, excluding the movie memories (See Table 3 for means and standard deviations).

Table 2. Main effects and interactions of event type and retrieval order

Event quality	n	F	MSE	p
Encoding importance				
Event type	57	8.09	6.46	.006
Retrieval order	57	5.32	3.19	.006
Type*Order	57	1.17	0.78	.313
Encoding valence				
Event type	57	0.50	0.57	.483
Retrieval order	57	4.49	4.14	.013
Type*Order	57	1.58	1.25	.211
Encoding intensity				
Event type	57	4.20	3.79	.045
Retrieval order	57	5.54	3.06	.005
Type*Order	57	0.18	0.11	.834
Importance				
Event type	57	1.24	1.68	.271
Retrieval order	57	0.63	0.58	.536
Type*Order	57	1.39	1.03	.254
Valence				
Event type	57	0.48	0.57	.493
Retrieval order	57	4.67	3.19	.011
Type*Order	57	1.69	1.45	.189
Intensity				
Event type	57	0.83	1.55	.368
Retrieval order	57	3.21	2.78	.044
Type*Order	57	1.87	1.37	.159
Vividness				
Event type	57	3.30	2.63	.075
Retrieval order	57	0.98	0.74	.380
Type*Order	57	2.17	0.98	.119
Confidence				
Event type	57	7.04	4.00	.010
Retrieval order	57	0.77	0.35	.464
Type*Order	57	1.54	0.65	.218
Rehearsal (Thinking)				
Event type	57	1.20	1.17	.278
Retrieval order	57	0.56	0.33	.580
Type*Order	57	2.50	1.31	.087
Rehearsal (Talking)				
Event type	57	2.57	2.81	.115
Retrieval order	57	4.75	2.96	.011
Type*Order	57	3.17	1.62	.046
Clarity				
Event type	57	3.73	2.13	.059
Retrieval order	57	0.93	0.53	.399
Type*Order	57	4.68	2.48	.011
Song				
Event type	57	110.56	240.85	.001
Retrieval order	57	2.80	1.56	.065
Type*Order	57	0.16	0.08	.850

Table 3. Means and standard deviations of event qualities for each reported competition and show memory

Event Quality	Competition 1		Competition 2		Competition 3		Show 1		Show 2		Show 3	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Encoding importance	4.58	0.56	4.30	0.78	4.12	0.84	4.18	0.91	4.02	1.01	4.00	1.05
Encoding valence	4.18	0.97	3.94	0.94	3.61	1.03	4.09	1.14	4.00	0.89	3.91	1.09
Encoding intensity	4.28	0.69	4.07	0.84	3.94	0.78	4.04	0.94	3.93	0.90	3.77	1.18
Importance	3.70	1.00	3.60	0.87	3.40	0.94	3.35	1.23	3.42	1.25	3.42	1.13
Valence	4.00	0.96	3.73	0.96	3.51	0.94	3.84	1.05	3.88	0.89	3.72	1.05
Intensity	3.33	1.11	3.03	1.13	2.84	1.01	2.91	1.41	2.91	1.31	2.82	1.21
Vividness	3.85	0.89	3.58	1.02	3.63	0.89	3.86	1.09	3.89	0.99	3.88	1.02
Confidence	3.96	0.77	3.73	0.91	3.76	0.87	4.02	0.99	4.02	0.94	4.07	0.84
Rehearsal (Thinking)	2.96	0.96	2.73	0.95	2.78	1.03	2.67	0.04	2.84	1.03	2.70	0.93
Rehearsal (Talking)	3.10	0.97	2.66	0.86	2.78	1.03	2.72	1.10	2.63	1.01	2.67	1.04
Clarity	4.11	0.88	3.76	1.01	3.88	0.87	4.02	0.99	4.11	1.01	4.26	0.92
Song retrieval	1.71	1.00	1.44	0.70	1.55	0.81	3.37	1.11	3.19	1.14	3.23	1.20
Time since event	3.74	2.54	3.33	2.38	3.12	2.58	4.19	2.74	3.35	2.22	3.25	2.69
Age at event	23.53	3.46	23.94	3.54	24.15	3.47	23.40	4.33	24.25	4.04	24.35	3.79

**Importance at the time of encoding.** There was a main effect of event type (see Table 2) such that competitions ( $M = 4.34$ ,  $SD = .06$ ) were rated as significantly more important at the time of the experience compared to shows ( $M = 4.06$ ,  $SD = .09$ ). As seen in Table 2, retrieval order also had a main effect on importance at the time of encoding ratings. Although these ratings displayed a tendency to decrease as the retrieval order increased, pairwise comparisons indicated that only the events reported first and third significantly differed from each other ( $p = .003$ ). More specifically, first reported events ( $M = 4.38$ ,  $SD = .72$ ) had higher ratings for the importance at the time of the experience compared to the ones reported as the third ( $M = 4.04$ ,  $SD = .93$ ). None of the other pairwise comparisons was significant.

