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The reminiscence bump in autobiographical memory: An investigation of the life script hypothesis

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THE REMINISCENCE BUMP IN AUTOBIOGRAPHICAL MEMORY: AN INVESTIGATION OF THE LIFE SCRIPT HYPOTHESIS

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ABSTRACT

THE REMINISCENCE BUMP IN AUTOBIOGRAPHICAL MEMORY:

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Researchers have consistently found that older adults report a higher percentage of autobiographical memories for experiences that occurred between ages 15 and 30 compared to any other period of life. This *reminiscence bump* is evident for memories involving positive emotions but not for memories involving negative emotions. The life script hypothesis proposes that people share cultural knowledge for the types and timing of positive landmark events expected to occur over the life course and that this shared knowledge guides the retrieval of autobiographical memories. In a series of five studies, the valence (positive and negative) and expectedness (not surprising and surprising; expected and unexpected) dimensions of the life script account of the reminiscence bump were examined. In Study 1, college students reported positive and negative memories between the ages of 8 and 18 (corresponding to the ages where positive and negative memory distributions begin to diverge) that were either surprising or not surprising. In

Studies 2 and 3, college students predicted and older adult recalled positive and negative memories from across the life span that were either surprising or not surprising. Finally, in Studies 4 and 5, college students predicted and older adults recalled memories that were highly expected and highly unexpected and rated these memories on positive and negative valence only after providing their descriptions. Inconsistent with life script predictions, memories cued by prompts for surprising and unexpected events demonstrated classic reminiscence bumps. The results show that positive memories are overrepresented between ages 15 and 30, but that a recently activated life script is not necessary to guide the memory search to this age period.

CHAPTER I

THE REMINISCENCE BUMP IN AUTOBIOGRAPHICAL MEMORY

When older adults are asked to recall autobiographical memories from across the entire life span, the resulting frequency distribution of these memories differs from what would be expected based on normal forgetting or decay over time (i.e., a monotonically decreasing retention function) in two ways (Rubin, Wetzler, & Nebes, 1986). The first departure from a normal decay function concerns the finding that adults recall few if any specific episodes before about the age of 3 years, an observation referred to as childhood or infantile amnesia (for review, see Pillemer & Dickson, in press). The second departure concerns the period of adolescence and young adulthood. Specifically, researchers have consistently found that adults report a higher percentage of autobiographical memories for experiences that occurred between 16 and 30 years compared to any other period of life (Berntsen & Rubin, 2004; Fromholt et al., 2003; Rubin & Berntsen, 2003; Rubin et al., 1986; Rybash, 1999). This phenomenon, referred to as the reminiscence bump, is found across cultures (Conway, Wang, Hanyu, & Haque, 2005; Janssen, Chessa, & Murre, 2005), and through the use of a variety of methods, including response to word cues (Jansari & Parkin, 1996; Rubin & Schulkind, 1997; Rubin et al., 1986), olfactory cues (Chu & Downes, 2000), and musical cues (Schulkind & Woldorf, 2005), when participants are asked to report their most vivid (Fitzgerald, 1988; Robinson & Taylor, 1998; Webster & Gould, 2007) and most important (Berntsen & Rubin, 2002)

autobiographical memories, when asked to report life chapters (Thomsen & Berntsen, 2008), stories that belong in a book about their life (Fitzgerald, 1996), personal memories involving positive emotions (Rubin & Berntsen, 2003), for the consequential events reported by noted psychologists in their autobiographies (Mackavey, Malley, & Stewart, 1991), as well as in response to questions concerning the acquisition of semantic information (Holmes & Conway, 1999; Janssen, Murre, & Meeter, 2008; Rubin, Rahhal, & Poon, 1998; for remember versus know, see Rybash & Monaghan, 1999; for musical and motion picture preferences, see Holbrook & Schindler, 1989 and 1996, respectively; for books, see Janssen, Chessa, & Murre, 2007; for generations or eras, see Holmes & Conway, 1999; Schuman & Scott, 1989; Sehulster, 1996; for dream content, see Cappeliez, 2008; Grenier, et al., 2005; and even for the preferential recall of information contained in a novel relative to the protagonist's age, Copeland, Radvansky, & Goodwin, 2009).

In contrast to positive autobiographical memories, memories involving negative emotions, such as sadness, fear, and anger, do not show the characteristic peak in reported frequency during adolescence and young adulthood (Rubin & Berntsen, 2003; for an exception, see Davison & Feeney, 2008 for memories of regret). Although several theories have been proposed to account for the reminiscence bump (e.g., Bluck & Habermas, 2000; Fitzgerald, 1988; 1996; 1999; Glück & Bluck, 2007; Jansari & Parkin, 1996; Janssen et al., 2008), Rubin and Berntsen (2003; Berntsen & Rubin, 2004) argue that the divergent pattern of findings for positive and negative memories is best explained by a life script hypothesis: "the retrieval of autobiographical memories is governed by culturally shared representations of the prototypical life cycle that locate the majority of

important transitional events in young adulthood and favor positive events" (2003, p. 2). These positive transitional events, or cultural landmarks (Collins, Pillemer, Ivcevic, & Gooze, 2007), include such experiences as high school graduation, college acceptance, and marriage. In contrast, because negative events are often unanticipated (e.g., car accident), or when expected are less temporally restricted (e.g., death of a parent), they do not become part of a culturally shared life script and thus negative memories are not overrepresented in any particular life period.

Cultural Life Script Hypothesis

A life script event is one that meets three broad criteria. First, scripted events are normative. That is, within a given culture, events contained in a life script are experienced by a majority of people (Berntsen & Rubin, 2004; Collins et al., 2007; Rubin & Berntsen, 2003). Second, scripted events are considered important or significant within a culture and typically indicate the achievement of a cultural milestone (e.g., high school graduation) or a major life transition (e.g., marriage or having a child). Taken as a whole, the life script constitutes what would be considered an idealized life within a culture (Berntsen & Rubin, 2004). Because of the first two characteristics, most people within a culture are aware of these scripted events. Finally, scripted events are tightly linked to a particular age or narrow age range. For example, one is likely to graduate high school at approximately 18, learn of college admittance decisions at approximately the same time, and to complete undergraduate studies by roughly 22. Because negative events are difficult if not impossible to predict (accidents or diseases), or when moderately predictable (death of one's parents), are not linked to a narrow age-range, the life script is composed of primarily positive age-linked events (Berntsen & Rubin, 2004).

Several studies provide empirical support for the existence of a cultural life script. First, Rubin and Berntsen (2003) asked a representative sample of approximately 1,300 Danish adults (ranging in age from 20 to 94) to provide the age at which they had their most important experience (and to classify it as positive, negative, or mixed), as well as their age for a time when they felt most in love, most proud, most afraid, most angry, and most jealous. The researchers then asked a sample of undergraduate psychology majors to imagine a hypothetical average 70-year-old reflecting back over his or her life and to estimate that person's age at the time these emotional events were likely to have occurred (they also included probes for happiest, saddest, and most traumatic events such that these results would be comparable to those of actual memories reported in an earlier study, Berntsen & Rubin, 2002). The researchers found that the actual age distributions provided by adults for positive memories (most in love, most happy, most proud, and most important) were strikingly similar to the age distributions predicted by college students. The distributions for predicted positive events evidenced a significant increase between the approximate ages of 16 and 30 corresponding to the reminiscence bump. Further, college students reported being highly confident in the ages they estimated for positive events, providing additional support for the idea that individuals within a culture share a script for when important positive life events typically occur. In contrast to the close match in positive memories and predictions, memories and predictions for negative events (most sad, most afraid, most traumatic, and most angry) neither closely corresponded (however, see most jealous, Fig. 6, p. 10) nor did they evidence an increase in frequency during adolescence and young adulthood.

In a second study, Berntsen and Rubin (2004, Experiment 1) asked a large sample of adult Danes to predict when a typical 100 year old would have experienced certain events; these included happiest, most in love, most important, saddest, most afraid, and most traumatic. Similar to their previous findings (Rubin & Berntsen, 2003), the researchers found significant increases in predicted positive, but not negative, events during adolescence and young adulthood, lower standard deviations for the predicted positive events compared to predicted negative events, and higher confidence in the dates assigned to predicted positive events compared to predicted negative events. In Experiment 2, Berntsen and Rubin asked undergraduate students to imagine an average infant and to list seven events they felt would be the most likely to take place over the course of his or her life and to rate each event on various dimensions (typicality, importance, age of occurrence, and valence). Events reported by a majority of participants were dominated by school (e.g., begin school, college), work (e.g., first job, retirement), and family (e.g., marriage, have children) themes, supporting the idea that life scripts are composed of culturally prescribed transitional events. As was the case with the hypothetical 100 year old, positive, but not negative, events predicted to occur in the life of a hypothetical infant evidenced an increase in frequency during adolescence and young adulthood.

The life script hypothesis is culturally specific. That is, it is composed of events an individual within a specific culture is highly likely to experience over the course of the life span. Although Berntsen and Rubin (2002; 2004; Rubin & Berntsen, 2003) provide strong evidence that members of a culture share knowledge of important, age specific, and predominantly positive events that occur over the course of one's life, and that

predicted life events closely correspond to actual adult memories, the researchers present evidence only from Danish samples. While we do know that the reminiscence bump itself is found cross-culturally (Conway & Haque, 1999; Conway et al., 2005; Janssen et al., 2005), Erdoğan, Baran, Avlar, Çağlar Taş, and Tekcan (2008; see also, Habermas, 2007 for related findings using a German sample) found that Turks also have a corresponding life script concept. The researchers asked Turkish college students to list the seven most important events likely to occur over the life span of a hypothetical newborn. Erdoğan et al. conducted analyses identical to those of Berntsen and Rubin (2004) such that they were able to directly compare the results from their Turkish sample with the results of the previous Danish study. Results of the Turkish study closely mirrored those of Berntsen and Rubin. Erdoğan et al. found a reminiscence bump in the third decade of life for only those events rated as positive by participants – the distributions of neutral and negative events were relatively flat. In addition, the standard deviations of age-at-event estimates for positive events were significantly lower than those for negative events (an indication of higher agreement among participants as to the timing of positive events).

Regarding the types of events predicted to occur over the course of one's life, seven of the top 10 events reported by Turkish participants were positive, 17 were reported by both Turkish participants (total number reported = 27) and Berntsen and Rubin's (2004) Danish participants (total number reported = 36) overall, and the three most frequently reported events (marriage, begin school, have children) were identical across samples (Erdoğan et al., 2008). Slight differences between the events predicted by Turkish and Danish participants demonstrate the importance of culture to life script theory. Specifically, only Turks mentioned circumcision and military service as likely to

occur in a male's life and only Danes reported confirmation and baptism, among others. In addition, Turks reported substantially more negative events (42%) compared to Danes (28%), possibly due to the higher number of low frequency negative events reported by Turks (e.g., mental illness, arranged marriage, and family quarrels). Taken as a whole, however, these data suggest that there is considerable overlap between different cultures as to the types of important events one is likely to experience over the life course as well as the timing with which one is expected to experience these events.

A second issue related to the life script account of the reminiscence bump concerns the actual content of memories. In studies conducted by Berntsen and Rubin (2002; Rubin & Berntsen, 2003), the researchers simply asked participants to report their age-at-event for different emotional memories. Although the researchers found a reminiscence bump only in response to positive cues, they were unable to determine whether positive (as opposed to negative) memories referred to culturally scripted activities and by extension whether positive memories from the bump period referenced cultural landmarks more frequently than positive memories from other life periods. That is, without an examination of memory content, one cannot determine if positive memories from the bump period refer to culturally important landmark or transitional events and thus whether a life script drives the overrepresentation of positive memories during adolescence and early adulthood. To address this issue, Collins et al. (2007; see also Bohn, 2009; Glück & Bluck, 2007; Pillemer, Ivcevic, & Gooze, 2007; Rubin, Berntsen, & Hutson, 2009) conducted a series of studies in which the researchers asked college students (Studies 1 through 3) and adult alumnae (Study 4) to describe in detail memories they had for experiences in which they felt especially good and bad about

themselves. In Study 1 (females only) and Study 2 (males and females) students were asked to only report memories between the ages of 8 and 18. This time period was selected because it corresponds to the sharp increase in the slope of the reminiscence bump found in previous research. The researchers hypothesized that if a life script guides retrieval of autobiographical memories, the distribution of positive memories should show a much more pronounced increase during adolescence compared to the distribution of negative memories. This hypothesis was confirmed. In Study 1, approximately one half (46.7%) of positive memories were from ages 17 and 18, where as only 18.5% of negative memories were from these ages. In Study 2, almost three quarters (70.3%) of positive memories occurred at either age 17 or 18, whereas only 34.0% of negative memories were from these ages.

Examination of the content of positive memories revealed a substantial percentage of culturally prescribed transitional or landmark events (Collins et al., 2007). In Study 1, 33.3% of positive memories between the ages of 17 and 18 were associated with the transition from high school to college (senior social functions, senior awards, high school graduation, and college acceptance) and in Study 2, 39.3% of positive memories that occurred between the ages of 17 and 18 were associated with this transition. In contrast, for both Study 1 and Study 2, negative memories from ages 17 and 18 were not associated with age specific cultural landmarks.

In order to compare the results of Studies 1 and 2 with previous research on the reminiscence bump (typically using adult aged samples), Collins et al. (2007, Study 4) asked adult alumni to provide positive and negative memories from the age periods of 8 to 18 and 34 to 44. They hypothesized that, similar to their findings for college students,

positive memories from the age period 8 to 18 should evidence a larger increase in frequency at ages 17 and 18 compared to negative memories from these years. Further, because the age period 34 to 44 is not associated with sharply defined cultural landmarks, the researchers argued that the age distributions for positive and negative memories should be similar. Again, these hypotheses were confirmed. A larger percentage of positive memories (39.5%) compared to negative memories (21.0%) were reported for ages 17 and 18. Content analysis of memories from the ages 17 and 18 revealed that 47.8% of positive memories were associated with culturally prescribed transitional events (i.e., senior awards, high school graduation, and college acceptance) whereas only 8.3% of negative memories from these ages were associated with the negative equivalent of a culturally prescribed transitional event (i.e., college rejection). In contrast, the mean ages of positive and negative memories from the age period 34 to 44 did not differ. Not surprisingly, of those positive memories from the 40th year, a moderate percentage (27.3%) was associated with a participant's 40th birthday, a transitional event common in the U.S. No cultural landmarks were present in the negative memories from this time period.

Alternate Hypotheses

While Rubin and Berntsen (2003; Berntsen & Rubin, 2004) have suggested that a cultural life script best explains reminiscence bump findings, they do concede that, "factors such as personality traits, values, concerns, as well as specific characteristics of the personal past, influence the degree to which an individual life story will agree with or deviate from cultural life script norms" (Rubin, et al., 2009, p. 55). Several theories have been developed to account for the bump, which are not necessarily mutually exclusive

with the life script hypothesis (for a review of the competing perspectives, see Berntsen & Rubin, 2002; Rubin et al., 1998). Accounts fall into four general categories, including the argument that memory distributions accurately reflect reality perspective (for discussion, see Berntsen & Rubin, 2004), a cognitive perspective (Rubin et al., 1998), a biological or maturational perspective (Janssen et al., 2008), as well as a narrative (Elnick, Margrett, Fitzgerald, & Labouvie-Vief, 1999; Fitzgerald, 1988, 1996, 1999), life story (Bluck & Habermas, 2000, 2001; Glück & Bluck, 2007), or identity (Conway, 2005; Conway & Haque, 1999; Conway & Holmes, 2004; Holmes & Conway, 1999) perspective.

Memory Distributions Accurately Reflect Reality Perspective

The first possibility, dismissed rather quickly by most theorists, is that the distributions of positive and negative memories across the life span directly reflect the actual distributions of subjectively experienced positive and negative events. Evidence supporting this perspective comes primarily from generational differences in autobiographical memory. For example, Berntsen and Rubin (2002) and Rubin and Berntsen (2003) asked a representative sample of the Danish population to report their age when they experienced extremely happy, sad, and traumatic events (2002), as well as for events in which they felt most afraid, most proud, most jealous, most in love and most angry (2003). Of importance to the memory accurately reflects reality perspective are the 70-year-olds' (ranging from 70 to 94) memories for fear and trauma. Specifically, these individuals would have been between 9 and 38 years old when Germany occupied Denmark (from April 1940 to May 1945; Rubin & Berntsen, 2003). After converting their data to adjust for age at the time of invasion and occupation, the researchers plotted

memories of both fear and trauma from pre-invasion through post-invasion (p. 8, Figure 5). As can be seen in their plot, memories of fear increase sharply as the invasion of Denmark approaches (1934 up to 1940), level off during the occupation, and drop sharply after occupation ends (approximately 1946). In contrast, memories of trauma do not increase until approximately the year of invasion, at which point they increase dramatically, decreasing somewhat during the latter years of occupation (approximately 1943-1945), and finally decreasing sharply at the end of occupation. Thus, the distribution of fear and trauma memories for Danish adults who experienced German invasion and occupation conforms to what one would likely actually experience as a foreign military takes up offensive positions and readies for invasion (fear), invades and occupies (trauma and fear), and later ends their occupation. Rubin and Berntsen (2003) argue that these findings reflect a cohort effect in which the generation of adults who experienced events related to World War II developed a specific "war generation" life script (p. 7; for related examples, see Conway & Haque, 1999; Schrauf & Rubin, 1998, 2001; for generational differences in life scripts, see Bohn, 2009; for research related to generational identity, see Brown et al., 2009; Schuman & Scott, 1989; Sehulster, 1996; and for autobiographical memory research specifically focused on World War II, see Berntsen & Thomsen, 2005; Berntsen & Rubin, 2006b). This argument, however, begs the question as to how some events become integrated into a life script while others remain simply the reflection of authentic personal experience.

Other evidence suggests that the distributions of positive and negative memories across the life span are in fact distinct from the distributions of actual positive and negative events. For example, Berntsen and Rubin (2002) accessed health record data for

Denmark that tabulates the number of therapeutic sessions attended by Danes that are supported by their insurance according to age group. Because insurance criteria require that therapeutic sessions be in response to highly negative experiences (victims of violence, robbery, and rape, death of a close family member or friend, individuals who have attempted suicide, etc.), and because a primary practitioner must first recommend an individual for therapy, Berntsen and Rubin argued that this data provides a relatively accurate and independent measure of the distribution of negative events over the life span. The plot of the number of therapeutic sessions attended per 100 people according to age (in ten year increments) shows that the number of therapeutic sessions attended is largest between the ages of 20 and 50 (p. 541, Figure 1). Thus, if the distribution of negative memories over the life span were a reflection of reality, one would expect the distribution to peak during this age period when negative events are higher relative to other periods (for additional arguments against the memory accurately reflects reality perspective, see Berntsen & Rubin, 2004).

Cognitive Perspective

The cognitive account of the reminiscence bump is based on the idea that preferential encoding occurs for novel or first time salient events followed by periods of less activity or relative stability (Rubin et al., 1998). Because novel events are often distinctive (e.g., first kiss), they receive more elaborate encoding than do frequently experienced events, are more often perceived as reference or transition points, and within autobiographical memory, may become organizing themes for similar future experiences. The cognitive account predicts that the timing of the bump should vary across populations according to the timing of transitional periods. This prediction has been

confirmed in studies examining autobiographical memories of adult immigrants. Schrauf and Rubin (1998, 2001) found that the distribution of autobiographical memories over the life span of Spanish-speaking immigrants peaked for the periods of immigration and settlement, independent of their age at the time of immigration and settlement (for similar findings related to national identity, see Conway & Haque, 1999). However, the cognitive account predicts that *all* events experienced during periods marked by a transition from novelty to relative stability should receive more elaborate encoding. Thus, it cannot account for the differences found for positive and negative memories across the life span (Berntsen & Rubin, 2002).

Biological or Maturational Perspective

Proponents of a biological or maturational hypothesis argue that because many human cognitive abilities increase from birth through adulthood, gradually declining thereafter, bump period memories simply benefit from more elaborate encoding by a cognitive system operating at peak ability (Janssen et al., 2008). However, this explanation has two significant weaknesses. First, as Bernsten and Rubin state, "standardized tests of memory and intelligence and laboratory tests of processing speed show an improvement from childhood to early adulthood that could match the beginning of the bump, however, the decline that follows is too slow. Linguistic abilities and crystallized intelligence stay at a high level for most of adult life, which is inconsistent with the shape of the bump" (2002, p. 640). Second, similar to the cognitive account, the biological hypothesis would predict that all events from the bump period would benefit from better encoding, but as the research reviewed here shows, only positive (not negative) memories demonstrate a reminiscence bump.