**Emotional valence at the time of encoding.** Event type had no effect on emotional valence at the time of encoding whereas retrieval order showed a main effect (see Table 2). Thus, competitions and shows were not different regarding their emotional valence at the time of the event. However, whether an event was reported in the first, second or third order made a difference. This difference was not qualified by an interaction. Pairwise comparisons revealed that the only significant difference was between the first and third events ( $p = .009$ ). Events reported first ( $M = 4.13$ ,  $SD = 1.06$ ) were rated as significantly more positive compared to the ones reported third ( $M = 3.75$ ,  $SD = 1.04$ ).

**Emotional intensity at the time of encoding.** Both event type and retrieval order had main effects on emotional intensity at the time of encoding (Table 2). These effects were not qualified by an interaction. Competitions ( $M = 4.12$ ,  $SD = .73$ ) were evaluated as significantly more intense than shows ( $M = 3.91$ ,  $SD = 1.01$ ). Moreover, first reported events ( $M = 4.17$ ,  $SD = .80$ ) were rated significantly higher in emotional intensity compared to the ones reported as the third event ( $M = 3.84$ ,  $SD = .97$ ) ( $p = .006$ ).

**Importance.** Neither event type nor retrieval order had main effects on the ratings about importance at the time of retrieval. Their interaction was not significant, either (See Table 2). Therefore, competitions and shows were rated similarly in their importance at the time of remembering. Moreover, whether an event was reported first, second or third had no impact on the importance judgments at the time of retrieval.

**Emotional valence.** There was no main effect of event type for emotional valence at the time of retrieval (Table 2). Retrieval order, on the other hand, had a main effect. The only significant difference was between the first and third events ( $p = .005$ ). Events reported first ( $M = 3.93$ ,  $SD = 1.03$ ) were rated as significantly more positive compared to the events reported third ( $M = 3.60$ ,  $SD = 1.00$ ).

**Emotional intensity.** There was no main effect of event type on emotional intensity at the time of retrieval. In other words, competitions and shows were similar in their emotional intensity. Retrieval order, however, had an effect on emotional intensity during remembering. Only the difference between first and third events was significant ( $p = .038$ ). Events reported in the first order ( $M = 3.09$ ,  $SD = 1.27$ ) were rated as significantly more intense compared to the ones reported in the third order ( $M = 2.78$ ,  $SD = 1.11$ ).

**Confidence.** Event type had a main effect on confidence. Participants were significantly more confident of show memories ( $M = 4.04$ ,  $SD = 1.47$ ) than competition memories ( $M = 3.82$ ,  $SD = .76$ ). An effect of retrieval order or an interaction was not found.

**Rehearsal (frequency of talking).** There was no effect of event type on frequency of talking. Dancers talked about competitions and shows to a similar extent. Retrieval order, however, showed a main effect. The difference between the first and second events was significant ( $p = .013$ ). Participants talked significantly more often about the events reported first ( $M = 2.95$ ,  $SD = 1.03$ ) compared to the ones reported second ( $M = 2.65$ ,  $SD = .95$ ). The interaction between event type and event order was also significant (Table 2). Dancers talked

about the competition reported in the first order significantly more often than the other competitions reported whereas they talked about all the shows they reported to a similar extent independent of the retrieval order.

**Clarity.** Neither event type nor retrieval order had an effect on clarity ratings regarding how detailed they remembered the reported events but their interaction was significant (Table 2). For memories of competitions, the first remembered events were recalled in more detail while it was just the opposite for memories of shows; the last reported show was recalled in a more detailed fashion.

Neither event type nor retrieval order had an effect on vividness and rehearsal (frequency of thinking). Furthermore, no interaction was found (Table 2).

**Song retrieval.** Main effect of event type was observed in remembering the songs in competitions and shows. Memory for songs was better for shows ( $M = 3.26$ ,  $SD = 1.14$ ) than competitions ( $M = 1.59$ ,  $SD = .85$ ). Retrieval order, however, had no effect on remembering songs.

With respect to song retrieval, dancers were asked to report how good they were at remembering songs of movies, competitions and shows in general. They responded on a five-point scale and within-subjects analysis of their responses indicated significant differences,  $F(2,56) = 51.50$ ,  $MSE = 36.57$ ,  $p = .001$ . All pairwise comparisons were highly significant. Dancers reported to be best in remembering songs of shows ( $M = 3.88$ ,  $SD = 1.05$ ) followed by songs of movies ( $M = 3.19$ ,  $SD = .97$ ) and competitions ( $M = 2.28$ ,  $SD = .98$ ).

**Time since event.** Time elapsed between the original experience and retrieval was calculated for each reported memory. Main effects of event type and retrieval order were examined by using the age of the participant as covariate. Results indicated no main effect of event type,  $F(1,55) = 2.30$ ,  $MSE = 14.93$ ,  $p = .135$ , or retrieval order  $F(2,55) = .83$ ,  $MSE = 3.22$ ,  $p = .437$ . None of the interactions, including those with age, reached significance.

**Comparison of event qualities at the time of encoding and retrieval.** Participants rated event qualities of importance, emotional valence and emotional intensity for both at the time of encoding and retrieval. Encoding and retrieval ratings of participants were compared for movie, competition, and show memories by using 3x2 within-subjects ANOVAs. Within-subject variables were event type (movie, competition and show) and time (encoding and retrieval).

Analyses revealed main effect of both event type ( $F(2,57) = 3.68, MSE = 2.51, p = .028$ ) and time ( $F(1,57) = 106.95, MSE = 30.09, p = .001$ ) for importance. These effects were qualified by an interaction ( $F(2,57) = 9.49, MSE = 2.27, p = .001$ ). Bonferroni post hoc test revealed that only movie ( $M = 3.66, SD = .82$ ) and competition memories ( $M = 3.94, SD = .55$ ) were significantly different from each other ( $p = .027$ ). No other pairwise comparison reached significance level. In terms of time, memories were rated as significantly less important at the time of retrieval ( $M = 3.49, SD = .82$ ) compared to encoding ( $M = 4.07, SD = .61$ ). And, the amount of decline in importance over time was greatest for competition memories while it was lowest for movie memories.

For emotional valence, there was no effect of event type ( $F(2,57) = .95, MSE = .82, p = .389$ ) whereas time showed a main effect ( $F(1,57) = 26.45, MSE = 3.19, p = .001$ ). This effect was not qualified by an interaction ( $F(2,57) = .01, MSE = .01, p = .989$ ). Memories were rated as significantly more positive in terms of emotional valence at the time of encoding ( $M = 3.92, SD = .76$ ) compared to retrieval ( $M = 3.73, SD = .72$ ).

Event type had no effect on emotional intensity ( $F(2,57) = 1.12, MSE = 1.19, p = .330$ ) whereas time had a main effect ( $F(1,57) = 154.28, MSE = 86.67, p = .001$ ). No interaction was obtained ( $F(2,57) = 2.97, MSE = .79, p = .055$ ). Memories were rated as significantly more intense at the time of encoding ( $M = 3.96, SD = .76$ ) compared to retrieval ( $M = 2.96, SD = 1.03$ ).



**Correlations between event frequency and event qualities.** The correlations between the number of competitions participated and event qualities were examined. The number of competition was only significantly correlated with emotional valence ( $r(67) = -.28, p = .024$ ) at the time of encoding and frequency of talking about the event ( $r(67) = .25, p = .040$ ). As the number of competitions dancers participated increased, emotional valence of the reported competitions at the time of the event was rated as less positive. Moreover, frequency of talking about competitions increased as the number of experienced competition increased. For show memories, the number of shows participated was not correlated with any of the event qualities measured.

### **Discussion**

The aim of the present study was to contribute to the limited number of research on autobiographical memory of repeated events. For that aim, memories of dancers for two types of events with different repetition rates (competitions and shows) were examined on the basis of different instances. Moreover, memories of movies were investigated as a control event. All reported memories were compared with respect to event qualities of importance, emotional valence, emotional intensity, vividness, confidence, rehearsal (frequency of thinking and talking), and clarity. Among these, event qualities of importance, emotional valence, and emotional intensity were rated for both encoding and retrieval stages. Event qualities were further examined in terms of the potential effect of retrieval order to understand whether order of recollection correlated with other differences in event characteristics.

Competitions and shows were especially selected for the current purposes based on the fact that they usually differ in event frequency. This difference was quite clear in our sample since dancers experienced shows significantly more often than competitions. Potential impact of event type (movie, competition, and show) was examined in two separate ways. First, all three event types were compared in term of event qualities to detect differences between the

control event, movie, and the two primary event types of the study (competition and show). Second, only competition and shows were compared and analyzed with respect to the effects of event type and retrieval order.

Movies, competitions and shows only differed from each other on importance and emotional intensity at the time of encoding, as predicted. Competitions were the most important event type for dancers followed by shows and movies. The same trend was observed for retrospective emotional intensity judgments but differences were not significant. Movies, competitions, and shows were similar in all the remaining event characteristics as hypothesized. This finding may be related to the possible decline in event qualities over time because all the remaining event characteristics belong to the time of retrieval. Thus, during the time elapsed between encoding and retrieval, event qualities may fade away or individuals' retrospective evaluations may be subject to change. This argument can be investigated by future research based on both current and retrospective ratings for these event characteristics at the time of encoding and corresponding ratings for the time of retrieval. In that way, it may be possible to understand whether events weaken in their event qualities over time or individuals rate events higher in case of retrospective evaluations.

In the present study, we had a chance to compare not only different instances of the same event type (e.g., competition) but also two separate event types with different repetition rates (competitions and shows). When competitions and shows were compared without including movies, once more, event type had an effect on importance and emotional intensity at the time of encoding. For dancers, competitions were much more important and emotionally more intense than shows. Shows and competitions further differed in confidence such that dancers were more confident of their show memories compared to that of competitions. This finding is not surprising considering that fact that shows are more frequently experienced, hence rehearsed, than competitions. Furthermore, different instances

of shows have relatively more common components in real life paving the way for stronger memory traces. For competitions, however, there are usually distinct components to be tagged that are more likely to vary across recurring instances leading to interference rather than rehearsal. Memories of competitions and shows were similar for the remaining event qualities as in the comparison of three event types.