Narrative, Life Story, and Identity Perspectives

Other theorists have proposed that it is a late adolescent focus on identity development that drives the reminiscence bump. For example, Fitzgerald argued that, during the period of adolescence and young adulthood, individuals engage in "intense self-oriented activities associated with the formation of an identity" (1996, p. 230). This intense focus results in better encoding for identity related experiences, and thus these memories are more available for future recall. In addition, identity related experiences form the basis of one's *self narrative*, a set of memory stories an individual uses to both define him or herself and to present one's self to others, contributing to increased rehearsal (both internally and socially) and greater availability for later recall (Elnick et al., 1999; Fitzgerald, 1988, 1996, 1999; Robinson & Taylor, 1998).

Accounts of the reminiscence bump similar to the self narrative hypothesis have been proposed by both Glück and Bluck (2007; Bluck & Habermas, 2000, 2001) and Conway and colleagues (Conway, 2005; Conway & Haque, 1999; Conway & Holmes, 2004; Holmes & Conway, 1999). Drawing on Erikson's developmental stage theory (1968), McAdams' life story approach to identity (2001), and Conway's self memory system (2005), these researchers contend that highly accessible autobiographical memories are those that were highly relevant to one's sense of self and identity development at the time of the original experience. Building on Erikson's theory, Holmes and Conway (1999) argued that the reminiscence bump is, in part, the product of the two developmental stages thought to occur during the bump period – identity formation and the formation of intimate relationships. Identity formation (more specifically, the formation of a generational identity), which occurs primarily during the second decade of

life, is a process in which an individual selects and identifies with specific cultural subgroups reflecting shared values, goals, customs, and knowledge. The researchers suggested that because this process requires attention to one's sociocultural environment (e.g., political events or social movements), memories for public events will show a relatively early reminiscence bump – one that occurs between 10 and 19 years of age. Erikson's stage of intimacy versus isolation, in contrast, occurs primarily during the third decade of life and involves the formation of long-term sexual relationship(s) with one's peers. Thus, attention during this period is focused on personal interactions of a private nature. When Holmes and Conway asked adults to list and date a number of important public and private events that occurred during the participants' lifetimes, they found that public events showed a somewhat earlier bump (10-19 years) than the bump for private events (20-29 years). These findings have been extended to include additional stages of Erikson's developmental theory (Conway & Holmes, 2004).

While the narrative and identity accounts of the reminiscence bump do make novel predictions as to the content of memories across the life span, similar to the cognitive and biological accounts of the reminiscence bump, they do not predict differences in the distribution of positive and negative memories. As Berntsen and Rubin (2002) suggest, Erikson's developmental stages are focused more on the *struggle* to resolve a conflict inherent to a particular stage and less on the resolution of that conflict. Given the importance of struggle in Erikson's stage theory, the researchers argue that, "if the bump reflects the way individuals narrate about development of their adult identity, it should contain memories of important and troublesome events, and happy events to the extent that they provide closure" (p. 640). While a cultural life script is not the sole

organizing dimension of autobiographical memory, nor the only factor underlying the reminiscence bump, it is the account that best predicts the overrepresentation of positive, but not negative, memories from adolescence and young adulthood, and will thus be the focus of this dissertation.

CHAPTER II

DISSERTATION STUDIES

While Collins et al. (2007) were able to more fully test the life script hypothesis by examining the content of memories for landmark or transitional events, the researchers did not sample adult memories from across the entire life span. That is, a more complete test of the life script hypothesis requires that adults be allowed to report detailed memories from across the entire life span. Several recent studies have partially addressed this issue. Thomsen and Berntsen (2008) asked older adults for five memories from across the lifespan that were central to their life stories. The researchers found a reminiscence bump extending from approximately 11 to 25 years of age, that 61% of memories referenced scripted events corresponding to those predicted by subjects in Berntsen and Rubin's study (2004, Table 3), and that memories of scripted events (as well as 'life chapter' start and end points) were significantly overrepresented during the bump period compared to other periods of life. Similar results have been reported by both Glück and Bluck (2007) and Bohn (2009). However, in each of these studies (as well as in most studies of autobiographical memory), participants were asked to describe their memories with only a brief heading, keyword, or sentence (Bohn, 2009; Thomsen & Berntsen, 2008), or a one to five word description (Glück & Bluck, 2007). In addition, similar to the methodology often used in autobiographical memory studies, adults were asked for multiple memories, ranging from five (Thomsen & Berntsen, 2008) up to 15

(Glück & Bluck, 2007). It is possible that the way adults are asked to report autobiographical memories (high versus low detail and number) influences memory retrieval. For example, Fitzgerald asked, "what would happen if we asked subjects to report a very large number of vivid memories, say 100[?] In such a study, would the last 10 memories reported be as vivid, as personally important, and show the same age distribution as the first 10" (1988, p. 267)? It seems reasonable to speculate that asking adults for very brief descriptions of multiple memories may bias their memory search such that they are more likely to engage a general life script, resulting in memories for highly typical events and leading to an overrepresentation of memories from adolescence and young adulthood. In contrast, asking for highly detailed descriptions of single memories may allow a more neutral test of the life script hypothesis in that participants will not be biased towards a life script driven search.

By obtaining detailed descriptions of positive and negative memories from across the lifespan, in addition to the age at which a memory event occurred, one can use content analyses to determine whether the high frequency of positive (but not negative) memories between the ages of 16 and 30 is due to an overrepresentation of stereotypical cultural landmarks during this time period. According to the life script hypothesis, one should find an increase in the frequency of positive memories between the ages of 16 and 30 relative to other periods of life (reminiscence bump), and further, that these memories predominantly describe landmark events (e.g., college acceptance and graduation, first professional job, and marriage). In contrast, analysis of negative memories should neither show a substantial increase in frequency between the ages of 16 and 30 relative to other periods of life nor should content evidence any clear thematic age-related pattern.

Because the life script is composed of highly typical positive events, a second way to assess whether the life script guides the retrieval of positive (but not negative) autobiographical memories (resulting in the reminiscence bump) is to ask people for memories of *unexpected* or *surprising* events. According to Berntsen and Rubin (2002, 2004; Rubin & Berntsen, 2003), a life script event is defined as a culturally important transitional or landmark event (one in which the vast majority of members of a specific culture are aware, anticipate, celebrate, and reminisce about) that occurs at a specific age or within a specified age range. Thus, these events are highly expected and not likely to feature feelings of surprise. A surprising memory, by definition, should be for an event that was atypical or unexpected and thus an event not captured by a culturally based life script.

The purpose of this dissertation research is to evaluate the life script account of the reminiscence bump. In a series of five studies, I examine the content and age distributions of college student and adult memories using new, theoretically relevant, memory probes. In Study 1, college students are asked to provide detailed accounts of positive and negative memories, either surprising or not surprising, from between 8 and 18 years of age. In Study 2, college students are asked to imagine a hypothetical 80 year old and to predict positive and negative events, either surprising or not surprising, this person would recall from any point across their lifespan. In Study 3, older adults are asked to provide detailed accounts of their own positive and negative memories, either surprising or not surprising, from across the lifespan. In Studies 4 and 5, the emotional component (i.e., positive or negative) of memory prompts is removed and the contribution of expectedness to the distribution of autobiographical memories over the

life span is examined. In Study 4, college students are asked to predict memories of expected and unexpected events from across the lifespan and in Study 5 older adults are asked to recall memories in response to these prompts. In Studies 4 and 5, participants are asked to rate the positive and negative valence of each event only after providing predicted or actual memories.

Hypotheses: Studies 1-3

Based on the reviewed literature on life scripts, a number of predictions can be made as to both the content and age distributions of positive, negative, surprising positive, and surprising negative memories across the life span. Because we anticipate replicating the findings of earlier studies examining college student and older adult positive and negative memories, predictions are first described for these probes. We expect that the age distributions of positive and negative events, including college student memories between the ages of 8 and 18 (Study 1), college student predictions of adult memories from across the life span (Study 2), and adult memories from across the life span (Study 3), should replicate the results of Collins et al. (2007), Berntsen and Rubin (2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), and Berntsen and Rubin (2002; Glück & Bluck, 2007; Rubin & Berntsen, 2003; Thomsen & Berntsen, 2008), respectively. Specifically, in Study 1, the age distribution of college students' positive compared to negative memories should show a sharper increase for the upward sloping component of the reminiscence bump (at 17 and 18 years). Additionally, the content of positive, but not negative, memories should more frequently reflect transitional or landmark events, particularly for ages 17 and 18 (Collins et al., 2007). In Study 2, college student predictions of adult positive, but not negative, memories should show a classic

reminiscence bump between the ages of 16 and 30 (although, in general, researchers put the reminiscence bump between 15 and 30 years, to construct age bins that are equivalent in size, we chose to use 16 to 30 years). In addition, content analysis should reveal that predicted positive events compared to predicted negative events more frequently reference life script events, particularly between the ages of 16 and 30 (Berntsen & Rubin, 2004). Finally, Study 3 should replicate the results of Berntsen and Rubin (2002), such that adults' positive, but not negative, memories are overrepresented between the ages of 16 and 30 and content analysis should reveal that positive compared to negative memories more frequently reference scripted events, particularly between the ages of 16 and 30.

Several outcomes are possible regarding surprising positive and surprising negative memories, including complete script disengagement, reverse script engagement, and memory search based on the emotional organization of autobiographical memory. For simplicity, predictions regarding surprising positive and surprising negative memories are made with reference to adult memories across the lifespan (Study 3). Similar to the predictions for positive and negative memories, predictions for surprising positive and surprising negative adult memories across the lifespan also apply to college student memories between the ages of 8 and 18 (Study 1) and college student predictions of adult memories across the lifespan (Study 2).

Complete Script Disengagement

Because a script is, by definition, composed of a sequence of highly expected positive events, asking participants to report memories of experiences that were surprising to them in a positive way may have the effect of disengaging the life script.

Stated another way, if a life script is responsible for the high frequency of positive memories from adolescence and early adulthood, then the distribution of surprising positive memories (by definition, unscripted) will not show evidence of a reminiscence bump. In addition, because negative events do not benefit from the organizational and retrieval properties of a life script, the distribution of surprising negative memories will not show evidence of a reminiscence bump. Thus, both surprising positive and surprising negative memory distributions will be relatively flat and the content of both positive and negative memories should rarely reference scripted events. This pattern of results would constitute evidence in support of the life script hypothesis.

Reverse Script Engagement

The second set of predictions for surprising positive and surprising negative memories is identical to the complete script disengagement predictions for surprising positive memories. However, because surprising negative memories may be due to the failure to achieve or realize an expected cultural landmark, the distribution of these memories may actually show an increased frequency in adolescence and early adulthood. If peoples' expectations are, in part, governed by a cultural life script, then a surprising negative prompt may first engage the life script for positive events and then trigger a search for violated expectations. This process could result in an overrepresentation of surprising negative memories from the bump period. Content of surprising negative memories would likewise refer to *failures* to achieve cultural milestones (e.g., not being accepted to one's first choice college or having one's marriage proposal rejected). This pattern of results would also constitute evidence in support of the life script hypothesis.

Emotion Driven Search

An alternative hypothesis in regards to the effects of asking for surprising memories involves the hierarchical nature of memory organization. Theoretically, Berntsen and Rubin (2004; see also Collins et al., 2007) argue that a life script is a, "hierarchical arrangement, with specific episodes nested under each of a series of superordinate transitional events" (p. 429), and further, that life scripts, "provide search descriptions for times when one is most likely to have experienced the emotion concerned" (p. 430). Thus, it may be that when an individual is asked for a surprising positive memory, the life script serves to guide the memory search to the transitional age period most likely to be populated by positive events, from within which the individual then searches for a positive memory that has an aspect of surprise. It could also be that emotional valence serves as the superordinate organizing element of autobiographical memory (Schulkind & Woldorf, 2005), such that a positive emotion cue activates the life script, which then guides memory search to the transitional age period most likely to be populated by positive landmark events, from which an individual then searches for a positive memory that has an aspect of surprise. In this case, the distribution of surprising positive memories should not differ from the distribution of standard positive memories in that both will show a reminiscence bump. Further, content analysis of surprising positive memories should reveal a high frequency of transitional events and landmarks (particularly during the bump period), similar to those found for standard positive memories, but with an element of surprise. Since emotionally negative memories are not organized according to a life script, adding an element of surprise to a request for these memories will not result in script engagement. Therefore, the distribution of surprising

negative memories should be flat, similar to negative memories, and the content of surprising negative memories should show little evidence of scripted landmark events. While this pattern of results would not directly contradict the life script hypothesis, it would remain unclear whether emotional valence or a life script serves as the superordinate organizing element of autobiographical memory (Schulkind & Woldorf, 2005). As Schulkind and Woldorf speculate, emotion may organize autobiographical memory in a manner orthogonal to other dimensions, including the life script, such that it "provides a means of organizing personal memory that permeates the entire life span" (p. 1034).

Gender, Order, and Participant Age

While there are no a priori reasons to expect gender (Janssen et al., 2005) or order differences in the current studies, these factors were analyzed with respect to memory distributions, memory age, and emotion ratings, and are reported where significant. However, the current age of adult participants in Studies 3 and 5 is relevant to the distributions of reported memories and thus, for Studies 3 and 5 we compared memory distributions for adults between 60 and 69 years of age with those for adults between 70 and 79 years of age in Study 3 (the sample for Study 3 included only adults 60 years of age and older) and those for adults less than 60 years of age with those for adults 60 years of age and older in Study 5 (the sample for Study 5 included only adults 50 years of age and older). Because memory distributions according to current age showed the same general pattern, and because it is not a central focus of the present research, this factor is not discussed further.

To summarize, we expect that the age distributions of positive and negative events, including college student memories between the ages of 8 and 18 (Study 1), college student predictions of adult memories from across the life span (Study 2), and adult memories from across the life span (Study 3), should replicate the results of Collins et al. (2007), Berntsen and Rubin (2004), and Berntsen and Rubin (2002), respectively. Positive memories and predicted positive memories should show an increased frequency during the bump period (ages 17 and 18 for college students and between 16 and 30 years for older adults) relative to negative memories and predicted negative memories, and the content of positive memories and predicted positive memories should refer more frequently to cultural landmarks or milestones relative to negative memories and predicted negative memories (particularly during the bump period). Furthermore, the addition of surprise to the positive and negative memory probes provides the opportunity for a novel test of the life script account of the reminiscence bump (see predictions above).

Experiment 1

In Study 1, college students are asked to provide detailed accounts of positive and negative memories, either surprising or not surprising, from between 8 and 18 years of age. We expect to replicate the findings of Collins et al. (2007) such that the age distribution of college students' positive compared to negative memories will show a sharper increase for the upward sloping component of the reminiscence bump (at ages 17 and 18). Additionally, the content of positive, but not negative, memories should more frequently reflect transitional or landmark events, particularly for ages 17 and 18.

Predictions regarding surprising positive and surprising negative memory content and distributions are outlined in the hypotheses section.

Method

College students were asked to describe, in as much detail as possible, either a memory for an experience that was especially positive and a memory for an experience that was especially negative; or a memory of a time when they were surprised in an especially positive way and a memory of a time when they were surprised in an especially negative way (counterbalanced). They were given a full 8 x 10 sheet of paper for each memory description, and could use the reverse side if they needed more room. We chose to use 'especially' instead of 'most' for positive and negative memories probes because the probe 'most' is likely to require one to evaluate their memory search with reference to cultural norms, thus biasing the memory search in favor of scripted events. Using 'especially' should free participants from this demand and provide a more neutral test of the life script hypothesis. Participants were instructed to limit their memories to only those having occurred between the ages of 8 and 18 (identical to the procedure used by Collins et al., 2007).

For each memory described, participants completed a series of follow up questions, including their age at the time of the memory experience, the frequency with which they had discussed the memory with others (rated on a 1 to 4 scale; 1 = never, 4 = frequently), the emotional impact of the original memory event (rated on a 1 to 5 scale; 1 = not at all emotional, 5 = extremely emotional), the extent to which they were surprised by the original memory event (rated on a 1 to 5 scale; 1 = not at all surprised, 5 = extremely surprised), and the extent to which they experienced difficulty retrieving the

memory in response to our probe (rated on a 1 to 5 scale; 1 = not at all difficult, 5 = extremely difficult). The question of surprise was included as a manipulation check (memories in response to surprising probes should be more surprising than memories in response to the other probes).

For each memory, participants also completed the short version of the Centrality of Events Scale developed by Berntsen and Rubin (2006a). The short version of the CES is a seven item Likert-type measure designed to assess the degree to which a traumatic experience has both affected a person and been integrated into the story of their life. Questions include, for example, "I feel this event has become part of my identity" and "This event was a turning point in my life" (p. 229). Berntsen and Rubin (2006a) found strong reliability for both the full and short versions of the CES, as well as convergent validity in the relation between the CES and measures of depression and post-traumatic stress disorder (PTSD). Although designed to address the impact of traumatic or stressful events, Rasmussen and Berntsen (2009) successfully used the CES short version in their study examining the functions of most positive and most negative memories.

For the purposes of this dissertation, analyses of follow-up questions will include only memory age and surprise rating. All other follow-up questions were included either for exploratory reasons (i.e., CES) or do not directly bare on the central questions addressed by this research.

College students completed questionnaires in groups of approximately 30. The only requirement for participation was that they be at least 18 years of age (due to the age constraints of the memory questions). Consent forms were provided to participants and they were asked to read, sign, and return these forms before the experiment started. Once

consent forms were collected, the four questionnaire versions were handed out to participants in rotating order. After participants completed the questionnaire, they were provided with a debriefing form, thanked, and dismissed. The study lasted for approximately 30 minutes. For participants who reported an age range (as opposed to an exact age) in response to a memory probe, the average age was calculated (rounded down in cases where the average was not a whole number).

Participants. Of the 215 participants who completed the questionnaire, 10 subjects were dropped for failure to follow instructions (four were 17 at the time of the study, five reported memories outside the 8-18 age range, and one failed to report a negative memory), resulting in a final sample of 205 participants. 92.2% of participants identified as European, Caucasian, or White, 3.9% as a mixture of backgrounds or other, 2% as Asian, 1% as Hispanic, and 1% as African American or Black. Females comprised 62% (n = 127) of the sample and the mean age of participants was 19.1 (ranging from 18 to 35). Completions by version are as follows: *especially positive* then *especially negative* = 47, *especially negative* then *especially positive* = 54, *surprising positive* then *surprising negative* = 51, and *surprising negative* then *surprising positive* = 53.

Content Coding. Content coding was conducted using a procedure identical to that used by Collins et al. (2007). Bump period (17-18) memories were first coded for the presence of culturally prescribed landmark events associated with the adolescent transition from high school to college. Landmark categories included formal senior social events (e.g., senior prom or homecoming), formal senior awards, high school graduation, college acceptance, as well as an 'other' landmark category (e.g., getting driver's license or beginning college). Two researchers read and coded all memories for the presence of a

landmark event, assigning each landmark to one of the content categories noted above. The coders achieved 92.63% agreement ($\kappa = .875$) for positive memories and 98.31% agreement ($\kappa = .881$) for negative memories. Differences were resolved through discussion.

Results

Mixed design factorials, with valence (positive and negative) as a within factor and expectedness (expected vs. surprising) as a between factor, were conducted on memory age and surprise rating. There was a significant effect of valence on age of reported memory, $F(1, 203) = 14.375$, $p < .001$, $\eta^2 = .066$, no effect of expectedness, $F(1, 203) = 0.905$, $p = .343$, and no valence by expectedness interaction, $F(1, 203) = 0.713$, $p = .400$. Positive memories ($M = 15.02$, $SD = 3.11$) occurred later than negative memories ($M = 13.90$, $SD = 3.26$). The mean age for especially positive memories was 15.31 ($SD = 3.08$), for surprising positive memories was 14.74 ($SD = 3.13$), for especially negative memories was 13.93 ($SD = 3.26$), and for surprising negative was 13.87 ($SD = 3.28$). There was a significant effect of valence on original surprise, $F(1, 202) = 31.560$, $p < .001$, $\eta^2 = .133$, a significant effect of expectedness, $F(1, 202) = 18.945$, $p < .001$, $\eta^2 = .086$, as well as a significant valence by expectedness interaction, $F(1, 202) = 4.484$, $p = .035$, $\eta^2 = .019$. Examination of the interaction revealed that especially negative ($M = 4.03$, $SD = 1.13$) memories were more surprising than especially positive ($M = 3.18$, $SD = 1.35$) memories, $t(99) = 4.664$, $p < .0001$, $\eta^2 = .180$, that surprising negative ($M = 4.26$, $SD = 0.84$) memories were more surprising than surprising positive ($M = 3.88$, $SD = 0.99$) memories, $t(103) = 3.066$, $p = .003$, $\eta^2 = .084$, that surprising positive memories were more surprising than especially positive memories, $t_{adjusted}(181.386) = 4.174$, $p <$

.0001, $\eta^2 = .088$, and that surprising negative memories were marginally more surprising than especially negative memories, *tadjusted*(183.971) = 1.722, $p = .087$, $\eta^2 = .016$.