In addition to the event qualities, memories were also examined in terms of the retrieval of the associated songs. Memory for song was best for shows followed by movies and competitions. This pattern of results is conceivable because shows are usually prepared in the context of specific songs. They are further rehearsed and performed with the same songs repeatedly. For movies, we generally listen to their soundtracks and the same movie has the same soundtrack, it is not variable. For competitions, on the other hand, competitors have no control over the songs to be played. They only know the order and duration of the dances that they are required to perform but have no information about the songs. For example, if they will dance samba, they only know that any song with samba rhythm will be played. As a result, it is not surprising that their memory for the songs in competitions is poorer. The songs are different even among the different rounds of the same competition and among different competitions. The probability of interference increases with repetition for competition songs while memory traces get stronger for show songs and soundtracks as a result of rehearsal of the same components. This pattern was further supported by our results based on dancers' memory for songs of movies, show and competitions in general in addition to their recollection of the songs associated with the reported events.

Importance, emotional valence and emotional intensity of reported events were rated for two different time points: at the time of experience and at the time of remembering. These two different types of judgments made it possible to compare the same event qualities across encoding and retrieval situations. For all three event qualities, ratings at the time of encoding

were higher than that of retrieval. More specifically, dancers rated their memories of shows and competitions as more important, emotionally more positive and more intense at the time of the experience compared to the time of remembering. However, as discussed before, this pattern of results may stem from two different processes. First, memory characteristics may be inclined to decrease as a result of mere passage of time. Second, dancers may attribute more importance and higher emotional valence and intensity over time paving the way for boosted retrospective evaluations. Future research is required to distinguish between these two possible underlying mechanisms regarding the differences in event qualities at the time of encoding and retrieval.

Shows were experienced more often than competitions in our sample. Despite the difference in their frequency rates, both event types displayed almost no correlation between their frequencies and event quality ratings. To be more specific, frequency of shows was correlated with none of the event qualities. The frequency of competitions, on the other hand, was only correlated with emotional valence and rehearsal (frequency of talking about the event). As the number of competition experiences increased, dancers not only rated their memories as emotionally more negative but also observed to be talking more often about the competitions they reported. These findings were not in the expected direction because we predicted to obtain a decline in event qualities as events became more frequently experienced. However, it will be misleading to conclude that event qualities are independent of event frequency on the basis of current results for several reasons. First, we had a selected group of participants (dancers) and specific event types (competitions and shows). Our sample was atypical in terms of both subjects and content. Second, the range of event frequency in our study may not be sufficient to find out any potential link between the event repetition and memory characteristics. Therefore, studies exploring different event types (e.g., holidays and

lectures) with repetition rates higher and lower than that of competitions and shows may be promising to investigate the impact of event frequency on memory qualities.

To sum up, current results indicated that our event selection was well-targeted as the selected event types were different from each other in terms of personal importance. Competitions were the most important experiences for dancers followed by shows and movies. The fact that these event types were similar in remaining memory characteristics is also meaningful in showing that competition and show memories become as ordinary as watching a movie for dancers as a result of repetition. Despite this similarity across event types, differences were observed across different instances of the same event type as a function of retrieval order. As predicted, memories reported first were higher in event qualities (e.g., more important, more positive, and more intense) in general than events reported as the third. It is important to note that event qualities displayed such a consistent decline with retrieval order that the differences between first and second events were not significant while the differences between the first and third memories were remarkable. Most probably, dancers started with the most distinct one among their several experiences. We would like to remind that they were instructed not to report their first and last experiences which would have been, by definition, more distinct. Then, the question is why dancers especially recollected these three cases among numerous instances.

As we discussed in the introduction, retrieval of recurring experiences can be conceptualized on the basis of different theoretical approaches which are not necessarily incompatible. Based on trace theories, for example, each competition experience has its own unique trace and similar memory traces will be activated simultaneously during retrieval. One event among several instances will be the finally recollected one depending on the strongest memory trace activated (Hintzman, 1984). Fuzzy trace theory actually adds further elaboration by suggesting that not only each competition has its own individual trace but it

also has two different types of traces: gist and verbatim (Brainerd & Reyna, 1996, 2002; Reyna, et.al., 2002). Combined with the trace theories, we can argue that the gist traces are the competing ones simultaneously activated during remembering whereas the verbatim traces are the ones more influential in determining the final result as they contain details specific to that instance. Schema or script-based theories state that similar instances of recurring events are organized into a unified cognitive structure (Fivush, 1984b; Hudson, 1990; Nelson, 1986; Nelson & Gruendel, 1981; Schank & Abelson, 1977). It can be argued that competitions and shows seem to become scripted by repetition as they are not different from a highly scripted event such as watching a movie in the theater with respect to event qualities. Finally, different versions of “script plus tag” theories propose that we have the script in our mind for repeated events and tag distinct components of each individual instance (Hudson, 1986; Morton, et.al., 1985; Reiser, 1986; Schank & Abelson, 1977)

From our perspective, remembering specific instances of a frequently occurring event can be explained by the combination of all the theoretical perspectives reviewed here. By repeated experiences, dancers develop a script by organizing several instances into a single abstract knowledge representation based on similar components. Moreover, they form memory traces for each individual competition experience and tag distinct components of each instance as attachment to their competition script. Based on the distinctiveness of the additional details of a particular instance, they may add variation or deviation tags for the distinct components. For example, winning the fourth place can be considered as a verbatim memory trace or variation tag since it is within the script. Getting disqualified, on the other hand, would be an example of a deviation tag but still verbatim memory trace because it represents a distinct detail peculiar to that instance. Furthermore, memory traces for the gist, common components, or the script, whatever we name it, will get stronger as they are rehearsed by repetition. Memory traces for deviation tags will also be strong as they are

distinct components that are unexpected in the script. Memory for variation tags, however, will be vulnerable to interference since they are distinct details expected within the range of the script and not necessarily rehearsed at each instance. Finally, memories of instances with more common components would feel similar and ordinary while instances with especially deviation tags would be perceived as more distinct and unique. However, even if they are evaluated as unique they will still have common components with earlier instances. To put it differently, they have deviation tags making them feel like unique but they have these tags as an attachment to the scripts representing the shared features. As we discussed at the very beginning, no event is totally unique, at least in our memory system. Therefore, it may not be possible to step in the same river twice in reality as suggested by Heraclitus but it is possible in our memories.

### **Conclusion**

Three chapters presented in the present dissertation concentrated on the retrieval processes in autobiographical memory system. The first two chapters specifically focused on the phenomenon of the reminiscence bump in the lifespan distributions of life scripts and autobiographical memories with respect to the possible impact of typical life events on these distributions. The final chapter, on the other hand, explored memory for repeated events with the purpose to understand how events become typical or scripted. Results of each study were discussed on the basis of the relevant theoretical approaches based on literature specific to each research topic.

In the first study, suppression of the most typical life events were expected to weaken or clear away the reminiscence bump in not only life script but also autobiographical memory distribution. Results were in the expected direction by demonstrating that the regular reminiscence bump disappeared in the lifespan autobiographical retrieval curve. Although suppression of the typical life events affected the distribution of life scripts similarly for the

intervals between 21- 30, it weakened the bump for age intervals 16-20 and 31-35 to a lesser extent. However, these intervals were not significantly different from the preceding and following ones regarding the number of reported events. Thus, we can argue that the regular reminiscence bump was absent in life script distribution as well. These findings have provided support for our argument that the characteristics of typical life events and their corresponding lifetime period may have a role in the emergence of the reminiscence bump.

In the second chapter, the most typical events were removed from the dataset after data collection rather than being suppressed at the time of retrieval by providing a list of ten events. The aim was to reveal whether the findings represented in the first chapter were distorted by possible inhibitory mechanisms. More specifically, the disappearance of the regular reminiscence bump in the first study might have resulted from the inhibition of events from the bump period as majority of the events (e.g., first job, graduation) in the given list were corresponding to that particular period of life. Results of the second study, however, clearly displayed that findings of the first research were not stemming from a generalized inhibition of the life events from the reminiscence bump period. Participants were given no instruction to exclude any life events or life scripts in their reports during retrieval as in the first study. Thus, there was no manipulation to lead to any inhibitory processes. The reminiscence bump was still affected in the same way providing support for the results of the first study. The robust reminiscence bump was not apparent in either life script or autobiographical memory distribution when the most typical ten life events were removed. In sum, results of the second study supported and extended the findings of the first one by showing that typical life events themselves have a role in the emergence of the reminiscence bump.

In the third chapter, memory processes for repeated events were examined in a special sample, dancers, for two different event types (competitions and shows) with different



repetition rates. Dancers provided one movies (control event type), three competition memories and three show memories which were further rated on the basis of numerous event qualities such as importance, emotional valence and emotional intensity. For these three event qualities, evaluations were gathered for both encoding and retrieval stages. Having more than one case for each event type allowed us to examine the effect of repetition and retrieval order. Results were in the predicted direction by demonstrating that movies, competitions and shows were different only in terms of importance and emotional intensity. Competitions were the most important and intense events for dancers followed by shows and movies. These three event types were similar in the remaining event qualities indicating that three events that are different from each other in terms of importance and emotional intensity at the time of the experience become similar to each other over time by repetition. In other words, competitions and shows seem to become as ordinary as watching a movie for dancers following several repeated experiences. With respect to the potential impact of retrieval order, we found that first reported events were rated higher in general compared to the events reported third. As predicted, event qualities displayed a steady decline as a function of their retrieval order. Results were discussed on the basis of trace theories, fuzzy trace theory and script-based theories to understand the possible mechanisms underlying the retrieval of different instances of recurring events.