The distributions of college student memories are presented in Figures 1 (positive and negative) and 2 (surprising positive and surprising negative). First, in regards to positive and negative memories, we replicated the findings of Collins et al. (2007) in that positive memories showed a more substantial increase in frequency at ages 17 and 18 relative to negative memories. Second, while the difference between surprising positive and surprising negative memory distributions is not as dramatic as that between positive and negative memories at ages 17 and 18, these memories show the same pattern.

For especially positive bump period memories ($n = 52$), 46.2% were coded as landmark events. Within positive landmarks, 41.7% involved college acceptance, 33.3% high school graduation, 12.5% formal senior award, 4.2% formal senior social event, and 8.3% were coded as 'other' landmark events. In contrast to positive bump period memories, of the especially negative bump period memories ($n = 29$), only 1 was coded as a landmark event and it concerned college acceptance (in this case, receiving notice that he or she was not accepted to their university of choice). A similar pattern emerged for surprising positive and surprising negative bump period memories. For surprising positive bump period memories ($n = 43$), 30.2% were coded as landmark events. Within surprising positive landmarks, 38.5% involved college acceptance, 23.1% high school graduation, 23.1% formal senior award, 15.4% formal senior social event, and none were coded as 'other' landmark event. In contrast, of the surprising negative bump period memories ($n = 30$), only 3 were coded as landmark events and all concerned college

rejection. See Table 1 for the percentage of landmark categories by memory prompt valence and expectedness.

Discussion

Similar to findings reported by Collins et al. (2007), we found that college student positive, but not negative, memories showed a sharper increase for the upward sloping component of the reminiscence bump (ages 17 and 18). Additionally, the content of positive, but not negative, memories more frequently referred to transitional or landmark events, particularly for ages 17 and 18. Similar to positive and negative memory findings, college student surprising positive, but not surprising negative, memories showed a sharper increase for the upward sloping component of the reminiscence bump (ages 17 and 18). However, relative to the sharp increase in positive memories for ages 17 and 18, the age distribution of surprising positive memories was not as pronounced. Content for surprising positive and surprising negative memories similarly mirrored the content of positive and negative memories. Again, relative to positive memories, the content of surprising positive memories reflected slightly fewer landmark events. Thus, the content and age distributions of positive and negative memories supports predictions derived from the life script hypothesis. These results also appear to support the emotion driven search prediction (Schulkind & Woldorf, 2005). The memory content and age distributions of surprising positive memories mirrored roughly the content and age distributions of standard positive memories. This suggests that the emotion cue activates the life script, which then guides memory search to the transitional age period most likely to be populated by positive landmark events, from which an individual then searches for a positive memory with an element of surprise.

Experiment 2

Similar to methods used in previous research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), I asked college students to imagine that a hypothetical 80-year-old, of the same gender and ethnicity as their self, is reflecting on events that had occurred over the course of his or her life. Participants were then asked to either briefly describe one positive and one negative memory that this hypothetical 80-year-old would recall, or one surprising positive and one surprising negative memory (counterbalanced). Participants were also asked to provide the age at which the hypothetical 80-year-old experienced the event, to rate the degree of difficulty they had in thinking of the event, and to rate their confidence that the event happened within the same decade as their prediction. We expect that, similar to findings reported in previous studies (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), predicted positive, but not negative, events will show a reminiscence bump between the ages of 16 and 30 and the content of predicted positive, but not negative, will more frequently reflect transitional or scripted events, particularly between the ages of 16 and 30. Our expectations for predicted surprising positive and predicted surprising negative content and age distributions are outlined in the hypotheses section.

Method

College students were asked to imagine an average or typical 80-year-old (not someone they knew), the same gender as their self, who is looking back over his or her life, thinking about a range of different events. Half of the participants were then asked to describe both a positive and negative memory (counterbalanced) that the hypothetical 80-year-old would have experienced over the course of his or her life and half were asked to

describe both a surprising positive and surprising negative memory (counterbalanced) that the hypothetical 80-year-old would have experienced over the course of his or her life. Participants were then asked to estimate how old the hypothetical 80-year-old was when he or she experienced the event, their confidence that the age estimate they provided fell within a decade of the actual experience (rated on a 1 to 7 scale; 1 = I have absolutely no confidence, 7 = I am extremely confident), as well as the extent to which they experienced difficulty thinking of the event in response to our probe (rated on a 1 to 5 scale; 1 = not at all difficult, 5 = extremely difficult). These questions were exploratory and are not reported in this dissertation.

Participants completed questionnaires in groups of approximately 40. Consent forms were provided to participants and they were asked to read, sign, and return these forms before the experiment started. Once consent forms were collected, the four questionnaire versions were passed out to participants in alternating order. After participants completed the questionnaire, they were provided with a debriefing form, thanked, and dismissed. The study lasted for approximately 30 minutes. For participants who reported an age range (as opposed to an exact age) in response to a memory probe, the average age was calculated (rounded down in cases where the average was not a whole number).

Participants. Of the 202 participants who completed the questionnaire, four subjects were dropped for failure to follow instructions, resulting in a final sample of 198 participants. 92.4% of participants identified as European, Caucasian, or White, 3.0% as a mixture of backgrounds or other, 0.5% as Asian, 2% as Hispanic, and 2.0% as African American or Black. Females comprised 82.8% (n = 164) of the sample and the mean age

of participants was 18.67 (ranging from 17 to 33). Completions by version are as follows: *especially positive* then *especially negative* = 50, *especially negative* then *especially positive* = 51, *surprising positive* then *surprising negative* = 49, and *surprising negative* then *surprising positive* = 48.

Content Coding. I first read all memories and generated content categories reflecting major themes or events for positive and negative predicted memories (collapsed across expectedness). Categories reaching 3% (rounded up) were retained – all other categories were folded into an 'other' category (similar to the procedure used by Bohn, 2009). This resulted in 8 positive categories and 10 negative categories (excluding 'other'). Using this coding scheme, a second researcher then independently coded all memories. The coders achieved 93.94% agreement ($\kappa = .922$) for predicted positive memories and 92.93% agreement ($\kappa = .913$) for predicted negative memories. Differences were resolved through discussion. A random sample of 30% of cases was then drawn, rounding up to achieve a total of 60 positive and 60 negative predicted memories. A research assistant, blind to hypotheses, then coded these predicted memories, resulting in 96.67% agreement ($\kappa = .959$) for predicted positive memories and 93.33% agreement ($\kappa = .924$) for predicted negative memories. Further examination of predicted events collapsed into the positive 'other' category revealed several events focused on college transitions (college acceptance, going to college, college graduation). Collapsing these events into a college transition category captured 4.0% of events and was thus retained as a separate category (resulting in a total of 10 positive categories). Tables 2 and 3 include content categories for positive (standard and surprising) and negative (standard and surprising) memories by bump period (bump period = 16-30 years), respectively.

Results

A mixed design factorial, with valence (positive and negative) as a within factor and expectedness (expected vs. surprising) as a between factor, was conducted on predicted memory age. There was a significant effect of valence on age of reported memory, $F(1, 196) = 68.091, p < .001, \eta^2 = .251$, no effect of expectedness, $F(1, 196) = 0.81, p = .776$, and a significant valence by expectedness interaction, $F(1, 196) = 6.700, p = .010, \eta^2 = .025$. Because Levene's test statistic was significant, group comparisons were made using an adjusted *t* statistic where necessary. These analyses revealed that standard positive memories ($M = 26.79$, $SD = 9.71$) were predicted to occur earlier than standard negative memories ($M = 43.78$, $SD = 21.55$), $t(100) = 7.742, p < .0001, \eta^2 = .375$, that surprising positive memories ($M = 31.4$, $SD = 14.99$) were predicted to occur earlier than surprising negative memories ($M = 40.28$, $SD = 21.21$), $t(96) = 3.966, p < .0001, \eta^2 = .141$, and that standard positive memories were predicted to occur earlier than surprising positive memories, $t_{adjusted}(163.464) = 2.558, p = 011, \eta^2 = .038$.

Order. To examine the influence of order, independent groups *t* tests were conducted on memory age according to question order. The age of surprising positive events was predicted to occur significantly older when this probe was presented second ($M = 35.02$, $SD = 15.40$) compared to first ($M = 27.86$, $SD = 13.83$), $t(95) = 2.412, p < .018, \eta^2 = .058$. There were no other significant order differences. With regards to the effect of order on the age of surprising positive predicted events, examination of the corresponding memory distributions revealed the same general pattern for these memories.

The distributions of college student predicted memories are presented in Figures 3 (positive and negative) and 4 (surprising positive and surprising negative). First, with regards to positive and negative memories, we replicated the findings of previous research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), in that positive memories showed a sharp increase in frequency between ages 16 and 30 relative to negative memories. Second, while the difference between surprising positive and surprising negative memory distributions for ages 16 through 30 is not as dramatic as that between positive and negative memories, these memories show the same temporal pattern. Thus, not only are positive events predicted to occur more frequently during late adolescence and early adulthood, surprising positive memories are also predicted to more frequently occur in this time period.

For predicted positive events (n = 198), 83.8% corresponded to a thematic content category and for predicted negative events (n = 198), 91.9% corresponded to a thematic content category. Within predicted positive events, 91.1% of standard events (n = 101) corresponded to a thematic content category and 76.3% of surprising events (n = 97) corresponded to a thematic content category. In addition, the majority of standard (80.20%) and surprising (60.82%) positive events fell within the bump period (16-30 years) and more bump period events (standard = 96.30%, surprising = 86.44%) corresponded to a thematic coding category than did non-bump period events (standard = 70.00%, surprising = 60.53%; see Table 2). For bump period positive events, marriage (48.15%) and having children (30.86%) were the two largest especially positive categories whereas proposal or engagement (16.95%) and learning of pregnancy (16.95%) are the two largest surprising positive categories. For non-bump period positive

events, 'other' was the largest category for both standard (30.00%) and surprising (39.47%) events, followed for both standard (25.00%) and surprising (26.32%) by becoming a grandparent. Thus, while there are differences in content between positive and surprising positive events, most categories reflect age-linked events that typically occur in late adolescence and young adulthood. In addition, the majority of standard positive events in the bump period focus on major landmark events (marriage and childbirth) whereas surprising positive bump period events more frequently reflect sub-events of these major landmarks (proposal and learning of pregnancy).

Within predicted negative events, 94.1% of standard events (n = 101) corresponded to a thematic content category and 89.7% of surprising events (n = 97) corresponded to a thematic content category. In addition, only 19.80% of standard and 34.02% of surprising negative events fell within the bump period. Further, more non-bump period events (standard = 96.30%, surprising = 92.19%) corresponded to a thematic coding category than did non-bump period events (standard = 85.00%, surprising = 84.85%; see Table 3). For non-bump period negative events, a parent's death (37.04%) and a spouse's death (22.22%) were the two largest especially positive categories whereas a spouse's death (21.88%), parent's death (14.06%), and accident or disease (14.06%) are the largest surprising negative categories. For bump period negative events, other's death (20.00%), followed by parent's death (15.00%), war (15.00%), and 'other' (15.00%) were the largest categories for standard negative events, whereas parent's death (18.18%), other's death (15.15%), and 'other' (15.15%) were the largest categories for surprising negative events. Thus, while there is high agreement between

participants as to negative and surprising negative content categories, these events are not tightly linked to particular life period and less likely to be in the bump period.

Discussion

Similar to findings reported in previous studies (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), college students especially positive predicted memories showed a more substantial increase in frequency between ages 16 and 30 relative to especially negative predicted memories. Although the peak in the distribution of surprising positive predicted memories was less pronounced relative to especially positive predicted memories, it nonetheless showed a bump between ages 16 and 30. In contrast, both negative and surprising negative predicted events showed relatively flat age distributions.

The majority of especially positive, especially negative, and surprising negative events were captured by our coding scheme, while fewer surprising positive events were captured. In general, positive predicted memories reflected scripted events as reported in earlier research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009). While especially positive predicted events more often corresponded to major transitional events (marriage and having a child), surprising positive predicted events more often corresponded to surprising experiences directly related to the major transitional events described in response to the especially positive cue (proposal or engagement and learning of pregnancy). Similar to the results of Study 1, these results appear to support the emotion driven search prediction (Schulkind & Woldorf, 2005), in that participants responding to a positive surprise prompt are cued first by the positive emotion component. The positive emotion component may then activate a cultural life

script, which guides memory search to the transitional age period heavily populated by positive scripted events, from which an individual then searches among the positive scripted events for one containing an element of surprise.

The majority of both especially negative and surprising negative events fell outside of the bump period. Specifically, negative non-bump period events were more heavily focused on the death of one's parent or spouse, whereas negative bump period events were more evenly distributed among categories, suggesting that the non-bump period events reflect an expectation that the frequency of negative events will increase with age. While the content of negative and surprising negative events was roughly equivalent, the event categories were underrepresented in the bump period and, relative to positive events, do not represent highly age-linked experiences. This replicates findings reported by Berntsen and Rubin (2004) and supports their view that negative events are less closely tied to a particular time period compared to positive events and thus are not overrepresented in the bump period. The results of Study 2 largely replicate the findings of previous research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), but similar to Study 1, we found evidence favoring an emotion driven memory search, of which the life script may be a subordinate element.

Experiment 3

In Study 3, older adults were asked to provide detailed accounts of their own positive and negative memories, either surprising or not surprising, from across the life span. While Collins et al. (2007) were able to more fully test the life script hypothesis by examining the content of memories for landmark or transitional events, the researchers did not sample adult memories from across the entire life span. That is, a more complete

test of the life script hypothesis requires that adults be allowed to report detailed memories from across the entire life span. While several recent studies have partially addressed this issue (Bohn, 2009; Glück & Bluck, 2007; Thomsen & Berntsen, 2008), participants in each of these studies were asked to provide only a brief memory description for multiple memories. Because adults may be likely to engage a life script to assist them in rapidly identifying multiple memories (resulting in memories for highly typical events and leading to an overrepresentation of memories from adolescence and young adulthood), in Study 3 I asked adults for highly detailed descriptions of single memories.

By obtaining detailed descriptions of positive and negative memories from across the life span, content analyses can be conducted to determine whether the high frequency of positive (but not negative) memories between the ages of 16 and 30 is due to an overrepresentation of stereotypical cultural landmarks during this time period. According to the life script hypothesis, we should find an increase in the frequency of positive memories between the ages of 16 and 30 relative to other periods of life, and these memories should predominantly describe landmark or transitional events. In addition, we should find that the content of adult positive memories closely corresponds to college students' predictions for positive events in Study 2. In contrast, analysis of negative memories should neither show a substantial increase in frequency between the ages of 16 and 30 relative to other periods of life nor should their content evidence any clear thematic age-related pattern. In addition, based on findings from Study 1 and 2, we expect that the distribution of surprising positive memories will be similar, albeit less

pronounced, to the distribution of standard positive memories, and that the distributions of standard and surprising negative memories will be similarly flat.

Method

All materials in Study 3 were identical to those used in Study 1, including memory prompts (a detailed description of either positive and negative memories or surprising positive and surprising negative memories) and follow up questions (e.g., their age at the time of the memory experience, the frequency with which they have shared their memory with others, how emotional they felt at the time of the experience, how surprised they were by the experience, and the CES short version). The only exception was that whereas college students in Study 1 were asked to provide specific memories from *between the ages of 8 and 18*, adults in the current study were instructed to provide specific memories from *any point across the life span.*

Participants. Older adults (60 years of age and above) were recruited from an older adult subject pool organized and administered by the Cornell Institute for Translational Research on Aging (CITRA) at Cornell University. This subject pool is composed of adults aged 60 years and over who live in Tompkins County, New York and are willing to participate in research. At the time this research was conducted, the pool consisted of 842 adults, all of whom were contacted by mail for participation in this study. Adults were mailed a recruitment letter and questionnaire. The recruitment letter described the current research and indicated its association with CITRA. Adults who agreed to participate (as indicated by completing and returning the questionnaire) were asked to complete the questionnaire and to return it to Cornell via an enclosed pre-paid envelope. Compensation for participation in this study was provided in the form of a

raffle for a $150 gift certificate to a local Ithaca restaurant, which subjects returned via US mail separate from their questionnaire. Debriefing letters were later mailed to all members of the older adult subject pool.

Of the 842 questionnaires mailed out, 26 adults contacted us to decline participation, 12 questionnaires were either returned due to incorrect address, were unopened, or were opened but not completed, and 281 were returned at least partially completed. Excluding the 38 adults who opted out or did not return at least a partially completed questionnaire, we achieved a response rate of 35.95%.

Of the 281 participants who returned at least partially completed questionnaire, 22 subjects were dropped for failure to follow instructions (e.g., reporting only one memory, not reporting memory age), resulting in a final sample of 259 participants (59.5% female). Almost all (97.7%) participants self-identified as European, Caucasian, or White, 1.5% identified as African American or Black, and 0.8% identified as a mixture of backgrounds or other. The mean age of participants was 70.65 (SD = 7.77) years, ranging from 60 to 93 years. Nearly half (48.3%) of participants reporting attending school beyond college, 16.2% completed college, 17.4% took or are taking college courses, 13.5% completed high school or received a GED, 2.3%, 1.5%, and 0.4% reported other educational experience, that they did not complete high school, or selected not applicable, respectively (0.4% missing). Completions by version are as follows: *especially positive* then *especially negative* = 57, *especially negative* then *especially positive* = 64, *surprising positive* then *surprising negative* = 63, and *surprising negative* then *surprising positive* = 75. For participants who reported an age range (as opposed to an exact age) in

response to a memory probe, the average age was calculated (rounded down in cases where the average was not a whole number).

Content Coding. Using the coding scheme generated from college student predictions in Study 2, the first author and a research assistant coded all memories independently. The coders achieved 83.78% agreement ($\kappa = .753$) for positive memories and 79.15% agreement ($\kappa = .755$) for negative memories. Differences were resolved through discussion. However, because the coding scheme generated by college students captured less than half of positive memories (52.51% coded as 'other'; 22.01% of negative memories coded as 'other'), the two coders next generated additional content categories based on actual adult memory content as well as the content categories reported by Berntsen and Rubin (2004). This resulted in an additional eight positive categories (total categories = 18) and an additional 6 negative categories (total categories = 17). The two coders then categorized adult memories, previously coded as 'other', using the additional categories (because a memory could still be coded as 'other', there were a total of nine positive and seven negative categories) achieving 76.47% agreement ($\kappa = .724$) for positive memories and 71.93% agreement ($\kappa = .649$) for negative memories. Differences were again resolved through discussion. After this second round of coding, 15.44% of positive memories and 15.79% of negative memories were categorized as 'other'. A random sample of 30.00% of cases from the full sample was then drawn, rounding up to achieve a total of 78 positive and 78 negative memories. A second research assistant, blind to hypotheses, then coded these memories using the coding scheme generated from college student predictions, resulting in 91.03% agreement ($\kappa = .851$) for positive memories and 78.21% agreement ($\kappa = .734$) for

negative memories. In addition, a random sample of 30.00% of memories initially coded as 'other' using the coding scheme generated from college student predictions was selected within valence (41 positive and 17 negative memories). The same research assistant then coded these memories according to the additional coding categories, resulting in 73.17% agreement ($\kappa = .680$) for positive memories and 64.71% agreement ($\kappa = .571$) for negative memories. Tables 4 and 5 include content categories by bump period (bump period = 16-30 years) for positive and surprising positive, and negative and surprising negative (respectively) prompts.