To conclude, present dissertation contributed to the autobiographical memory research in two major ways. First, results of the first two studies displayed that the reminiscence bump phenomenon, which stimulated a tremendous research attention over decades, may be just an artifact of advantaged accessibility of the most typical life events themselves. It is further argued that these typical events might be corresponding to the reminiscence bump period as a result of certain biological and social constraints. Second, the final study provided insight about a relatively neglected topic of research, memory for repeated events in adults. By

examining two different event types with varying frequencies in a selected sample, the third study paved the way for future studies to explore the retrieval of different instances of repeated experiences.

## References

- Alba, J. W., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin*, *93*, 203–231.
- Bartlett, F.C. (1932). *Remembering: A Study in Experimental and Social Psychology*. Cambridge University Press.
- 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*, 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. DOI:10.3758/BF03195836.
- Bohn, A. (2010). Generational differences in cultural life scripts and life story memories of younger and older adults. *Applied Cognitive Psychology*, *24*(9), 1324-1345. DOI:10.1002/acp.1641
- Brainerd, C. J., & Reyna, V. F. (1996). Mere memory testing creates false memories in children. *Developmental Psychology*, *32*, 467–478.
- Brainerd, C. J., & Reyna, V. F. (2002). Recollection rejection: How children edit their false memories. *Developmental Psychology*, *38*, 156–172.
- Brewer, W. F. (1986). What is autobiographical memory? In D. C. Rubin (Ed.), *Autobiographical Memory*, (pp. 25-49). Cambridge: Cambridge University Press.
- Bruce, D., Dolan, A., & Philips-Grant, K. (2000). On the transition from childhood amnesia to the recall of personal memories. *Psychological Science*, *11*, 360-364. DOI: 10.1111/1467-9280.00271

- Connolly, D. A., & Lindsay, D. S. (2001). The influence of suggestions on children's reports of a unique experience versus an instance of a repeated experience. *Applied Cognitive Psychology, 15*, 205–223.
- Connolly, D. A., & Price, H. L. (2006). Children's suggestibility for an instance of a repeated event versus a unique event: The effect of degree of association between variable options. *Journal of Experimental Child Psychology, 93*, 207–223.
- Conway, M. A. (1997). Memory and Identity. In J. W. Pennebaker, D. Paez and B. Rimé (Ed.) *Collective Memory of Political Events*, (pp. 21-46). New Jersey: Lawrence Erlbaum Associates, Publishers.
- Conway, M. A., & Holmes, A. (2004). Psychosocial stages and the accessibility of autobiographical memories across the life cycle. *Journal of Personality, 72*(3), 461-478. DOI: 10.1111/j.0022-3506.2004.00269.x
- Conway, M. A., Wang, Q., Hanyu, K., & Haque, S. (2005). A cross-cultural investigation of autobiographical memory: On the universality and cultural variation of the reminiscence bump. *Journal of Cross-Cultural Psychology, 36*(6), 739-749. DOI:10.1177/0022022105280512
- 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*, 708-723. DOI: 10.1080/09658210902939322
- Ece-Usta, B. (2010). The interplay between cultural life scripts and life stories across three different age groups. Graduate thesis, Boğaziçi University.
- Ece, B., & Gülgöz, S. (2014). The Impact of Suppressing the Typical Life Events on the Reminiscence Bump. *Applied Cognitive Psychology*. DOI: 10.1002/acp.3056

- Erdoğan, A., Baran, B., Avlar, B., Taş, A. Ç., & Tekcan, A. İ. (2008). On the persistence of positive events in life scripts. *Applied Cognitive Psychology, 22*, 95-111.  
DOI:10.1002/acp.1363
- Farrar, M., & Goodman, G. (1992). Developmental changes in event memory. *Child Development, 63*, 173–187.
- Fitzgerald, J. M. (1988). Vivid memories and the reminiscence phenomenon: The role of a self narrative. *Human Development, 31*, 261-27. DOI: 10.1159/000275814
- 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. (1984a). Children's long-term memory for a novel event: An exploratory study. *Merrill-Palmer Quarterly, 30*, 303–316.
- Fivush, R. (1984b). Learning about school: The development of kindergarteners' school scripts. *Child Development, 55*, 1697–1709. (DETAILS)
- Gallo, D. A. (2006). *Associative illusions of memory: False memory research in DRM and related tasks*. New York: Psychology Press.
- Gluck, J., & Bluck, S. (2007). Looking back across the life span: A life story account of the reminiscence bump. *Memory & Cognition, 35(8)*, 1928-1939. DOI: 10.3758/BF03192926
- Habermas, T., & Bluck, S. (2000). Getting a life: The emergence of the life story in adolescence. *Psychological Bulletin, 126*, 748-769. DOI: 10.1037/0033-2909.126
- Han, J. J., Leichtman, M. D., & Wang, Q. (1998). Autobiographical memory in Korean, Chinese, and American children. *Developmental Psychology, 34(4)*, 701-713. DOI: 10.1037//0012-1649.34.4.701

- Haque, S., & Hasking, P. A. (2010). Life scripts for emotionally charged autobiographical memories: A cultural explanation of the reminiscence bump. *Memory, 18*(7), 712-729. DOI:10.1080/09658211.2010.506442.
- Harley, K., & Reese, E. (1999). Origins of Autobiographical Memory. *Developmental Psychology, 35*(5), 1338-1348. DOI: 10.1016/j.sbspro.2014.03.339.
- Hintzman, D. L. (1984). MINERVA 2: A simulation model of human memory. *Behavior Research Methods, Instruments, & Computers, 16*(2), 96-101. DOI: 10.3758/BF03202365
- Holbrook, M. B., & Schindler, R. M. (1989). Some exploratory findings on the development of musical tastes. *Journal of Consumer Research, 16*, 119–124. DOI: 10.1086/209200
- Holmes, A., & Conway, M. A. (1999). Generation identity and the reminiscence bump: Memory for public and private events. *Journal of Adult Development, 6*, 21-34. DOI:10.1023/A:1021620224085
- Hudson, J. A. (1990). Constructive processes in children's event memory. *Developmental Psychology, 2*, 180–187.
- Hudson, J.A., Fivush, R., & Kuebli, J. (1992). Scripts and episodes: The development of event memory. *Applied Cognitive Psychology, 6*, 483-505.
- Hudson, J. A., & Nelson, K. (1986). Repeated encounters of a similar kind: Effects of familiarity on children's autobiographical memory. *Cognitive Development, 1*, 253–271.
- Hyland, D. T., & Ackerman, A. M. (1988). Reminiscence and autobiographical memory in the study of personal past. *Journal of Gerontology: Psychological Sciences, 43*, 35-39. DOI:10.1093/geronj/43.2.P35
- Janssen, S. M. J., Chessa, A. G., & Murre, J. M. J. (2005). The reminiscence bump in autobiographical memory: Effects of age, gender, education, and culture. *Memory, 13*(6), 658-668. DOI: 10.3758/BF03193393

- Janssen, S. M. J., Chessa, A. G., & Murre, J. M. J. (2007). Temporal distribution of favourite books, movies and records: Differential encoding and resampling. *Memory, 15*, 755–767. DOI: 10.1080/09658210701539646
- Janssen, S. M. J., Galak, A., & Murre, J. M. J. (2011). A model for removing the increased recall of recent events from the temporal distribution of autobiographical memory. *Behavior Research Methods, 43*, 916-930. DOI: 10.3758/s13428-011-0110-z
- 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.  
DOI:10.1080/17470210701774242
- Janssen, S. M. J., Murre, J. M. J., & Meeter, M. (2008). Reminiscence bump in memory for public events. *European Journal of Cognitive Psychology, 20*, 738–764.  
DOI:10.1080/09541440701554409
- Katzman, R., Brown, T., Fuld, P., Peck, A., Schechter, R., & Schimmel, H. (1983). Validation of a short orientation-memory concentration test of cognitive impairment. *American Journal of Psychiatry, 140*, 734-739.
- Linton, M. (1982). Transformations of memory in everyday life. In U. Neisser (Ed.), *Memory observed*. San Francisco, CA: W. H. Freeman & Co.
- Loftus, E. F. (1975). Leading Questions and the Eyewitness Report. *Cognitive Psychology, 7*, 560-572.
- Loftus, E. F. (1993). Desperately seeking memories of the first few years of childhood: The reality of early memories. *Journal of Experimental Psychology: General, 122*(2), 274-277. DOI: 10.1037//0096-3445.122.2.274

- Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of Automobile Destruction: An Example of the Interaction between Language and Memory. *Journal of Verbal Learning and Verbal Behavior* 13, 585–589. DOI:10.1016/S0022-5371(74)80011-3.
- McNichol, S., Shute, R., & Tucker, A. (1999). Children's eyewitness memory for a repeated event. *Child Abuse and Neglect*, 23, 1127–1139.
- Mcrae, C. N., Schloerscheidt, A. M., Bodenhausen, G. V., & Milne, A. B. (2002). Creating memory illusions: Expectancy-based processing and the generation of false memories. *Memory*, 10, 63-80.
- Morton, J., Hammersley, R. H., & Bekerian, D. A. (1985). Headed records: A model for memory and its failure. *Cognition*, 20, 1-23.
- 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
- Nelson, K. (1986). *Event knowledge: Structure and function in development*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Nelson, K., & Gruendel, J. (1981). *Generalized event representations: Basic building blocks cognitive development*. In M. E. Lamb, & A. L. Brown (Eds.), *Advances in development psychology* (pp. 131–158). Hillside, NJ: Erlbaum.
- Nelson, K., & Ross, G. (1980). The generalities and specifics of long-term memory in infants and young children. *New Directions for Child Development*, 10, 87–101.
- Norman, D. A., & Bobrow, D. G. *Descriptions: A basis for memory acquisition and retrieval*. Report #1703. Center for Human Information Processing, La Jolla, CA, 1977.
- Piaget, J. (1926). *The Language and Thought of the Child*. New York: Harcourt Brace & Company.