Results

Mixed design factorials, with valence (positive and negative) as a within factor and expectedness (standard vs. surprising) as a between factor, were conducted on memory age and surprise rating. There was no effect of valence on age of reported memory, $F(1, 257) = 0.060$, $p = .807$, no effect of expectedness, $F(1, 257) = 0.329$, $p = .567$, and no valence by expectedness interaction, $F(1, 257) = 2.122$, $p = .146$. There was a significant effect of valence on original surprise, $F(1, 250) = 29.550$, $p < .001$, $\eta^2 = .104$, a significant effect of expectedness, $F(1, 250) = 48.676$, $p < .001$, $\eta^2 = .163$, as well as a significant valence by expectedness interaction, $F(1, 250) = 4.029$, $p = .046$, $\eta^2 = .014$. Surprising positive memories ($M = 3.99$, $SD = 1.00$) were perceived as more surprising than standard positive memories ($M = 3.04$, $SD = 1.36$), *tadjusted*$(208.883) = 6.200$, $p < .0001$, $\eta^2 = .368$, surprising negative memories ($M = 4.31$, $SD = 0.88$) were perceived as more surprising than standard negative memories ($M = 3.77$, $SD = 1.33$), *tadjusted*$(198.979) = 3.772$, $p < .0001$, $\eta^2 = 067$, standard negative memories were perceived as more surprising than standard positive memories, $t(114) = 4.282$, $p < .0001$,

$\eta^2 = .139$, and surprising negative memories were perceived as more surprising than surprising positive memories, $t(136) = 3.092$, $p = .002$, $\eta^2 = .066$.

The distributions of adult memories are presented in Figures 5 (especially positive and especially negative) and 6 (surprising positive and surprising negative). As expected, we found that standard positive memories ($n = 121$; 34.71%) showed a larger increase in frequency between ages 16 and 30 relative to standard negative memories ($n = 121$; 27.27%). Second, while the difference between surprising positive ($n = 138$; 34.78%) and surprising negative ($n = 138$; 21.01%) memory distributions for ages 16 through 30 is more pronounced relative to the difference between standard positive and negative memories during this time period, these memories show the same temporal pattern, with one exception. Surprising negative memories show an increased frequency for ages 46 through 60 (23.91%). In addition, whereas the overwhelming majority of predicted positive (80.20%) and surprising positive (60.82) events from Study 2 were expected to occur between 16 and 30 years, the percentage of adult positive (34.71%) and surprising positive (34.78%) memories within this period was smaller. Thus, while the increased frequency of adult positive and surprising positive memories relative to adult negative and surprising negative memories (respectively) conforms to the general temporal patterns predicted by college students, the actual differences are substantially less pronounced. However, our findings do replicate previous research for standard memories, and demonstrate that both adult positive and surprising positive memories are similarly distributed across the lifespan.

For positive memories ($n = 259$), 47.49% corresponded to a thematic content category predicted by college students in Study 2, and for negative memories ($n = 259$),

77.61% corresponded to a thematic content category predicted by college students in Study 2. Within positive memories, 48.76% of standard memories (n = 121) corresponded to a thematic content category and 46.38% of surprising memories (n = 138) corresponded to a thematic content category. Within negative memories, 79.34% of standard memories corresponded to a thematic content category and 76.09% of surprising memories corresponded to a thematic content category. Thus, older adult negative and surprising negative memories conformed to college student predictions for these events (Study 2) to a substantially greater extent than did older adult positive and surprising positive memories conform to college student predictions.

After including additional categories to code memories not captured by college student predictions in Study 2, 91.89% of positive memories corresponded to a thematic content category and 96.14% of negative memories corresponded to a thematic content category. Within positive memories, 91.74% of standard memories corresponded to a thematic content category and 92.03% of surprising memories corresponded to a thematic content category. For bump period memories, 100.00% of standard and 91.67% of surprising positive memories corresponded to a thematic content category, and for non-bump period memories, 87.34% of standard and 92.22% of surprising positive memories corresponded to a thematic content category (see Table 4 for positive content categories according to expectedness and valence; note that percentage is calculated within college student predictions from Study 2 and additional content categories, respectively; percentages reported in this section are calculated from the combined predicted and additional categories, except where noted). For positive bump period memories, having a child (19.05%), marriage (16.67%), and career or financial advance (16.67%) were the

largest standard positive categories, whereas having a child (20.83%) and career or financial advance (16.67%) were the two largest surprising positive categories. For positive non-bump period memories, career or financial advance (17.72%), personal accomplishment (13.92%), and non-romantic relationship experience (13.92%) were the largest standard positive categories, whereas career or financial advance (18.89%) and life lesson or character growth (14.44%) were the two largest surprising positive categories.

After including additional categories to code memories not captured by college student predictions in Study 2, 97.52% of standard negative memories corresponded to a thematic content category and 94.93% of surprising negative memories corresponded to a thematic content category. For bump period memories, 96.97% of standard and 96.55% of surprising negative memories corresponded to a thematic content category, and for non-bump period memories, 97.72% of standard and 94.50% of surprising negative memories corresponded to a thematic content category (see Table 5 for negative content categories according to expectedness and valence; again note that percentage is calculated within college student predictions from Study 2 and additional content categories, respectively; percentages reported in this section are calculated from the combined predicted and additional categories, except where noted). For negative bump period memories, career or financial difficulty (18.18%), accidents or diseases (12.12%), and non-romantic relationship difficulty (12.12%) were the largest standard negative categories, whereas other's death (17.24%) and victimization or discrimination (17.24%) were the two largest surprising negative categories. For negative non-bump period memories, career or financial difficulty (18.18%) and victimization or discrimination

(15.91%) were the two largest standard negative categories, whereas accidents or diseases (28.44%) and career or financial difficulty (17.43%) were the two largest surprising negative categories.

Discussion

Similar to findings reported in previous studies (Berntsen & Rubin, 2002; Rubin & Berntsen, 2003), older adults especially positive memories showed a greater increase in frequency between ages 16 and 30 relative to their especially negative memories. A novel finding is that adults' memories of surprising positive events showed the same increase in frequency between ages 16 and 30 relative to adults' memories of surprising negative events. While the increase in frequency for positive and surprising positive memory distributions between the ages of 16 and 30 years is not as great as that predicted by college students in Study 2, both memory distributions show a clear reminiscence bump.

College student predictions from Study 2 captured over two thirds of adult negative memories, but only slightly less than half of adult positive memories. Within positive memories, college student predictions that adult memories of having a child would be overrepresented during the bump period were generally accurate, although they overestimated the extent to which adults would recall their marriage and underestimated the extent to which adults would recall career or financial related experiences, the latter remaining consistently high across both bump and non-bump periods as well as expectedness condition. In addition, the shift in predictions from an emphasis on marriage and having a child for especially positive memories to an emphasis on proposal or engagement and learning of pregnancy for surprising positive memories was not born

out in adult memories for these experiences. In fact, very few adults recalled either their proposal or learning of pregnancy. Within the bump period, the difference between positive and surprising positive memory content appears to be based on an emphasis on marriage in the especially positive condition (16.67% within predicted categories; surprising positive = 0.00%) and an emphasis on college transition in the surprising positive condition (10.42% within predicted categories; especially positive = 0.00%). There was little difference in predicted categories for non-bump period memories; the majority of both especially positive and surprising positive memories were coded as 'other'. Similarly, there were only small differences in frequency among positive and surprising positive bump period memories for the additional content categories.

Although college student predictions from Study 2 captured a larger percentage of adult negative relative to positive memories, the emphasis on death in college student predictions (for bump period negative events, 33.96% referred to death not a result of war, and for non-bump period negative events, 58.63% referred to death not a result of war) was only reflected to a small extent by the content of adult memories (for bump period negative memories, 19.35% referred to death not a result of war, and for non-bump period negative memories, 18.79% referred to death not a result of war). The majority of adult bump period memories (not including 'other', which was the largest category for both negative and surprising negative bump period memories) referred to career or finance related events, accidents or diseases, other's death, and victimization or discrimination. The difference between negative and surprising negative bump period memories appears to be a result of an emphasis in surprising negative memories on other's death (17.24% within predicted; especially negative = 9.09%) and victimization

or discrimination (17.24% within predicted; especially negative = 3.03%) and an emphasis in especially negative memories on 'other' (33.33% within predicted; surprising negative = 27.59%) and war (9.09% within predicted; surprising negative = 0.00%). Similar to bump period negative memories, non-bump period negative memories emphasized career or finance related events, accidents or diseases, other's death, and victimization or discrimination. Non-bump period negative memories also emphasized relationship difficulty and death of one's parent, both being greater in especially negative memories relative to surprising negative memories. Other differences between non-bump period negative memories included an emphasis on accidents or diseases in surprising negative memories (28.44% within predicted; especially negative = 9.09%) and, for especially negative memories, an emphasis on both victimization or discrimination (15.91% within predicted; surprising negative = 9.17%) and parent's death (11.36% within predicted; surprising negative = 2.75%).

In contrast to findings from Studies 1 and 2, the results of Study 3 provide no clear evidence that in the positive surprise condition, participants first use the 'positive' cue to direct memory search to the bump period, which is overpopulated with positive experiences, and then search for a transitional or landmark event (e.g., marriage or having a child) with a surprising component (e.g., proposal or learning of pregnancy). While there is a difference in marriage reference between positive (16.67%) and surprising positive (0.00%) bump period memories, references to having a child are nearly identical, and memories of learning of pregnancy or becoming engaged are similarly absent. Surprising positive bump period memories only outnumber (to a relatively large extent) especially positive bump period memories for college transition, a cultural script category

in prior studies (10.42%; especially positive = 0.00%), and for 'other' (33.33; especially negative = 26.19%). While the additional content categories do demonstrate differences between positive and surprising positive bump period memories, the number of participants in these cells is very small and thus meaningful conclusions are difficult to draw.

General Discussion: Studies 1-3

In Studies 1 through 3, two methodological issues warrant discussion, including the prompt 'surprise' in addition to the specific roles played by emotional valence and expectedness in the memory search. First, the cue 'surprise' is not neutral with regards to emotional valence. In Bradley and Lang's Affective Norms for English Words (ANEW, 1999), which provides means and standard deviations for word valence (unpleasant or negative to pleasant or positive) and arousal (calm to excited) using a 1 to 9 rating scale, 'surprised' was rated as moderately arousing ($M = 7.47$, $SD = 2.09$) and moderately positive ($M = 7.47$, $SD = 1.56$). In addition, Talarico, LaBar, and Rubin (2004; Rubin & Talarico, 2009) found support for a vector model of emotion in which memories elicited by positive and negative cues lined up on separate axes according to valence, and across each valence axis, varied according to intensity. In this model, memories generated in response to the 'surprise' cue were also rated as moderately intense (e.g., more intense than 'amused' and less intense than 'excited') and moderately positive (e.g., more positive than 'relieved' and less positive than 'happy'). Because 'surprise' itself is not an emotionally neutral cue, it is possible that asking for positive memories with an element of surprise may not fully disengage the life script (as outlined for complete script disengagement in the hypotheses section), but only partially disengage it.

In Studies 4 and 5, this issue is addressed by asking college students to predict, and older adults to recall, *expected* and *unexpected* events from across the life span. While there are no data as to the emotional valence of the terms 'expected' and 'unexpected', it seems likely that expected and unexpected are more neutral relative to the positive valence of surprise.

The second, and more important, methodological issue concerns the distinctive roles played by emotional valence and expectedness in the memory search. In Studies 1 through 3, participants are asked for surprising or standard memories that are either positive or negative. Because our analyses suggest that (at least for Studies 1 and 2), in the positive surprise condition, participants first use the 'positive' cue to direct the memory search to the bump period and then search for an expected event (e.g., marriage or having a child) with a surprising component (e.g., proposal or learning of pregnancy), it could be that the emotional component overrides any effect of expectedness (Schulkind & Woldorf, 2005). In order to more fully assess the expectedness dimension of the memory search, we would need to include a memory probe first requesting an expected or unexpected memory, and then have participants rate the valence of their reported memory after the fact (Rubin, personal communication). This would allow us to more clearly determine whether it is a life script per se that drives the memory search or whether a life script is subordinate to an emotion driven search. Thus, I ask college students to predict (Study 4), and older adult participants to recall (Study 5), memories from across the life span for highly expected and highly unexpected experiences without specifying emotional valence in advance. Only after describing each event are participants asked to rate their memories on positive and negative valence, in addition to

other measures (e.g., age-at-event, rehearsal frequency, and CES). This should help to clarify the distinction between the emotional valence and expectedness dimensions of memory search.

Hypotheses: Studies 4 and 5

The purpose of Studies 4 and 5 is to examine the direct guiding role played by emotion cues in Studies 1 through 3 and in previous research (Collins et al., 2007; Erdoğan et al., 2008; Rubin & Berntsen, 2003). As Rubin and Berntsen (2003, p. 3) argued,

> Life scripts provide search descriptions for times when one is most likely to have experienced [an] emotion. So for 'happy' or 'in love,' there is a time period during which one is most likely to have such emotions, according to shared cultural norms. Even though sadness and anger may be as expected and as common as being happy and in love over the overall life time, there is no particular time period to search for these emotions. If no specific time slot in a life script is allocated to certain types of events, they will not benefit from a life script that supports and structures their retrieval and, thus, by default, should show the monotonically decreasing retention function of normal forgetting.

Because Study 4 and 5 memory prompts do not include emotion cues, participants are asked to rate emotional valence only after providing their memory, and the surprise prompt (a moderately positive term) is replaced with more neutral 'expected' and 'unexpected' prompts, the initial memory search should not be driven by emotional valence. Predictions and interpretations of possible outcomes are provided below according to memory prompt.

Expected Events

In previous research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), the vast majority of important events predicted to occur over the course of one's life were considered positive as opposed to negative. In addition, negative

events are almost always unanticipated, or at least when anticipated (parent's death), rarely occur within a predictable and narrow time span. Thus, according to the life script hypothesis, we should find that almost all predicted expected events and actual adult memories of expected events will be rated as positive. Second, a life script is composed, by definition, of events expected to take place at specified times across one's life and the majority of these events take place in adolescence and young adulthood (Berntsen & Rubin, 2002, 2004; Rubin & Berntsen, 2003; Rubin et al., 2009). If a life script, absent a corresponding positive cue, is sufficient to drive memory search to the period overrepresented by scripted events, we should find that predicted events and adult memories in response to the expected prompt are highly overrepresented between the ages of 16 and 30 compared to other periods of life. Third, the majority of positive predicted events and memories in response to an expected prompt, especially those in the bump period, should reflect culturally scripted events. Fourth, expected events and memories should be rated more positive overall compared to unexpected events and memories. Finally, for the few expected events and memories rated as negative, we may find some thematic overlap (parent's death), but should find little agreement as to when these events will or have occurred.

Unexpected Events

As Rubin et al. state, "highly negative events typically consist of either deviations from the timing and sequencing of the life script or of non-scripted events" (2009, p. 57). Similarly, Rubin and Berntsen suggest that, "a life story reflecting a life script is a way of expressing satisfaction with life, whereas deviations are used to draw attention to problems, unhappiness, or things that did not work out" (2003, p. 12). Thus, according to

the life script hypothesis (Berntsen & Rubin, 2002, 2004; Rubin & Berntsen, 2003; Rubin et al., 2009), many unexpected events and memories should be rated as negative and unexpected events and memories should be rated as more negative overall in comparison to expected events and memories. In addition, the distributions of unexpected negative events and memories should not show an increased frequency during adolescence and young adulthood and content should reflect non-age-linked or idiosyncratic negative life experiences. If, however, we do find a substantial number of unexpected positive events and memories, there are at least two possible scenarios and corresponding interpretations. First, if the distributions of positive unexpected events and memories *do not* show an increase during adolescence and early adulthood, this would suggest that the emotion cue (positive) is necessary to activate a life script. While this finding would not be inconsistent with life script theory, it would suggest that emotional valence rather than expectedness serves as the superordinate organizing element of autobiographical memory (Schulkind & Woldorf, 2005). In contrast, and most interesting from a theoretical perspective, if the distributions of positive unexpected events and memories *do* show an increase during adolescence and early adulthood, this would constitute evidence bearing against a life script account of the reminiscence bump: an emotion cue would not appear to be necessary to direct memory search to late adolescence and early adulthood, and a bump is apparent even for unexpected events. A reminiscence bump for positive unexpected events and memories would thus require a different theoretical explanation, such as the memory accurately reflects reality perspective.

Experiment 4

Similar to Study 2, as well as to previous research (Berntsen & Rubin, 2004; Bohn, 2009; Erdoğan et al., 2008; Rubin et al., 2009), in Study 4 I asked college students to imagine that a hypothetical 80-year-old, of their same gender and ethnicity, is reflecting on events that had occurred over the course of his or her life. Participants are then asked to briefly describe one highly expected and one highly unexpected memory that this hypothetical 80-year-old would recall (counterbalanced). After participants describe each event, they are then asked to rate both the positive and the negative valence of the event (Rubin & Talarico, 2009; Talarico et al., 2004). Participants are also asked to provide the age at which the hypothetical 80-year-old experienced the event, to rate their confidence that the event happened within the same decade as their prediction, as well as the extent to which they experienced difficulty thinking of the event in response to our probe.

Method

Similar to the methodology of Study 2, college students were asked to imagine an average or typical 80-year-old (not someone they know), of their same gender, who is looking back over his or her life, thinking about a range of different events. Participants were then asked to describe both a memory of an event the hypothetical 80-year-old would have perceived as highly expected and a memory of an event that the hypothetical 80-year-old would have perceived as highly unexpected (counterbalanced) over the course of his or her life. Participants were then asked to rate both the positive (scale ranging from 1 to 5; 1 = not at all positive, 5 = extremely positive) and negative (scale ranging from 1 to 5; 1 = not at all negative, 5 = extremely negative) valence of each

event, to rate how surprised the hypothetical 80-year-old would have been by the event (scale ranging from 1 to 5; 1 = not at all surprised, 5 = extremely surprised), to estimate how old the hypothetical 80-year-old was when he or she experienced the event, their confidence that the age estimate they provided falls within a decade of the actual experience (rated on a 1 to 7 scale; 1 = I have absolutely no confidence, 7 = I am extremely confident), as well as the extent to which they experienced difficulty thinking of the event in response to our probe (rated on a 1 to 5 scale; 1 = not at all difficult, 5 = extremely difficult). Only memory age, positive and negative valence, and surprise ratings are reported in this dissertation.

Participants completed questionnaires in groups of approximately 40. Consent forms were provided to participants and they were asked to read, sign, and return these forms before the experiment started. Once consent forms were collected, the two questionnaire versions were passed out to participants in alternating order. After participants completed the questionnaire, they were provided with a debriefing form, thanked, and dismissed. The study lasted for approximately 20 minutes. For participants who reported an age range (as opposed to an exact age) in response to a memory probe, the average age was calculated (rounded down in cases where the average was not a whole number).

Participants. Of the 199 participants who completed the questionnaire, three subjects were dropped for failure to follow instructions, resulting in a final sample of 196 participants. 87.2% of participants identified as European, Caucasian, or White, 3.6% as a mixture of backgrounds or other, 3.1% as Asian, 3.1% as Hispanic, and 3.1% as African American or Black. Females comprised 73.5% (n = 144) of the sample and the mean age

of participants was 18.59 (ranging from 17 to 26). Questionnaires with memory probes *expected* followed by *unexpected* were completed by 101 participants and *unexpected* followed by *expected* by 95 participants.

Content Coding. The first author read all event descriptions and generated content categories for expected and unexpected predicted events independently. Categories obtaining 3% (rounded up) were retained – all other categories were folded into 'other'. This resulted in 6 expected categories and 10 unexpected categories (excluding 'other'). Using this coding scheme, the first author and a research assistant independently coded all event descriptions. The coders achieved 96.94% agreement ($\kappa = .957$) for expected events and 89.80% agreement ($\kappa = .884$) for unexpected events. Differences were resolved through discussion. A random sample of 30% of cases was then drawn, rounding up to achieve a total of 59 expected and 59 unexpected events. A research assistant, blind to hypotheses, then coded these event descriptions, resulting in 100.00% ($\kappa = 1.000$) agreement for expected events and 93.22% ($\kappa = .923$) for unexpected events.

Using a procedure identical to that used by Talarico et al. (2004; Rubin & Talarico, 2009), a valence score was calculated for each event based on the corresponding positive and negative ratings (positive score + (6 – negative)/2 = valence), such that a score of three represented a neutral event, above three a positive event, and below three a negative event. Events were then coded as positive, negative or neutral based on their valence score. Consistent with predictions drawn from the life script hypothesis, we found that the majority of expected events were rated as positive (81.63%; negative = 14.29%, neutral = 4.08%) and the majority of unexpected events were rated as negative (77.04%; positive = 20.41%, neutral = 2.55%). Because one of the main

theoretical issues addressed by this dissertation concerns differences between positive and negative memories, memories rated as neutral (expected $n = 8$, unexpected $n = 5$) are excluded from further analysis except where noted.

Results

Paired samples *t* tests (expected versus unexpected) were next conducted on memory age, positive rating, negative rating, and surprise rating (neutral events included). Predicted expected events ($M = 26.81$, $SD = 12.16$) were significantly earlier in age than predicted unexpected events ($M = 26.81$, $SD = 12.16$), $t(195) = 6.810$, $p < .0001$, $\eta^2 = .034$, predicted expected events ($M = 4.02$, $SD = 1.31$) were significantly more positive compared to predicted unexpected events ($M = 1.81$, $SD = 1.40$), $t(195) = 15.097$, $p < .0001$, $\eta^2 = .072$, predicted unexpected events ($M = 3.85$, $SD = 1.46$) were significantly more negative compared to predicted expected events ($M = 1.78$, $SD = 1.20$), $t(195) = 15.061$, $p < .0001$, $\eta^2 = .072$, and predicted unexpected events ($M = 4.27$, $SD = 0.9$) were significantly more surprising compared to predicted expected events ($M = 2.16$, $SD = 1.17$), $t(195) = 19.490$, $p < .0001$, $\eta^2 = .091$.

Order. To examine the influence of order, independent groups *t* tests were conducted on memory age, positive rating, negative rating, and surprise rating (neutral events included). The age of expected events was predicted by students to be older when this probe was presented second ($M = 28.92$, $SD = 14.61$) compared to first ($M = 24.82$, $SD = 8.91$), *tadjusted*$(153.633) = 2.351$, $p = .020$, $\eta^2 = .015$, the age of unexpected events was predicted to be older when this probe was presented second ($M = 39.81$, $SD = 18.30$) compared to first ($M = 31.73$, $SD = 17.08$), $t(194) = 3.193$, $p = .002$, $\eta^2 = .016$, and unexpected events were predicted as more surprising when this probe was presented first

($M = 4.46$, $SD = 0.68$) compared to second ($M = 4.08$, $SD = 1.19$), *tadjusted*(161.104) = 2.794, $p = .006$, $\eta^2 = .017$. There were no other significant order differences. Examination of the distributions of expected and unexpected events by task order revealed the same general pattern within expectedness.

The distributions of predicted memories are presented in Figures 7 (expected and unexpected, neutral included), 8 (expected positive and expected negative), and 9 (unexpected positive and unexpected negative). First, in regards to expected and unexpected events, almost all (81.12%) of expected events were predicted to occur in the bump period. In addition, nearly half (44.39%) of unexpected events were predicted to occur in the bump period with the remaining unexpected events predicted to gradually decline with age. Thus, not only did we find a strong bump for expected events, confirming predictions drawn from the life script hypothesis, we also found a substantial bump for unexpected events. Examining the distributions of positive and negative expected events, we find a substantial reminiscence bump for positive expected events, with 90.63% of events falling in the bump period. In contrast, expected negative events are more evenly distributed across the life span and only 39.29% fall within the bump period. Examining the distributions of positive and negative unexpected events, negative events show only a modest increase during the bump period (35.76%), declining gradually over the life span (31-45 = 25.17%, 46-60 = 15.23%, and 61+ = 15.23%). In contrast, unexpected positive events show a strong reminiscence bump, with 80.00% of predictions falling within the bump period.

Tables 6 and 7 include content categories by valence (positive and negative) and bump period (16-30 years) for expected and unexpected prompts, respectively. For

expected events (n = 188), 84.04% corresponded to a thematic content category for unexpected events (n = 191), 85.34% corresponded to a thematic content category. Within expected events, 89.73% of positive events corresponded to a thematic content category and 53.57% of negative events corresponded to a thematic content category. Within unexpected events, 72.50% of positive events corresponded to a thematic content category and 88.74% of negative events corresponded to a thematic content category. In addition, the majority of expected (90.63%) and unexpected (80.00%) positive events fell within the bump period (16-30 years) and, overall, more bump period events (expected = 91.03%, unexpected = 82.56%) corresponded to a thematic coding category than did non-bump period events (expected = 50.00%, unexpected = 87.62%), with the exception of unexpected bump and non-bump period events, which were roughly equivalent.

For bump period expected events, marriage (65.52%) and having children (16.55%) were the two largest positive categories, and for bump period unexpected events, having children (34.38%) and marriage related events (34.38%) were the two largest positive categories. For non-bump period expected events, becoming a grandparent (52.33%) and 'other' (40.00%) were the two largest positive categories, and for non-bump period unexpected events, 'other' (50.00%) and career or financial related events (37.50%) were the two largest positive categories. Although there are small differences in content between positive expected and unexpected events, the majority of these events were predicted to occur within the bump period. In addition, the majority of both expected and unexpected positive events referred to either marriage related experiences or to experiences related to having a child, both reflecting age-linked events that typically occur in late adolescence and young adulthood.

For bump period expected events, 'other' (27.27%) and events related to World War II (27.27%) were the two largest negative categories, and for bump period unexpected events, accidents or diseases (20.37%) and having children (18.52%) were the two largest negative categories. For non-bump period expected events, 'other' (58.82%) and death (41.18%) were the only negative categories, and for non-bump period unexpected events, accidents or diseases (28.87%) and the death of one's child (14.43%) were the two largest negative categories. While it is difficult to draw conclusions for expected negative events due to the low number of events in this category (n = 28), 59.25% of unexpected negative events within the bump period and 76.29% of unexpected negative events outside of the bump period refer to either accidents and diseases or to death unrelated to war (death of other, parent, child, spouse, or the JFK assassination).

Discussion

This study provides a number of new findings relevant to a life script account of the reminiscence bump. Consistent with predictions drawn from the life script hypothesis (Berntsen & Rubin, 2002, 2004; Rubin & Berntsen, 2003; Rubin et al., 2009), but not previously reported in earlier studies, highly expected events were predominately positive and highly unexpected events were predominantly negative. Second, and also consistent with life script predictions, a large majority of positive expected events were predicted to occur in the bump period and the distribution of these predicted events demonstrated a strong reminiscence bump. In contrast, more negative expected events were predicted to occur outside of the bump period and the distribution of these predicted events was relatively flat. Third, positive expected events predominantly referred to highly age-

linked scripted events (i.e., marriage and having children), especially for those in the bump period. In contrast, the majority of negative expected events referred to either 'other' or to death, neither being a highly age-linked event. Of the few predicted to occur in the bump period, one third were coded as 'other' and one third referred to World War II, the latter an event that a hypothetical 80-year-old would have experienced in some way, and a finding consistent with Rubin and Berntsen's (2003) specific "war generation" script (p. 7).

The distribution of unexpected negative events was relatively flat, a finding consistent with predictions drawn from the life script hypothesis. Also consistent with a life script hypothesis, unexpected negative content for bump and non-bump periods referred primarily to death or 'other', although a moderate number in the bump period did refer to marriage related events. However, a number of findings were inconsistent with predictions drawn from the life script. First, the overall distribution of unexpected events showed a reminiscence bump, albeit a smaller one relative to that for expected events. Most important from a theoretical point of view is the finding that unexpected positive events showed a clear reminiscence bump. The life script hypothesis predicts that, at the very least, an emotionally positive cue is necessary to activate a life script, which then leads to an overrepresentation of bump period memories. Because we asked participants to predict *highly unexpected* events, and only later to rate their memories on emotional valence, the presence of a reminiscence bump for unexpected positive events suggests that an emotion cue is not necessary to direct memory search to late adolescence and early adulthood. If this suggestion is born out in Study 5, where I examine adult memories of expected and unexpected events across the life span, then a different

theoretical explanation, such as the memory accurately reflects reality perspective, would appear to be necessary to explain the reminiscence bump in autobiographical memory.

Experiment 5

Findings of Studies 1 through 3 suggest that when participants are asked for surprising positive and surprising negative events and memories, it is the emotional valence cue that activates the life script. However, Study 4 results suggest that even when the positive bias of 'surprise' is removed (participants were instead asked to predict either unexpected or expected events) and participants are asked to rate the positive and negative valence of events only after providing their descriptions, we still find a reminiscence bump for both expected and unexpected positive events. To determine whether older adult memories across the life span conform to the predictions of college students in Study 4, in Study 5 older adults were asked to provide detailed accounts of their own highly expected and highly unexpected memories from across the life span and to rate each memory on positive and negative valence only after providing their memory description. By doing this, memory search should not be driven by emotional valence in response to expected and unexpected prompts.

Method

Memory probes mirrored those of Study 4 – older adults were asked to write, in detail, both a specific personal memory of an event that was highly expected and a specific personal memory of an event that was highly unexpected. Adults were instructed that their memories could be drawn from across their entire life span. After completing each memory description, adults were asked to rate the valence of their memory on positive (ranging from 1 to 5; 1 not at all positive, 5 = extremely positive) and negative

scales (ranging from 1 to 5; 1 not at all negative, 5 = extremely negative). Follow up questions were identical to Studies 1 and 3 (i.e., their age at the time of the memory experience, the frequency with which they have shared their memory with others, how emotional they felt at the time of the experience, how surprised they were by the experience, and the CES short version). Only memory age, positive and negative valence, and surprise ratings are reported in this dissertation. For participants who reported an age range (as opposed to an exact age) in response to a memory probe, the average age was calculated (rounded down in cases where the average was not a whole number).

Participants. Older adults (50 years of age and above) who had taken part in New Hampshire statewide political opinion polling from 2006 to 2008 (contact established using a random-digit dialing procedure), and who had agreed to be re-contacted for research purposes, were contacted by the University of New Hampshire Survey Center to take part in the current memory study. In total, 1,430 adults were contacted about participation, and of those who agreed to receive our research materials (890), 888 possessed complete mailing addresses. Adults were mailed a recruitment letter, describing the current research, and a questionnaire. Adults who agreed to participate (as indicated by completing and returning the questionnaire) were asked to complete the questionnaire and to return it to UNH via an enclosed pre-paid envelope. Compensation for participation in this study was provided in the form of two participant raffles, each for a $100 credit card gift certificate, which subjects returned via US mail separate from their questionnaire. Debriefing letters were later mailed to all adults who had initially agreed to receive our research materials.

Of the 888 questionnaires mailed out, 11 adults contacted us to decline participation and 1 questionnaire was returned due to incorrect address. Excluding the 12 adults who opted out or did not receive our research materials, 378 questionnaires were returned at least partially completed, a response rate of 43.15%. Of the 378 participants who returned at least partially completed questionnaire, 16 subjects were dropped for failure to follow instructions (e.g., reporting only one memory, not reporting memory age), resulting in a final sample of 362 participants (45.9% female). Almost all (98.9%) participants self-identified as European, Caucasian, or White, 0.3% identified as Hispanic, and 0.8% identified as a mixture of backgrounds or other. The mean age of participants was 63.3 (*SD* = 8.6) years, ranging from 50 to 89 years. Nearly half (42.8%) of participants reporting attending school beyond college, 25.1% completed college, 17.7% took or are taking college courses, 10.2% completed high school or received a GED, 3.0% and 1.1% indicated other educational experience or did not complete high school, respectively. Completions by version are as follows: *expected* then *unexpected* = 175 and *unexpected* then *expected* = 187.

Content Coding. Using the coding scheme generated from college student predictions in Study 4, the first author and a research assistant coded all memories independently. The coders achieved 95.58% agreement (κ = .938) for expected memories and 87.57% agreement (κ = .844) for unexpected memories. Differences were resolved through discussion. Similar to Study 3, the coding scheme generated by college students captured approximately half of expected memories (46.41% coded as 'other'; 35.64% of unexpected memories coded as 'other'). Thus, the two coders next generated additional content categories based on actual adult memory content as well as content categories

reported by Berntsen and Rubin (2004). This resulted in an additional nine expected categories (total categories = 16) and an additional 11 unexpected categories (total categories = 22). The two coders then categorized adult memories, previously coded as 'other', using the additional categories (because a memory could still be coded as 'other', there were a total of 10 expected and 12 unexpected additional categories) achieving 75.00% agreement ($\kappa = .728$) for expected memories and 73.64% agreement ($\kappa = .704$) for unexpected memories. Differences were again resolved through discussion. After this second round of coding, 7.46% of expected memories and 6.08% of unexpected memories were categorized as 'other'. A random sample of 30% of cases was then drawn, rounding up to achieve a total of 109 expected and unexpected memories (both memories were coded for each subject selected). A research assistant, blind to hypotheses, then coded these adult memories using the coding scheme generated from college student predictions, resulting in 95.41% agreement ($\kappa = .936$) for expected memories and 86.24% agreement ($\kappa = .826$) for unexpected memories. In addition, a random sample of memories coded as 'other' using the coding scheme generated from college student predictions was next selected within condition (50 expected and 39 unexpected memories). A research assistant, blind to hypotheses, then coded these memories according to the additional coding categories, resulting in 82.00% agreement ($\kappa = .788$) for expected memories and 76.92% agreement ($\kappa = .734$) for unexpected memories.

Using a procedure identical to that used in Study 4 (Rubin & Talarico, 2009; Talarico et al., 2004), a valence score was calculated for each memory based on the corresponding positive and negative ratings (positive score + (6 – negative)/2 = valence),

such that a score of three represented a neutral memory, above three a positive memory, and below three a negative memory. Memories were then coded as positive, negative or neutral based on their valence score. Consistent with predictions drawn from the life script hypothesis as well as Study 4 predictions, we found that the majority of expected memories were rated as positive (75.97%; negative = 20.17%, neutral = 3.87%) and the majority of unexpected memories were rated as negative (64.64%; positive = 28.73%, neutral = 6.63%). Because one of the main theoretical issues addressed by this dissertation concerns differences between positive and negative memories, memories rated as neutral (expected $n = 14$, unexpected $n = 24$) are excluded from further analysis except where noted.

Results

Paired samples *t* tests (expected versus unexpected) were conducted on memory age, positive rating, negative rating, and surprise rating (neutral events included). There was no difference in the age of expected ($M = 31.73$, $SD = 16.50$) and unexpected memories ($M = 32.30$, $SD = 17.27$), $t(361) = 0.494$, $p = .621$, expected memories ($M = 3.77$, $SD = 1.49$) were significantly more positive compared to unexpected memories ($M = 2.18$, $SD = 1.61$), $t(361) = 13.099$, $p < .0001$, $\eta^2 = .24$, unexpected memories ($M = 3.50$, $SD = 1.60$) were significantly more negative compared to expected memories ($M = 1.99$, $SD = 1.45$), $t(361) = 12.725$, $p < .0001$, $\eta^2 = .310$, and unexpected memories ($M = 4.55$, $SD = 0.74$) were significantly more surprising compared to expected memories ($M = 2.40$, $SD = 1.47$), $t(361) = 25.509$, $p < .0001$, $\eta^2 = .643$.

Order. To examine the influence of order, independent groups *t* tests were conducted on memory age, positive rating, negative rating, and surprise rating (neutral

events included). The age of expected memories was significantly older when this probe was presented second ($M = 35.82$, $SD = 16.41$) compared to first ($M = 27.36$, $SD = 15.49$), $t_{adjusted}(359.972) = 5.046$, $p < .0001$, $\eta^2 = .066$, and the age of unexpected memories was older when this probe was presented second ($M = 34.87$, $SD = 16.81$) compared to first ($M = 29.90$, $SD = 17.40$), $t(360) = 2.764$, $p = .006$, $\eta^2 = .021$. There were no other significant order differences. With regards to the effect of order on expected and unexpected memory ages, examination of the corresponding memory distributions revealed the same general pattern for all memories.

The distributions of adult memories are presented in Figures 10 (expected and unexpected, neutral included), 11 (expected positive and expected negative), and 12 (unexpected positive and unexpected negative). With regards to the distributions of expected and unexpected events, we found strong reminiscence bumps for both. Nearly half (45.30%) of expected memories fall within the bump period and slightly fewer (37.02%) unexpected memories fall within the bump period. Memories falling outside the bump period are distributed in a relatively equivalent manner. Within expected memories, the distribution of positive memoires shows a strong reminiscence bump, with 49.82% of positive expected memories falling in the bump period. In contrast, the distribution of expected negative memories is relatively flat, with approximately 25% of memories falling in the 0-15, 16-30, and 31-45 year age bins, tapering off with increasing age. Thus, the reminiscence bump for expected memories was driven almost entirely by positive expected memories. Within unexpected memories, the distribution of positive memories also shows a strong reminiscence bump, with 48.08% of memories falling within the bump period. The distribution of unexpected negative memories is more

evenly distributed relative to the distribution of unexpected positive memories. However, the distribution of unexpected negative memories does show modest increases for age bins 16-30 (31.62%) and 46-60 (23.50%). Thus, while the reminiscence bump for expected memories was driven almost entirely by expected positive memories, the reminiscence bump for unexpected memories is driven to a small extent by unexpected negative events.

Tables 8 and 9 include content categories for expected and unexpected memories (neutral memories included) by bump period (16-30 years; note that percentage is calculated within college student predictions from Study 4 and additional content categories, respectively; percentages reported in this section are calculated from the combined predicted and additional categories, except where noted). For expected memories, 53.59% corresponded to a thematic content category predicted by college students and, after including the additional categories, 92.54% corresponded to a thematic content category. For unexpected memories, 64.36% corresponded to a thematic content category predicted by college students and, after including the additional categories, 93.92% corresponded to a thematic content category. In addition, slightly less than half of expected (45.30%) and more than one third of unexpected (37.02%) memories fell within the bump period. Furthermore, only a slightly greater percentage of expected memories in the bump period (predicted = 66.46%; additional = 90.91%), compared to expected memories not in the bump period (predicted = 42.93%; additional = 88.90%), corresponded to a thematic coding category. A relatively equal percentage of unexpected memories in the bump period (predicted = 59.70%; additional = 95.52%) and unexpected

memories not in the bump period (predicted = 67.11%; additional = 92.98%) corresponded to a thematic coding category.

The major predicted categories for expected memories include, marriage (16.57%), having a child (16.85%), death (9.94%), and high school or college transitions (8.01%). The major predicted categories for unexpected events include, accidents or diseases (20.72%), events related to career or finance (12.15%), marriage (8.29%), and a parent's death (6.91%). When expected and unexpected events are compared across bump and non-bump periods, the major predicted categories for expected bump period memories include marriage (25.00%), having a child (22.56%), and high school or college transition (14.02%), whereas the major predicted categories for expected non-bump period memories include, death (15.15%), having a child (12.12%), 'other' (11.11%), and marriage (9.60%). Thus, for expected memories, bump period memories focus more on highly age-linked scripted events (i.e., marriage, having a child, and school transitions) than do non-bump memories. The major predicted categories for unexpected bump period memories include events related to career or finance (14.18%), accidents or diseases (11.94%), and marriage (8.21%), whereas the major predicted categories for unexpected non-bump period memories include, accidents or diseases (25.88%), events related to career or finance (10.96%), and marriage (8.33%). Unexpected bump and non-bump memories differed in several ways across predicted categories, including for bump period memories a greater emphasis on career or finance career or finance (14.18%; non-bump = 10.96%) and having children (7.46%; non-bump = 1.75%), whereas non-bump period memories more often emphasized accidents and diseases.

Tables 10 and 11 include content categories by valence and bump period (again, note that percentage is calculated within college student predictions from Study 4 and additional content categories, respectively; percentages reported in this section are calculated from the combined predicted and additional categories, except where noted). Within expected memories, 92.00% of positive memories corresponded to a thematic content category and 93.15% of negative memories corresponded to a thematic content category. Within unexpected memories, 91.35% of positive memories corresponded to a thematic content category and 95.73% of negative memories corresponded to a thematic content category. For bump period expected memories, events related to marriage (28.47%) and to having children (24.09%) were the two largest predicted positive categories, and for non-bump period expected memories, events related to having children (17.39%) and 'other' (13.77%) were the two largest predicted positive categories The main differences within expected positive memories included, for bump period memories, an emphasis on marriage (28.47%; non-bump period = 9.42%), having children (24.09%; non-bump period = 17.39%), and high school or college transitions (13.14%; non-bump period = 3.62%), and for non-bump period memories, an emphasis on 'other' (13.77%; bump period = 2.19%). For bump period unexpected memories, events related to career or finance (20.00%) and marriage (14.00%) were the two largest predicted positive categories, and for non-bump period unexpected memories, events related to career or finance (20.37%) and accidents or diseases (16.67%) were the two largest predicted positive categories. The main differences within unexpected positive memories included, for bump period memories, an emphasis on having children (12.00%; non-bump period = 3.70%), and for non-bump period memories, an emphasis on

accidents or diseases (16.67%; bump period = 4.00%) and 'other' (12.96%; bump period = 4.00%). The distribution of positive events is generally consistent with college student predictions from Study 4, but college students overemphasized marriage and World War II related events, underemphasized having children and high school or college transitions, and omitted other important events older adults tended to recall, such as career or finance related events, personal accomplishments or disappointment, and accidents or diseases.