- Piefke, M., & Fink, G. R. (2005). Recollections of one's own past: the effects of aging and gender on the neural mechanisms of episodic autobiographical memory. *Anatomy and Embryology*, *210*, 497-512. DOI: 10.1007/s00429-005-0038-0
- Pillemer, D. B. (1998). What is remembered about early childhood events? *Clinical Psychology Review*, *18*(8), 895-913. DOI: 10.1016/S0272-7358(98)00042-7
- Pillemer, D. B. (2001). Momentous events and the life story. *Review of General Psychology*, *5*(2), 123-134. DOI: 10.1037/1089-2680.5.2.123
- Powell, M. B., & Thomson, D. M. (1996). Children's memory of an occurrence of a repeated event: Effect of age, repetition, and retention interval across three question types. *Child Development*, *67*, 1988-2004.
- Price, H. L., & Connolly, D. A. (2004). Event frequency and children's suggestibility: A study of cued recall responses. *Applied Cognitive Psychology*, *18*, 809-821.
- Reisberg, D., Heuer, F., McLean, J., & O'Shaughnessy, M. (1988). The quantity, not the quality, of affect predicts memory vividness. *Bulletin of the Psychonomic Society*, *26*, 100-103.
- Reiser, B. J. (1986). The encoding and retrieval of memories of real-world experiences. In J. A. Galambos, R. P. Abelson, & J. B. Black (Eds.), *Knowledge structures*. Hillsdale, NJ: Erlbaum.
- Reyna, V. F., Holliday, R., & Marche, T. (2002). Explaining the development of false memories. *Developmental Review*, *22*, 436-489.
- Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 803-814.

- Rubin, D. C. (1982). On the retention function for autobiographical memory. *Journal of Verbal Learning and Verbal Behavior*, 21, 21-38. DOI: 10.1016/S0022-5371(82)90423-6
- Rubin, D. C., Berntsen, D., & Hutson, M (2009). The normative and the personal life: Individual differences in life scripts and life story events among USA and Danish undergraduates. *Memory*, 17, 54-68. DOI: 10.1080/09658210802541442
- Rubin, D. C., Rahhal, T. A., & Poon, L. W. (1998) Things learned in early adulthood are remembered best. *Memory and Cognition*, 26, 3-19. DOI: 10.3758/BF03211366
- 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
- Rubin, D. C., Wetzler, S. E., & Nebes, R. D. (1986). Autobiographical memory across the lifespan. In D. C. Rubin, (Ed.) *Autobiographical Memory* (pp. 202-224). Cambridge: Cambridge University Press.
- Rybash, J.M. (1999). Aging and autobiographical memory: The long and bumpy road. *Journal of Adult Development*, 6(1), 1-10. DOI: 10.1023/A:1021667823176
- Rybash, J. M., & Monaghan, B. E. (1999). Episodic and semantic contributions to older adults' autobiographical recall. *Journal of General Psychology*, 126, 85–96. DOI:10.1080/00221309909595353
- Schank, R.C. (1979). *Reminding and memory organization: An introduction to MOPS* (Research report No. 170). New Heaven, Yale University, Department of Computer Science, December 1979.

- Schank, R. C. (1980). Language and memory. *Cognitive Science*, 4 (3), 243-284. DOI:  
DOI: 10.1207/s15516709cog0403\_2
- Schank, R.C. & Abelson, R. (1977). *Scripts, plans, goals, and understanding*. Hillsdale , NJ:  
Earlbaum Assoc.
- Schrauf, R. W., & Rubin, D. C. (1998). Bilingual autobiographical memory in older adult  
immigrants: a test of cognitive explanations of the reminiscence bump and the  
linguistic encoding of memories. *Journal of Memory and Language*, 39, 437-457.  
DOI: 10.1006/jmla.1998.2585
- Talarico, J. M., LaBar, K. S., & Rubin, D. C. (2004). Emotional intensity predicts  
autobiographical memory experience. *Memory and Cognition*, 32, 1118-1132.
- Thomsen, D. K., & Bernsten, D. (2008). The cultural life script and life story chapters  
contribute to reminiscence bump. *Memory*, 16(4), 420-435. DOI:  
10.1080/09658210802010497
- Todd, C., & Perlmutter, M. (1980). Reality recalled by preschool children. In M. Perlmutter  
(Ed.), *Children's memory: New directions for child development* (pp. 69–86). San  
Francisco, CA: Jossey-Bass.
- 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
- Weinstein, Y., & Shanks, D. R. (2010). Rapid induction of false memory for pictures.  
*Memory*, 18, 533-542.