For bump period expected memories, high school or college transitions (21.05%), having children (15.79%), and death (15.79%) were the largest predicted negative categories, and for non-bump period expected memories, death (44.44%) and marriage related events (9.26%) were the two largest predicted negative categories The main differences within expected negative memories included, for bump period memories, high school or college transitions (21.05%; non-bump period = 0.00%) and having children (15.79%; non-bump period = 0.00%), and for non-bump period memories, an emphasis on death (44.44%; bump period = 15.79%) and marriage related events (9.26%; bump period = 0.00%). However, because there were few (n = 19) expected negative bump period memories, it is difficult to make strong generalizations based on this data. For bump period unexpected memories, accidents or diseases (13.51%), parent's death (12.16%), and career or finance related events (12.16%) were the largest predicted negative categories, and for non-bump period unexpected memories, accidents or diseases (28.13%) and parent's death (10.00%) were the two largest predicted negative categories. The main differences within unexpected negative memories included, for bump period memories, an emphasis on having children (5.41%; non-bump period = 0.63%), and for non-bump period memories, an emphasis on accidents or diseases

(28.13%; bump period = 13.51%), and the death of ones child (4.38%; bump period = 1.35%). Similar to college student predictions in Study 4, a large percentage of both unexpected bump period negative memories (39.18%) and unexpected non-bump period negative memories (55.01%) referred to either accidents and diseases or to death unrelated to war (death of other, parent, child, spouse, or the JFK assassination). However, college students omitted other important events older adults tended to recall, such as life lessons or character development, non-romantic relationship experiences, personal accomplishments or disappointments, victimization or discrimination, as well as events related to the Vietnam War.

Discussion

Similar to Study 4, the results of Study 5 provide a number of new findings relevant to a life script account of the reminiscence bump. Consistent with predictions drawn from the life script hypothesis (Berntsen & Rubin, 2002, 2004; Rubin & Berntsen, 2003; Rubin et al., 2009), highly expected memories were predominately positive and highly unexpected memories were predominantly negative. Second, and also consistent with life script predictions, almost half of positive expected memories were predicted to occur in the bump period and the distribution of positive expected memories demonstrated a strong reminiscence bump. In contrast, more negative expected memories were predicted to occur outside of the bump period and the distribution of negative expected memories was relatively flat. Third, positive expected memories predominantly referred to highly age-linked scripted events (i.e., marriage, having children, and high school or college transitions), especially for those in the bump period. While a number of expected negative memories, particularly in the bump period, referenced highly age-

linked scripted events (high school or college transition and having children), when bump and non-bump periods are combined ($n = 73$), the majority of expected negative memories refer to either death (36.99%) or to accidents and diseases (12.33%), events that, while thematically scripted, are not highly age-linked.

For unexpected memories, the distribution of negative memories was relatively flat, although there are small increases both during the bump period (31.62%) as well as between ages 46 and 60 years (23.50%). These findings are generally consistent with predictions drawn from the life script hypothesis. Also consistent with a life script hypothesis, unexpected negative memories for bump and non-bump periods referred primarily to accidents and diseases, death, or 'other', events that, while thematically scripted, are not highly age-linked. However, a number of findings were inconsistent with predictions drawn from the life script. First, mirroring college student predictions from Study 4, the overall distribution of unexpected memories showed a reminiscence bump, albeit a smaller one relative to that for expected memories. Similarly mirroring college student predictions from Study 4, the distribution of unexpected positive memories showed a clear reminiscence bump. The life script hypothesis predicts that, at the very least, an emotionally positive cue is necessary to activate a life script, which then leads to an overrepresentation of bump period memories. Because we asked adults to describe *highly unexpected* memories, and only later to rate their memories on emotional valence, the presence of a reminiscence bump for unexpected positive memories suggests that an emotion cue is not necessary to direct memory search to late adolescence and early adulthood. Thus, another explanation is needed.

General Discussion

The purpose of this dissertation research was to evaluate the life script account of the reminiscence bump in autobiographical memory. According to Rubin and Berntsen (2003; Berntsen & Rubin, 2004), an individual within a given culture possesses knowledge as to the type and timing of important landmark or transitional events that one is likely to experience over the course of his or her life – a *life script.* A life script is defined according to three general criteria. First, scripted events are normative in that the majority of people within a given culture will experience the scripted events. Second, scripted events are significant within a culture, typically indicating the achievement of a cultural milestone or a major life transition (e.g., marriage or having a child), and thus most individuals within a culture anticipate, celebrate, and reminisce about these events. Third, scripted events are tightly linked to a particular age or narrow age range. Because negative events are difficult if not impossible to predict (accidents or diseases), or when predictable (death of one's parents) are not linked to a narrow age-range, the life script is composed of primarily positive age-linked events.

A life script serves to organize and guide the retrieval of autobiographical memory. Because scripted events are primarily positive and occur during late adolescence and young adulthood, these events benefit from the organizational and retrieval properties of a life script. In contrast, because negative events are often unanticipated and are not overrepresented during any life period, they do not benefit from the functional properties of a life script. Thus, when older adults are asked to recall emotionally positive memories from across the life span, the life script guides memory search to the life period overrepresented by positive scripted events, which results in the

reminiscence bump (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). Although individuals may experience emotionally negative events to a similar extent as emotionally positive events over a life time, emotionally negative events do not cluster at any particular time period. Thus, emotionally negative events do not benefit from the functional properties of a life script and the distribution of these memories over the life span shows a classic forgetting curve.

The first goal of this dissertation was to provide a more balanced evaluation of the life script hypothesis by asking college students and older adults to provide detailed descriptions of single memories. In the majority of studies done on autobiographical memory over the life span, particularly those addressing the reminiscence bump, researchers ask older adults to recall multiple memories (e.g., Glück & Bluck, 2007; Thomsen & Berntsen, 2008), to provide only very brief descriptions of their memories (e.g., Bohn, 2009; Thomsen & Berntsen, 2008), and often ask for participants' 'most' positive or 'most' important memories (Berntsen & Rubin, 2002; Rubin & Berntsen, 2003). However, other researchers have speculated that this methodology may bias memory search. Specifically, by asking for very brief descriptions of multiple 'most' important memories, adults may be more likely to engage a general life script, resulting in memories for highly typical events and leading to an overrepresentation of memories from adolescence and young adulthood (Fitzgerald, 1988). Thus, this dissertation provides a more balanced evaluation of the life script hypothesis by asking participants to report highly detailed descriptions of single memories using more neutral (i.e., "especially" positive, "highly" unexpected) memory prompts.

The second goal of this dissertation was to assess both the emotional and expectedness dimensions of the life script hypothesis. Because the life script is composed of highly typical positive events, a second way to assess whether the life script guides the retrieval of positive (but not negative) autobiographical memories is to ask people for memories of *unexpected* or *surprising* events. According to Berntsen and Rubin (2002, 2004; Rubin & Berntsen, 2003), scripted events are highly expected and not likely to feature feelings of surprise. A surprising memory, by definition, should be for an event that was atypical or unexpected and thus an event not captured by a culturally based life script. Thus, in Studies 1 through 3, participants were asked to predict (Study 2) or recall (Studies 1 and 3) either especially positive and especially negative memories, or surprising positive and surprising negative memories. To control for the influence of emotion and more clearly isolate the expectedness dimension of the life script hypothesis, in Studies 4 and 5 participants were asked to predict (Study 4) or recall (Study 5) both expected and unexpected memories and, only after providing their memory descriptions, to rate their memories on positive and negative valence. In this discussion, I will first address the extent to which actual memory distributions for Studies 1 and 3 correspond to the different theoretical perspectives presented in the introduction to this dissertation. Next, I will address the relationship between predicted memory distributions presented in Study 2 and the corresponding adult memory distributions presented in Studies 3. I will then discuss content analyses for actual memories presented in Studies 1 and 3 with regards to the different theoretical perspectives as well as the extent to which the content of predicted memories (Study 2) corresponds to actual memories (Study 3). I will then

follow these general steps to address the findings of Studies 4 and 5. Finally, I will make suggestions for future research on the reminiscence bump in autobiographical memory.

The life script hypothesis predicts an increase in memory frequency between the approximate ages of 16 and 30 years for positive memories and a generally flat distribution for negative memories (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). In the current research, we did indeed replicate this finding. In Study 1, the frequency of college students' positive relative to negative memories between the ages of 8 and 18 showed a marked increase at ages 17 and 18, corresponding to the upward sloping component of the reminiscence bump. Similarly, in Study 3, older adult memories from across the life span showed an increase for positive relative to negative memories between the ages of 16 and 30 years. Although there is not a large difference in frequency for positive and negative memories between 16 and 30 years, the distribution of positive memories increases sharply from 15.70% between ages 0 and 15 to 34.71% between ages 16 and 30, then decreases sharply to 19.01% between ages 46 and 60, finally tapering off to 11.57% from 61 years and older. In contrast, for negative memories, the frequency increases only slightly from 23.97% between ages 0 and 15 to 27.27% between ages 16 and 30, then decreases slightly to 22.31% between ages 31 and 35, and tapers off with age.

Although the complete script engagement perspective (based on a strong version of life script hypothesis) predicts that the distribution of surprising positive memories will not increase during the bump period, and the reverse script engagement perspective predicts that surprising negative memories will show an increase during the bump period, results from Studies 1 and 3 show that surprising positive memories are distributed

similarly to especially positive memories and the distribution of surprising negative memories is generally flat, similar to the distribution of especially negative memories. In Study 1, the distribution of college student memories between ages 8 and 18 showed an increase for surprising positive compared to surprising negative memories at ages 17 and 18. This pattern is almost identical to the pattern of especially positive and especially negative memories. In Study 2 we found that the distribution of college student predicted surprising positive memories increased sharply during the bump period whereas the distribution of predicted surprising negative memories increased less sharply during the bump period. More importantly, in Study 3 we found that the distribution of adult surprising positive memories increased sharply during the bump period whereas the distribution of adult surprising negative memories was relatively flat. Thus, neither the addition of surprise to a positive or to a negative memory prompt had any effect on the corresponding memory distributions, a finding inconsistent with both complete script disengagement and reverse script engagement predictions. These results are more consistent with the emotion driven search perspective, which predicts that a positive emotion cue first guides memory search to the period of life overrepresented by positive events, from which an individual then searches for a positive event with a surprising element. For this prediction to hold, however, we should find that surprising positive compared to especially positive memories refer to a positive transitional event with a surprising aspect, a topic I will return to after addressing the relationship between memory predictions and actual adult memories.

By definition, a life script is made up of highly normative events that most people in a given culture are either aware of or participate in (Berntsen & Rubin, 2004; Rubin &

Berntsen, 2003). Thus, in Study 2 we asked college students to describe either especially positive and negative or surprising positive and negative events that a hypothetical 80-year-old would recall from across his or her life. If a life script contributes to the organization and retrieval functions of autobiographical memory, then college student predictions of adult memory over the life span should be generally consistent with actual adult memories, both with respect to temporal distribution, as well as in the reference to culturally scripted events, and the latter should be most consistent for positive memories in the bump period. Content analysis of Study 2 data shows that, while memories predicted by college students were broadly consistent with actual memories provided by older adults in Study 3, there were several important differences. First, the distributions of especially positive and negative and surprising positive and negative predicted memories roughly mirror the corresponding adult distributions – both standard and surprising positive predicted memories show a reminiscence bump and the distributions of both standard and surprising negative predicted memory distributions are relatively flat, with the exception of a small increase in surprising negative memories during the bump period.

With regards to memory content, college students were less accurate in their predictions of older adult memories. The positive content categories predicted by college students captured less than half of adult memories and the correspondence between predicted positive categories and adult positive memories was lower than the correspondence between college student predicted negative categories and adult negative memories. First, for positive memories overall, slightly less than half of college students predicted either marriage or having a child, whereas, overall, only 3.09% of adult positive

memories referred to marriage and 8.88% referred to having a child. One of the mid-level positive categories predicted by college students, career or finance related events (9.60%), was the highest positive category for adults, referenced in 17.76% of memories. In addition, whereas college student predictions emphasized marriage (38.61%) and having a child (28.71%) for especially positive memories and engagement (10.31%) and learning of pregnancy for surprising positive memories (13.40%), adults referenced having a child equally across both conditions (especially positive = 8.26%, surprising positive = 9.42%), referenced marriage to only a slightly greater extent in their especially positive memories (especially positive = 6.61%, surprising positive = 0.00%), and almost never referenced engagement (especially positive = 0.83%, surprising positive = 2.17%) or learning of pregnancy (especially positive = 1.65%, surprising positive = 1.45%). However, adults did mention marriage more frequently for especially positive memories in the bump period (16.67%) relative to surprising positive memories in the bump period (0.00%) and college transition was mentioned more frequently for surprising positive memories in the bump period (10.42%) relative to especially positive memories in the bump period (0.00%). There were few other differences between especially positive and surprising positive memories in the bump period. For especially positive and surprising positive non-bump memories, there were also few differences – most either referenced career or finance related events (especially positive = 17.72%, surprising positive = 18.89%) or fell into a category not predicted by college students (especially positive = 64.56%, surprising positive = 64.44).

Based on the findings of Studies 1-3, it is difficult to support either the life script hypothesis or the emotion driven search perspective. The life script hypothesis correctly

predicts a reminiscence bump for positive memories, as well as a generally flat distribution for negative memories, but other findings are inconsistent with a life script account of the reminiscence bump. First, surprising positive and negative memories showed a highly similar temporal organization to those of especially positive and negative memories, respectively. Second, only half of adult positive and surprising positive memories referred to experiences predicted by college students, and adult memories only very rarely referenced the major events predicted by college students (marriage and having a child). Finally, with the exception of marriage, there were few differences between bump and non-bump period memories.

The results of Study 3 are mixed with respect to the emotion driven search predictions. Based on this perspective, we hypothesized that, similar to content categories predicted by college students in Study 2, adult surprising positive memories would reference surprising events directly related to major transitional or highly scripted events (i.e., engagement or learning of pregnancy). However, this prediction was not born out – only a very small percentage of adults referenced either engagement or learning of pregnancy. The only meaningful difference captured by our content analysis was a greater emphasis on marriage in especially positive bump period memories and a greater emphasis on college transitions in surprising positive bump period memories. It is unclear why college transitions (college acceptance, college graduation) would be overrepresented in surprising positive bump period memories relative to the other categories. College students predicted little difference in references to college transition between positive (4.94%) and surprising positive (6.68%) bump period memories. Although it was not included in our coding of Study 3, it may be that this category is

overrepresented in surprising relative to standard positive bump period memories because the central focus is on learning of college acceptance. A post hoc examination of the five surprising positive bump period memories referring to college transitions revealed that three referred to college acceptance. However, due to small sample size, it is difficult to make meaningful comparisons among subgroups of participants.

College acceptance is, however, a prominent content category in Study 1. If the relatively greater emphasis on college acceptance in surprising positive bump period memories from Study 3 is meaningful, then we should find, for college student memories between 8 and 18, a greater emphasis on college acceptance for surprising positive compared to especially positive memories at ages 17 and 18. However, our analysis reveals that college student especially positive memories (41.67%) more frequently reference college acceptance than do their surprising positive memories (23.08%). While there are fewer landmark references in surprising positive memories (30.23%) relative to especially positive memories (46.15%) overall, surprising positive memories only show a relatively greater emphasis on formal senior awards and formal senior social events compared to especially positive memories.

Although adults in Study 3 did not reference the surprising positive events predicted by college students in Study 2, adult surprising positive memories were more surprising than especially positive memories and, with the exceptions of marriage and college transition, the content of surprising positive memories was highly similar to the content of especially positive memories. Thus, with respect to the emotion driven search perspective, it appears that adults selected less clearly defined (in the sense that they were not predicted by college students) deviations from major scripted events. In sum then, the

findings for especially positive and surprising positive memories of Studies 1 through 3 are generally inconsistent with life script predictions and are mixed with respect to predictions based on an emotion driven search perspective.

While the content of negative memories is less central to an evaluation of the life script hypothesis, the life script does predict: (a) that negative events may be thematically scripted in the sense that most individuals are aware of and will experience such events (e.g., death of one's parent), but (b) thematically scripted negative events will not be tightly age-linked (e.g., accidents or disease) and thus will not be overrepresented in any period of life (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). These predictions were generally confirmed. The content of college student predictions for negative and surprising negative memories was more consistent with the content of actual adult negative and surprising negative memories relative to the consistency between predicted positive and actual positive memories. However, the emphasis on death in college student predictions was reflected to a lesser extent by the content of adult memories, and not including 'other', the majority of adult bump period memories referred to career or finance related events, accidents or diseases, other's death, and victimization or discrimination. While other differences emerged between standard and surprising negative memories overall, as well as across bump and non-bump periods, none of the content categories predicted by college students or generated empirically represent highly age-linked events (not including the Pearl Harbor attack or the Great Depression, neither of which was referenced in adult memories), and thus our findings regarding negative memories are consistent with both the life script hypothesis and the emotion driven search perspective.

In an effort to control for the influence of emotion cue (positive or negative) as well as the slightly positive valence of the prompt 'surprise' (Bradley & Lang, 1999; Rubin & Talarico, 2009; Talarico et al., 2004), Studies 4 and 5 more clearly separated expectedness from emotional valence by asking college students to predict and older adults to recall events that were highly expected and events that were highly unexpected. Participants rated valence only after describing each event. The life script hypothesis predicts that the majority of expected events and memories will be rated positive and the corresponding memory distributions will show classic reminiscence bumps. When expected events are separated by emotion rating, only the distribution of expected events and memories rated positive will show a reminiscence bump while the distribution of those rated negative will be relatively flat.

The results of Studies 4 and 5 confirm these predictions. The majority of college student predictions for expected events were rated positive and the distribution of these events showed a sharp peak during the bump period (81.12% of expected events were predicted to occur between ages 16 and 30). Similarly, the majority of adult memories for expected events were rated positive and the distribution of these memories showed a strong increase during the bump period, albeit less pronounced that that predicted by college students (45.30% of expected memories occurred between ages 16 and 30). When student predictions for expected events were separated based on emotion ratings, positive predicted events showed a classic reminiscence bump and negative predicted events were not overrepresented during any period of life. Similarly, for adults' actual expected memories, the distribution of positive memories showed a classic reminiscence bump and

the distribution of negative memories was relatively flat. Thus, findings regarding the distributions of expected events and memories are consistent with life script predictions.

With regards to unexpected events and memories, the life script hypothesis predicts that the majority will be rated negative and that the memory distributions will be relatively flat. Consistent with the first prediction, the majority of unexpected events and memories were rated negative. However, in marked contrast to life script predictions, the distribution of predicted unexpected events showed an increased frequency in the bump period (44.39% of unexpected events were predicted to occur between ages 16 and 30). More importantly, the distribution of adult unexpected memories also showed an increased frequency in the bump period (37.02% of unexpected memories occurred between ages 16 and 30), an increase only slightly less than that of adult expected memories. When unexpected events were separated based on emotion ratings, the distribution of positive predicted events showed a classic reminiscence bump (80.00% predicted to occur between ages 16 and 30) whereas the distribution of negative predicted events was relatively flat. Similarly, for adult unexpected memories, the distribution of positive memories showed a classic reminiscence bump (48.08% occur between ages 16 and 30) whereas the distribution of negative memories showed only a modest increase in the bump period (31.62% occur between ages 16 and 30). Thus, findings regarding the distributions of unexpected events and memories are inconsistent with life script predictions. In the absence of a positive emotion cue to direct memory search to adolescence and young adulthood, the distributions of unexpected events and memories show clear reminiscence bumps, particularly within positive unexpected events and memories.

With regards to the content of expected events and memories, the life script hypothesis predicts that the majority of expected events and memories rated positive, especially those in the bump period, will reflect culturally scripted events. In general, our findings were consistent with this prediction. In Study 4, almost 90.00% of expected positive events corresponded to a thematic content category whereas only about half of expected negative events corresponded to a thematic content category. In addition, over 90.00% of expected positive events were predicted to occur in the bump period. Within the bump period, 82.07% of expected positive events referred to marriage or to having a child. For expected positive memories not in the bump period, the majority referred to either becoming a grandparent or to 'other'. Thus, our findings for predicted expected events confirm predictions made by the life script hypothesis.

Findings related to adult memories for expected events (Study 5) were not as strong as predictions made by college students (Study 4), but are generally consistent with the life script hypothesis. Only 53.59% of adult expected memories corresponded to a category predicted by college students. However, of the adult memories that were captured by college student generated categories, the major events were marriage, having a child, death, and high school or college transition. When expected memories were examined according to whether they occur in the bump period, the major bump period events included marriage, having a child, and high school or college transition, whereas the major non-bump period events included death, having a child, 'other', and marriage. When only positive bump and non-bump period memories were examined, we found the same pattern with the exception that death was no longer a major category for non-bump period memories. Thus, while findings for expected memories are not as strong as those

predicted by college students, they are in general agreement with life script predictions that these memories refer to highly age linked scripted events, particularly for positive memories in the bump period.

As previously noted, the majority of unexpected events and memories were rated negative, confirming life script predictions. The life script also predicts that, within negative unexpected memories, there may be thematic overlap, but thematically related memories will not be tied to a narrow age range (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). In addition, because a positive emotion cue was not included in the memory prompt (which, according to the life script hypothesis, is necessary to guide memory search to late adolescence and young adulthood where positive events are overrepresented), the life script hypothesis predicts that unexpected events and memories rated as positive will not refer to highly scripted events.

In Study 4, over half of unexpected events predicted by college students referred to death or accidents and disease (parent's death, spouse's death, child's death, or death of other). However, events related to having a child and marriage were also present, accounting for 10.99% and 7.85% of unexpected events, respectively. In addition, less than half of unexpected events were predicted to occur in the bump period. Within the bump period, 34.88% referred to death or accidents and disease, 24.42% referred to having a child, and 12.79% referred to marriage, whereas within non-bump period events, 67.61% referred to death or accidents and disease, 0.00% referred to having a child, and 3.81% referred to marriage. Comparison of positive and negative unexpected events revealed that positive events referred exclusively to marriage, having a child, 'other', and

career or finance, whereas negative events referred primarily to death or accidents and disease (66.89%).

For negative unexpected events in the bump period, college student predictions emphasized parent's death and having a child, whereas predictions for the non-bump period emphasized spouse's death, child's death, and accidents and disease. Thus, even within negative unexpected events, bump period predicted memories more often referenced events related to childbirth, a highly scripted event, when compared to non-bump period predicted memories. The majority of these events related to having a child referred to unexpected or unplanned pregnancies and not a violation of an expected scripted event (which would be necessary to constitute evidence for the reverse script engagement hypothesis). The remaining unexpected negative content categories, while thematically distinct, do not reflect temporally scripted events, and thus, our results for the predicted content of unexpected negative memories is consistent with life script predictions.

Similar to college student predictions, adult memories of unexpected negative events emphasized death (parent and other) and accidents or disease (for accidents or disease and death not the result of war, these events were referenced in 47.85% of adult unexpected negative memories). However, adults rarely reported memories of either a spouse's or a child's death and adults more frequently reported memories of career or finance related events as well as victimization or discrimination, the latter not predicted by college students. Again, similar to college student predictions, adult memories of negative unexpected events in the bump period emphasized parent's death, other's death, and accidents or disease. However, adults rarely reported having a child and more

frequently reported events related to career or finance as well as the Vietnam War, the latter not predicted by college students. Finally, adult memories of unexpected negative events not in the bump period emphasized other's death, accidents or disease, and career or finance to an extent similar to college student predictions. However, adults rarely reported memories of either a spouse's or a child's death and adults more frequently reported memories of a parent's death, career or finance, marriage, as well as victimization or discrimination. Overall though, excluding adult unexpected negative memories related to the Vietnam War in the bump period and those related to marriage in the non-bump period, the large majority of adult memories referred to thematically distinct, but non age-linked events and these findings were in general agreement with college student predictions and consistent with life script predictions.

For positive unexpected events in the bump period, college student predictions only emphasized events related to marriage, having a child, 'other', and career or finance. For positive unexpected events not in the bump period, college student predictions emphasized only events related to 'other', career or finance, and marriage. Thus, when asked to predict a highly unexpected event that a hypothetical 80-year-old would recall, in the absence of a positive cue, those college students who did predict positive events often described highly scripted events, a result inconsistent with predictions drawn from the life script hypothesis.

College student predictions of adult unexpected memories captured roughly two thirds of actual adult memories. The major college student predicted categories for unexpected positive events were marriage, having a child, 'other', and career or finance, and the major adult unexpected positive memory categories were career or finance,

marriage, and accidents or disease (in this case, near misses or illness recovery). For unexpected positive memories falling in the bump period, adults emphasized events related to career or finance, marriage, and having a child (identical, except by degree, to college student predictions for the bump period), and accidents or disease was no longer a major category. For unexpected positive memories not falling in the bump period, adults emphasized events related to career or finance, marriage, and accidents or disease (in this case, highly consistent to college student predictions with the exception of accidents and disease, which was not represented in college student predictions). Similar to the findings for college student predictions for positive unexpected events, when asked to report a highly unexpected event from any point across the life span, in the absence of a positive cue, adults who did report positive memories frequently described highly scripted events, particularly for memories falling in the bump period. These finding are inconsistent with both the life script hypothesis as well as the emotion driven search perspective.

In sum, the findings of the current research are generally consistent with a life script account of the reminiscence bump for the temporal distributions and thematic content of especially positive, especially negative, surprising negative, and highly expected college student predictions and adult memories, as well as college student predictions of surprising positive memories and the overall positive and negative ratings of expected and unexpected events and memories. Mixed with respect to emotion driven search predictions are findings for adult surprising positive memories. Not consistent with either the life script account of the reminiscence bump or the emotion driven search perspective are the temporal distributions and thematic content of highly unexpected and positive highly unexpected college student predictions and adult memories. Contrary to

predictions derived from the life script hypothesis as well as the emotion driven search perspective, unexpected positive memories produce a classic reminiscence bump. When asked for highly unexpected events or memories, in the absence of a positive cue, participants who do predict or report positive events draw heavily on highly positive scripted events.

Findings presented in the current research are also difficult to reconcile with alternative theories of the reminiscence bump. As discussed in the introduction, the cognitive and identity theoretical perspectives do not directly predict differences in the distributions of positive and negative memories (Berntsen & Rubin, 2004), a finding that has been consistently reported and is replicated here. However, the possibility that distributions of positive and negative memories across the life span simply reflect the actual distributions of subjectively experienced positive and negative events appears to warrant further consideration. Berntsen and Rubin (2004) argue that if the distribution of adult memories over the life span accurately reflects peoples' subjective experiences, then we should find reminiscence bumps for both positive and negative memories as the evidence they present suggests that the incidence of both positive and negative events is highest during adolescence and young adulthood. Other research suggests that people perceive more events in their lives to be positive than negative and that the affective intensity of negative events fades faster than the affective intensity of positive events (fading affect bias; Holmes, 1970; Walker, Skowronski, & Thompson, 2003), particularly when an individual perceives a negative event as atypical within his or her life (Ritchie et al., 2006). These biases contribute to a larger pool of highly accessible positive autobiographical memories. It remains unclear, however, why a fading affect bias for

negative memories would result in an overrepresentation of positive memories in adolescence and young adulthood. It may be that positive events experienced during this time period have a stronger long-term impact on an individual's general life trajectory. The transition to college or work, getting married, or having a child are all events that affect the direction of one's life long after the original event has taken place, and are frequently thought about and talked about. Negative events that would likely have a long-term impact on ones life trajectory are often ones that are most unpredictable and are therefore least associated with a particular time period (e.g., death of a loved one, permanent injury from a automobile accident).

Although these results are inconsistent with the life script hypothesis and are mixed with respect to the emotion driven search perspective, they do not rule out such accounts. One possibility is that when an adult is asked to report either an expected or unexpected memory from across the life span, in the absence of an emotion cue the person makes an explicit or conscious choice to search for either a positive or negative memory, thereby "self-cuing" an emotion driven search that contributes to the reminiscence bump. That is, the possibility that autobiographical memory is organized according to valence and that emotionally positive memories benefit from a cultural life script cannot be dismissed without additional evidence about the process by which adults search autobiographical memory. This possibility could be explored by using a "think-aloud" methodology (Whitten & Leonard, 1981) in which adults are given expected and unexpected memory prompts and asked to narrate their ongoing memory selection processes.

A second possible avenue for future research focuses on the methodology commonly used to study the reminiscence bump in autobiographical memory. The present series of studies suggest that the way in which adults are asked to report autobiographical memories (detail and number) influences memory retrieval. As previously suggested, asking adults for very brief descriptions of multiple memories may encourage them to engage a life script, resulting in memories for highly typical events and leading to an overrepresentation of memories from adolescence and young adulthood. In contrast, asking for highly detailed descriptions of single memories may free adults from the constraints of a life script. One way to examine this question is to systematically vary the methods used to elicit adult memories (detail of memory description and number of memories described) within the same study. One could then compare memory distributions and content for single memories versus multiple memories, high versus low detail, as well as examine how memory distributions and content change as a function of the order in which events are recounted – that is, whether one's first 'most' positive memory is similar to one's fifth 'most' positive memory.

In conclusion, the frequently replicated finding that memories of positive life events are overrepresented in late adolescence and early adulthood is robust, but the reminiscence bump for positive life events does not appear to require the activation of a cultural life script. Although the indirect influence of a life script is not ruled out by the present findings, the more parsimonious explanation is that our memories are distributed over time according to our subjective experiences of events. The onus is thus on advocates of the life script hypothesis to more fully demonstrate its central and essential role in the organization of autobiographical memory. As Roger Waters of Pink Floyd

sang, it may simply be that "the memories of a man in his old age are the deeds of a man in his prime" (1972).

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APPENDICES

APPENDIX A: TABLES

Table 1
Study 1 landmark categories by memory prompt

	Standard		Surprising	
Landmark Category	Positive	Negative	Positive	Negative
Proportion landmark	46.15%	3.45%	30.23%	10.00%
College acceptance	41.67%	100.0%	23.08%	100.00%
High school graduation	33.33%	0.00%	23.08%	0.00%
Formal senior award	12.50%	0.00%	23.08%	0.00%
Other	8.33%	0.00%	0.00%	0.00%
Formal senior social event	4.17%	0.00%	15.38%	0.00%

Table 2

Study 2 positive content categories for bump and non-bump periods

	Bump Period (16-30 years)		Non-Bump Period	
Category	Standard	Surprising	Standard	Surprising
n	81	59	20	38
Marriage	48.15%	15.25%	0.00%	0.00%
Having child	30.86%	11.86%	20.00%	0.00%
College transition	4.94%	6.78%	0.00%	0.00%
Career or financial advance	4.94%	5.08%	20.00%	21.05%
Other	3.70%	13.56%	30.00%	39.47%
Meeting significant other	3.70%	10.17%	0.00%	2.63%
War resolution or reunion	2.47%	3.39%	5.00%	2.63%
Proposal or engagement	1.23%	16.95%	0.00%	0.00%
Learning of pregnancy	0.00%	16.95%	0.00%	7.89%
Grandchild	0.00%	0.00%	25.00%	26.32%

Table 3

Study 2 negative content categories for bump and non-bump periods

	Bump Period (16-30 years)		Non-Bump Period	
Category	Standard	Surprising	Standard	Surprising
n	20	33	81	64
Other death	20.00%	15.15%	9.88%	9.38%
Parent death	15.00%	18.18%	37.04%	14.06%
Other	15.00%	15.15%	3.70%	7.81%
War	15.00%	12.12%	6.17%	1.56%
Victimization or discrimination	10.00%	6.06%	3.70%	4.69%
Pearl Harbor attack	5.00%	12.12%	0.00%	3.13%
Accident or disease	5.00%	9.09%	6.17%	14.06%
Career or financial difficulty	5.00%	6.06%	4.94%	7.81%
Relationship difficulty	5.00%	6.06%	3.70%	10.94%
Great depression	5.00%	0.00%	2.47%	4.69%
Spouse death	0.00%	0.00%	22.22	21.88%

Table 4

Study 3 positive content categories for bump and non-bump periods

	Bump Period (16-30 years)		Non-Bump Period	
Category	Standard	Surprising	Standard	Surprising
PREDICTED				
n	42	48	79	90
Other	26.19%	33.33%	64.56%	64.44%
Having child	19.05%	20.83%	2.53%	3.33%
Career or financial advance	16.67%	16.67%	17.72%	18.89%
Marriage	16.67%	0.00%	1.27%	0.00%
Meeting significant other	11.90%	12.50%	7.59%	5.56%
War resolution or reunion	4.76%	0.00%	0.00%	0.00%
Proposal or engagement	2.38%	6.25%	0.00%	0.00%
Learning of pregnancy	2.38%	0.00%	1.27%	2.22%
College transition	0.00%	10.42%	2.53%	3.33%
Grandchild	0.00%	0.00%	2.53%	2.22%
ADDITIONAL (within 'other' category)				
n	11	16	51	58
Non-romantic relationship	36.36%	6.25%	21.57%	20.69%
Life lesson/character development	27.27%	31.25%	15.69%	22.41%
Personal accomplishment	9.09%	25.00%	21.57%	15.52%
Long trip or vacation	9.09%	6.25%	9.80%	3.45%
Celebration	9.09%	0.00%	5.88%	13.79%
Accident or disease recovery	9.09%	0.00%	5.88%	5.17%
Other	0.00%	25.00%	19.61%	12.07%
Academic achievement	0.00%	6.25%	0.00%	5.17%
Retirement	0.00%	0.00%	0.00%	1.72%

Table 5

Study 3 negative content categories for bump and non-bump periods

	Bump Period (16-30 years)		Non-Bump Period	
Category	Standard	Surprising	Standard	Surprising
PREDICTED				
n	33	29	88	109
Other	33.33%	27.59%	15.91	22.94%
Career or financial difficulty	18.18%	13.79%	18.18%	17.43%
Accident or disease	12.12%	10.34%	9.09%	28.44%
Other death	9.09%	17.24%	12.50%	6.42%
Relationship difficulty	9.09%	6.90%	13.64%	7.34%
War	9.09%	0.00%	2.27%	0.92%
Parent death	6.06%	6.90%	11.36%	2.75%
Victimization or discrimination	3.03%	17.24%	15.91%	9.17%
Spouse death	0.00%	0.00%	1.14%	4.59%
Great depression	0.00%	0.00%	0.00%	0.00%
Pearl Harbor attack	0.00%	0.00%	0.00%	0.00%
ADDITIONAL (within 'other' category)				
n	11	8	14	25
Non-romantic relationship	36.36%	6.90%	14.29%	48.00%
Academic difficulty	27.27%	3.45%	0.00%	4.00%
Personal disappointment	18.18%	3.45%	21.43%	8.00%
Other	9.09%	3.45%	14.29%	24.00%
Arrest or legal difficulty	9.09%	0.00%	7.14%	4.00%
Life lesson/character development	0.00%	10.34%	21.43%	8.00%
Parental relationship difficulty	0.00%	0.00%	21.43%	4.00%

Table 6

Study 4 expected content categories for bump and non-bump periods by valence rating

	Bump Period (16-30 years)		Non-Bump Period	
Category	Positive	Negative	Positive	Negative
n	145	11	15	17
Marriage related	65.52%	18.18%	6.67%	0.00%
Having child	16.55%	9.09%	0.00%	0.00%
High School or college transition	8.97%	9.09%	0.00%	0.00%
Other	7.59%	27.27%	40.00	58.82%
World War II related	1.38%	27.27%	0.00%	0.00%
Death	0.00%	9.09%	0.00%	41.18%
Grandchild	0.00%	0.00%	53.33%	0.00%

Table 7

Study 4 unexpected content categories for bump and non-bump periods by valence rating

	Bump Period (16-30 years)		Non-Bump Period	
Category	Positive	Negative	Positive	Negative
n	32	54	8	97
Having child	34.38%	18.52%	0.00%	0.00%
Marriage related	34.38%	0.00%	12.50%	3.09%
Other	21.88%	14.81%	50.00%	9.28%
Career or financial related	9.38%	0.00%	37.50%	7.22%
Accident or disease	0.00%	20.37%	0.00%	28.87%
Other death	0.00%	14.81%	0.00%	10.31%
Parent death	0.00%	12.96%	0.00%	6.19%
Child death	0.00%	7.41%	0.00%	14.43%
World War II related	0.00%	7.41%	0.00%	4.12%
JFK assassination	0.00%	3.70%	0.00%	3.09%
Spouse death	0.00%	0.00%	0.00%	13.40%

Table 8

Study 5 expected content categories for bump and non-bump periods (neutral included)

Category	Bump Period (16-30 years)	Non-Bump Period
PREDICTED CATEGORIES		
n	164	198
Other	33.54%	57.07%
Marriage related	25.00%	9.60%
Having child	22.56%	12.12%
High School or college transition	14.02%	3.03%
Death	3.66%	15.15%
World War II related	1.22%	1.52%
Grandchild	0.00%	1.52%
ADDITIONAL CATEGORIES (within 'other' category)		
n	55	113
Career or financial	34.55%	19.47%
Personal accomplishment/disappointment	27.27%	15.04%
Other	9.09%	19.47%
Long trip or vacation	9.09%	10.62%
Vietnam War related	7.27%	0.88%
Accident or disease	5.45%	8.85%
Non-romantic relationship	3.64%	6.19%
Life lesson or character development	3.64%	2.65%
Celebration or rite	0.00%	11.50%
Retirement	0.00%	5.31%

Table 9
Study 5 unexpected content categories for bump and non-bump periods (neutral included)

Category	Bump Period (16-30 years)	Non-Bump Period
PREDICTED CATEGORIES		
n	134	228
Other	40.30%	32.89%
Career or financial related	14.18%	10.96%
Accident or disease	11.94%	25.88%
Marriage related	8.21%	8.33%
Other death	7.46%	6.14%
Having child	7.46%	1.75%
Parent death	6.72%	7.02%
World War II related	1.49%	0.88%
Child death	0.75%	3.07%
JFK assassination	0.75%	1.75%
Spouse death	0.75%	1.32%
ADDITIONAL CATEGORIES (within 'other' category)		
n	54	75
Life lesson or character development	18.52%	5.33%
Non-romantic relationship	14.81%	17.33%
Vietnam War related	14.81%	0.00%
Other	11.11%	21.33%
Victimization or discrimination	9.26%	22.67%
High school or college transition	9.26%	0.00%
Personal accomplishment/disappointment	7.41%	12.00%
Academic achievement/failure	5.56%	2.67%
Romantic relationship	5.56%	1.33%
Long trip or vacation	3.70%	4.00%
9/11 terrorist attacks	0.00%	8.00%
Parental relationship	0.00%	5.33%

Table 10

Study 5 expected content categories for bump and non-bump periods by valence rating

	Bump Period (16-30 years)		Non-Bump Period	
Category	Positive	Negative	Positive	Negative
PREDICTED				
n	137	19	138	54
Other	32.85%	47.37%	62.32%	44.44%
Marriage related	28.47%	0.00%	9.42%	9.26%
Having child	24.09%	15.79%	17.39%	0.00%
High School or college transition	13.14%	21.05%	3.62%	0.00%
Death	0.73%	15.79%	4.35%	44.44%
World War II related	0.73%	0.00%	1.45%	1.85%
Grandchild	0.00%	0.00%	1.45%	0.00%
ADDITIONAL (within 'other' category)				
n	45	9	86	24
Career or financial	40.00%	11.11%	19.77%	20.83%
Accomplishment/disappointment	31.11%	11.11%	15.12%	16.67%
Long trip or vacation	11.11%	0.00%	12.79%	0.00%
Other	6.67%	22.22%	22.09%	12.50%
Vietnam War related	4.44%	11.11%	0.00%	4.17%
Non-romantic relationship	4.44%	0.00%	5.81%	8.33%
Life lesson/character development	2.22%	11.11%	3.49%	0.00%
Accident or disease	0.00%	33.33%	2.33%	25.00%
Celebration or rite	0.00%	0.00%	11.63%	12.50%
Retirement	0.00%	0.00%	6.98%	0.00%

Table 11

Study 5 unexpected content categories for bump and non-bump periods by valence rating

	Bump Period (16-30 years)		Non-Bump Period	
Category	Positive	Negative	Positive	Negative
PREDICTED				
n	50	74	54	160
Other	48.00%	37.84%	42.59%	27.50%
Career or financial related	20.00%	12.16%	20.37%	8.75%
Marriage related	14.00%	5.41%	12.96%	7.50%
Having child	12.00%	5.41%	3.70%	0.63%
Accident or disease	4.00%	13.51%	16.67%	28.13%
World War II related	2.00%	0.00%	1.85%	0.63%
Parent death	0.00%	12.16%	0.00%	10.00%
Other death	0.00%	9.46%	0.00%	8.75%
Spouse death	0.00%	1.35%	1.85%	1.25%
Child death	0.00%	1.35%	0.00%	4.38%
JFK assassination	0.00%	1.35%	0.00%	2.50%
ADDITIONAL (within 'other' category)				
n	24	28	23	44
Life lesson/character development	20.83%	14.29%	8.70%	4.55%
Non-romantic relationship	16.67%	14.29%	21.74%	15.91%
Romantic relationship	16.67%	3.57%	4.35%	0.00%
High school or college transition	12.50%	7.14%	0.00%	0.00%
Vietnam War related	8.33%	21.43%	0.00%	0.00%
Other	8.33%	10.71%	30.43%	15.91%
Accomplishment/disappointment	8.33%	7.14%	17.39%	9.09%
Academic achievement/failure	8.33%	3.57%	4.35%	2.27%
Long trip or vacation	8.33%	0.00%	4.35%	2.27%
Victimization or discrimination	0.00%	17.86%	0.00%	34.09%
Parental relationship	0.00%	0.00%	8.70%	4.55%
9/11 terrorist attacks	0.00%	0.00%	0.00%	11.36%

APPENDIX B: FIGURES

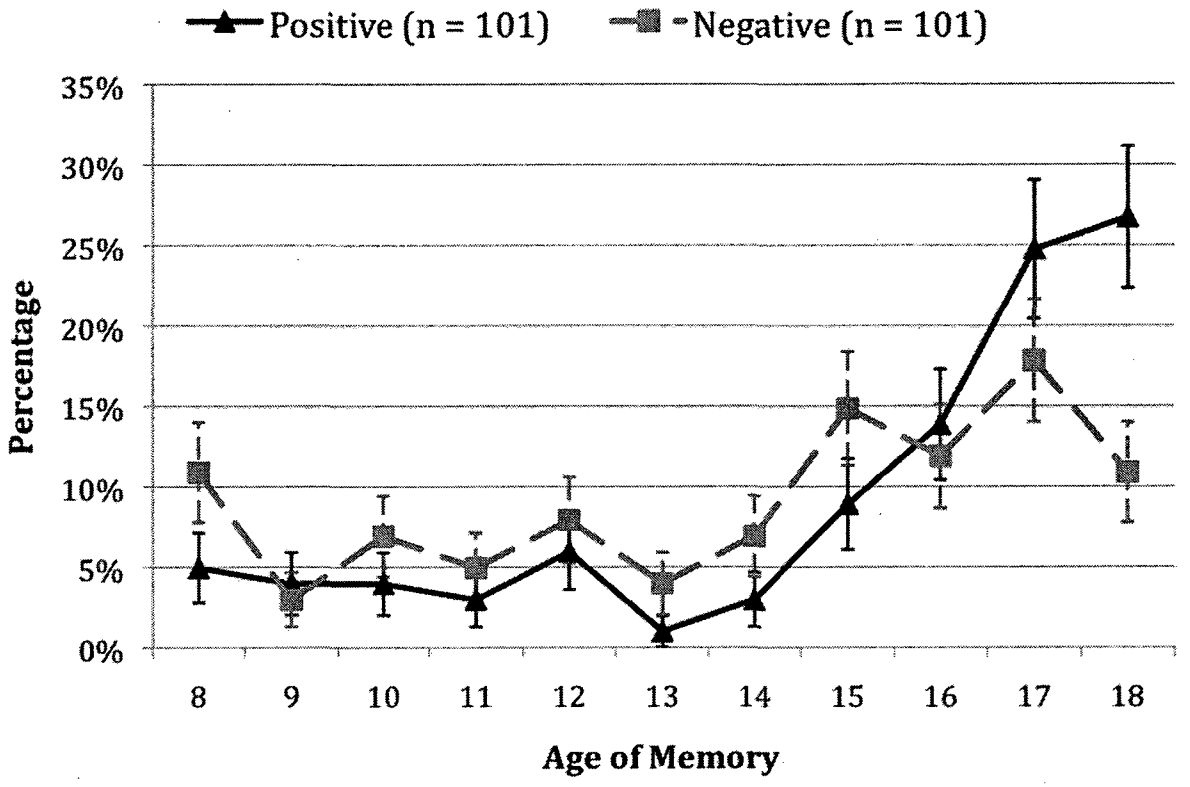

Figure 1. Age distributions of positive and negative memories between the ages of 8 and 18 for college students (Study 1). Error bars represent standard errors.

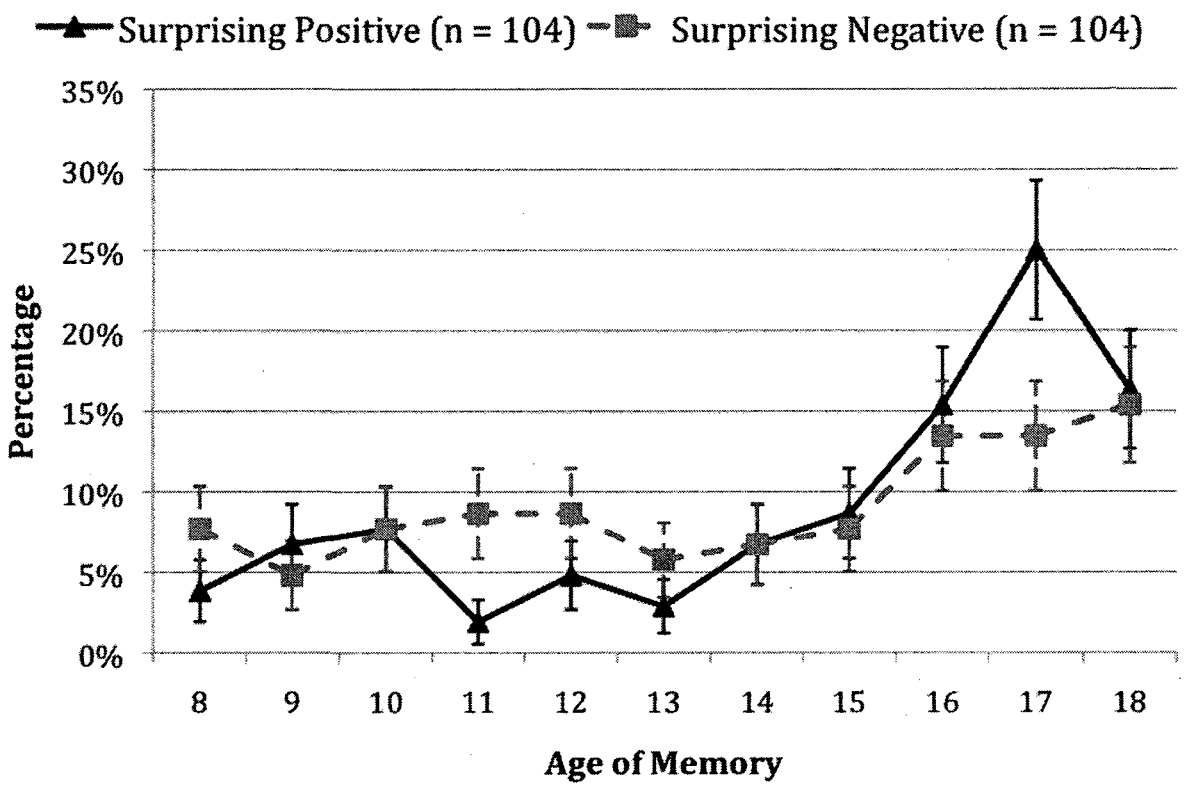

Figure 2. Age distributions of surprising positive and surprising negative memories between the ages of 8 and 18 for college students (Study 1). Error bars represent standard errors.

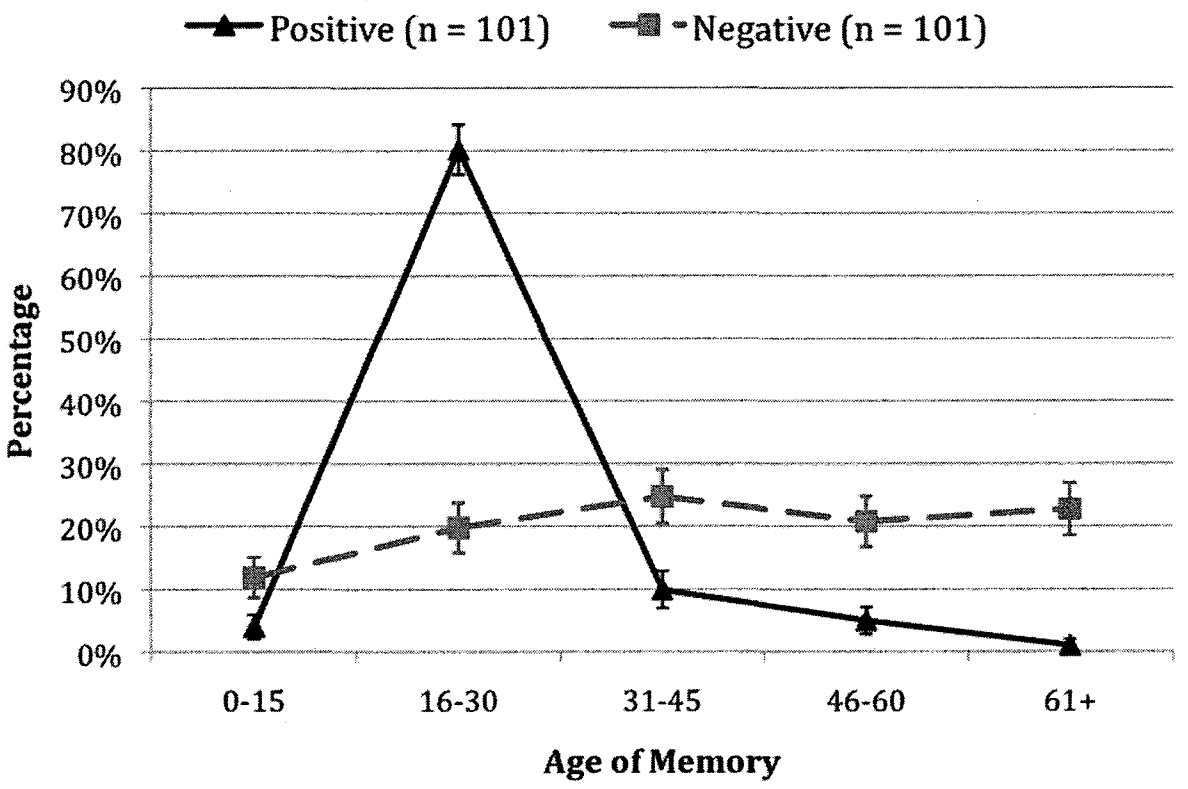

Figure 3. Age distributions of positive and negative memories across the lifespan as predicted by college students (Study 2). Error bars represent standard errors.

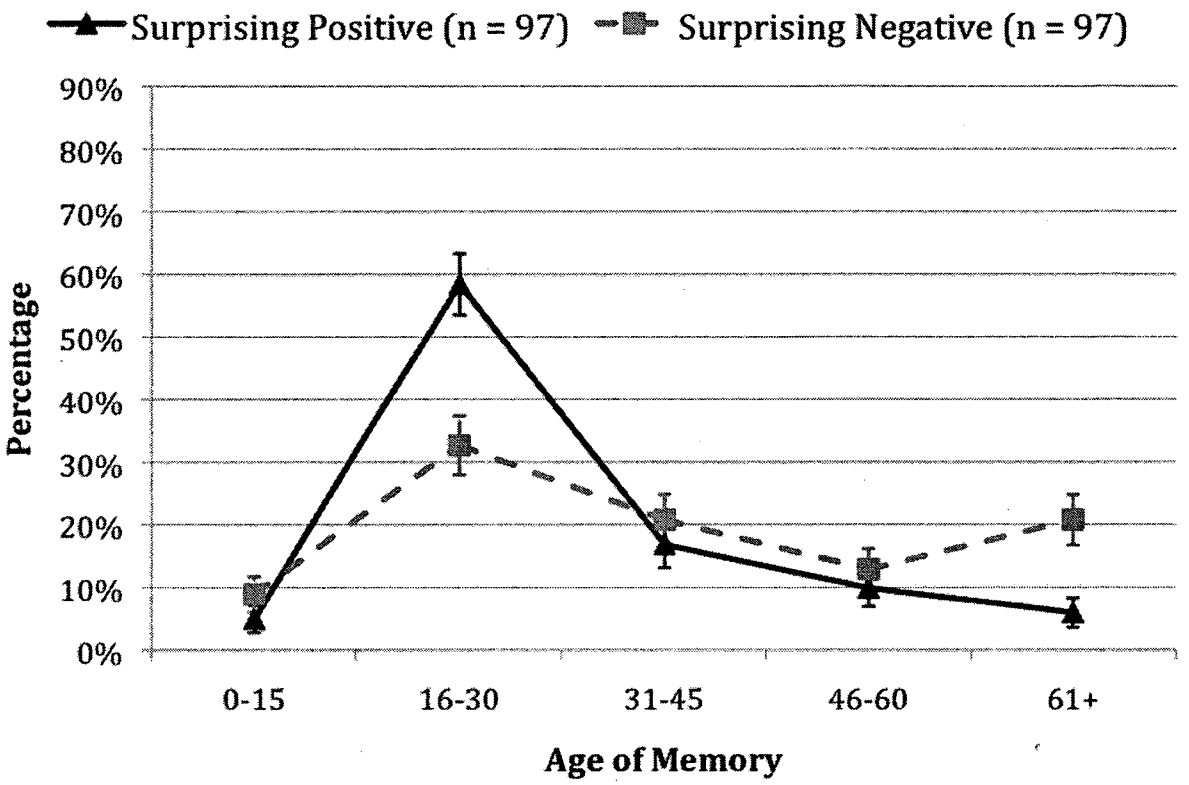

Figure 4. Age distributions of surprising positive and surprising negative memories across the lifespan as predicted by college students (Study 2). Error bars represent standard errors.

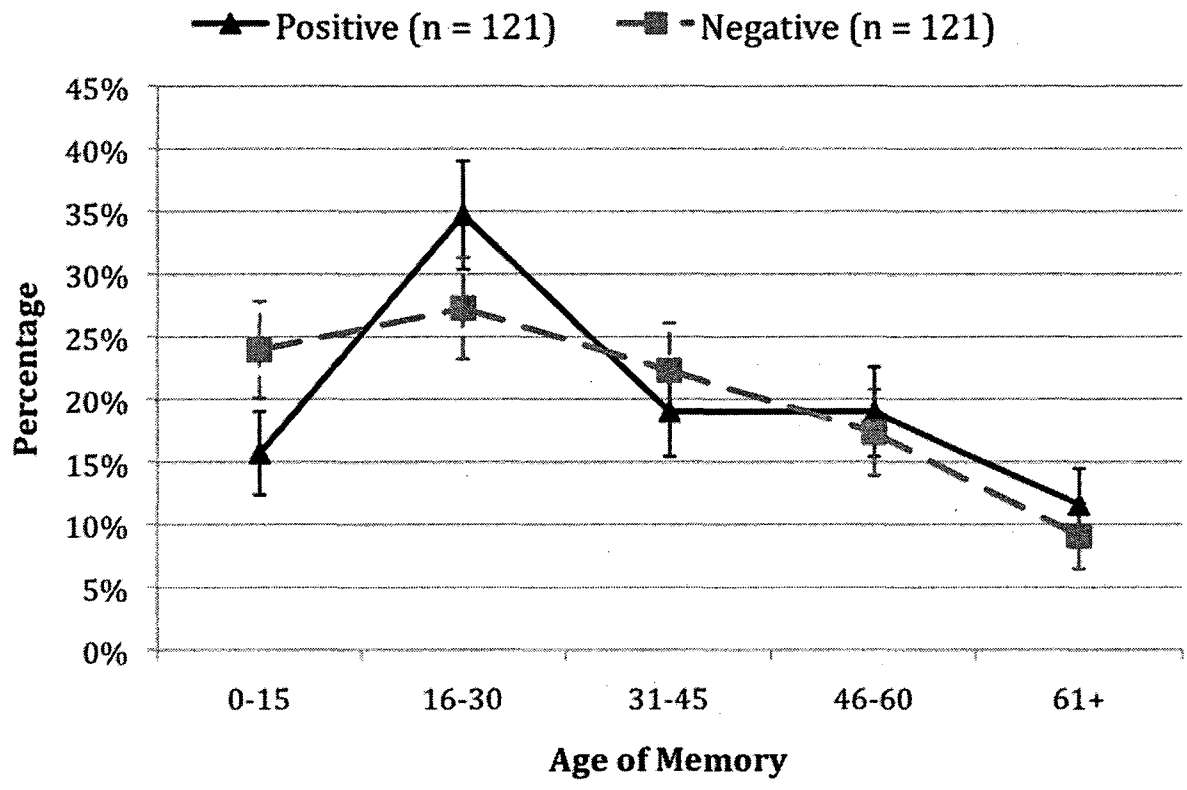

Figure 5. Age distributions of positive and negative memories across the lifespan for older adults (Study 3). Error bars represent standard errors.

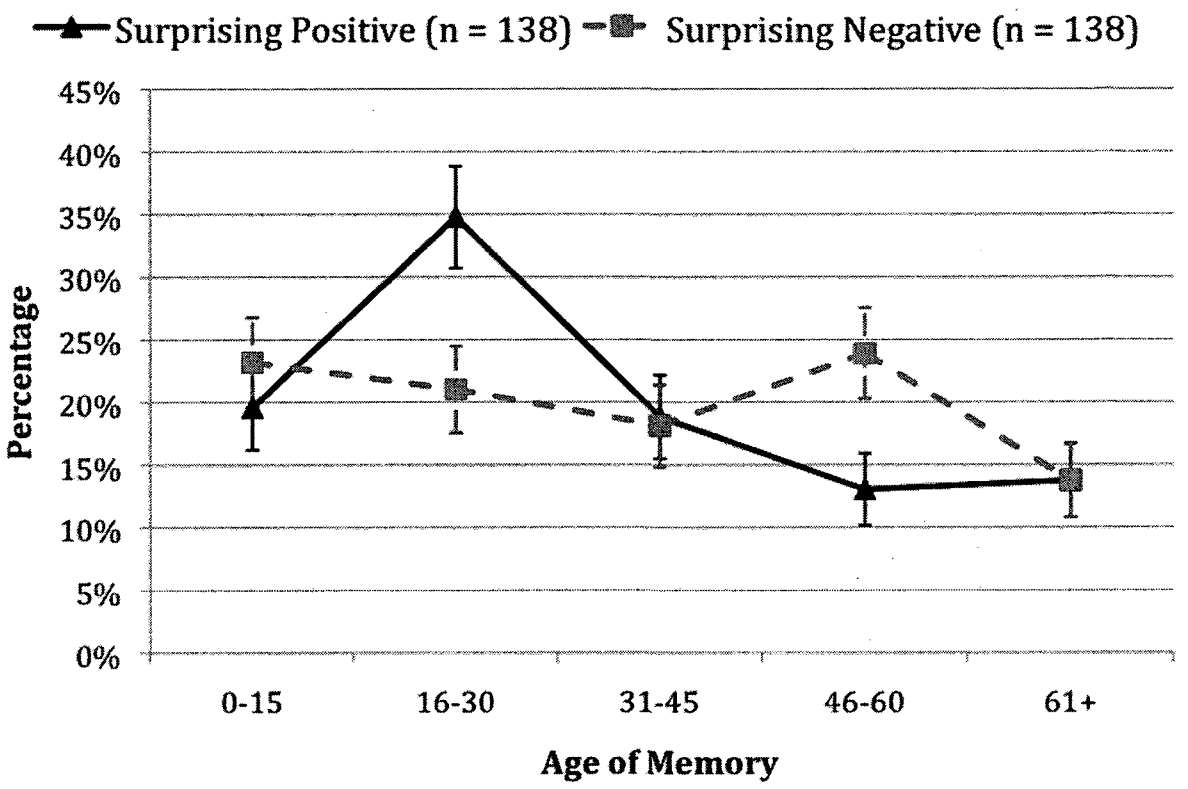

Figure 6. Age distributions of surprising positive and surprising negative memories across the lifespan for older adults (Study 3). Error bars represent standard errors.

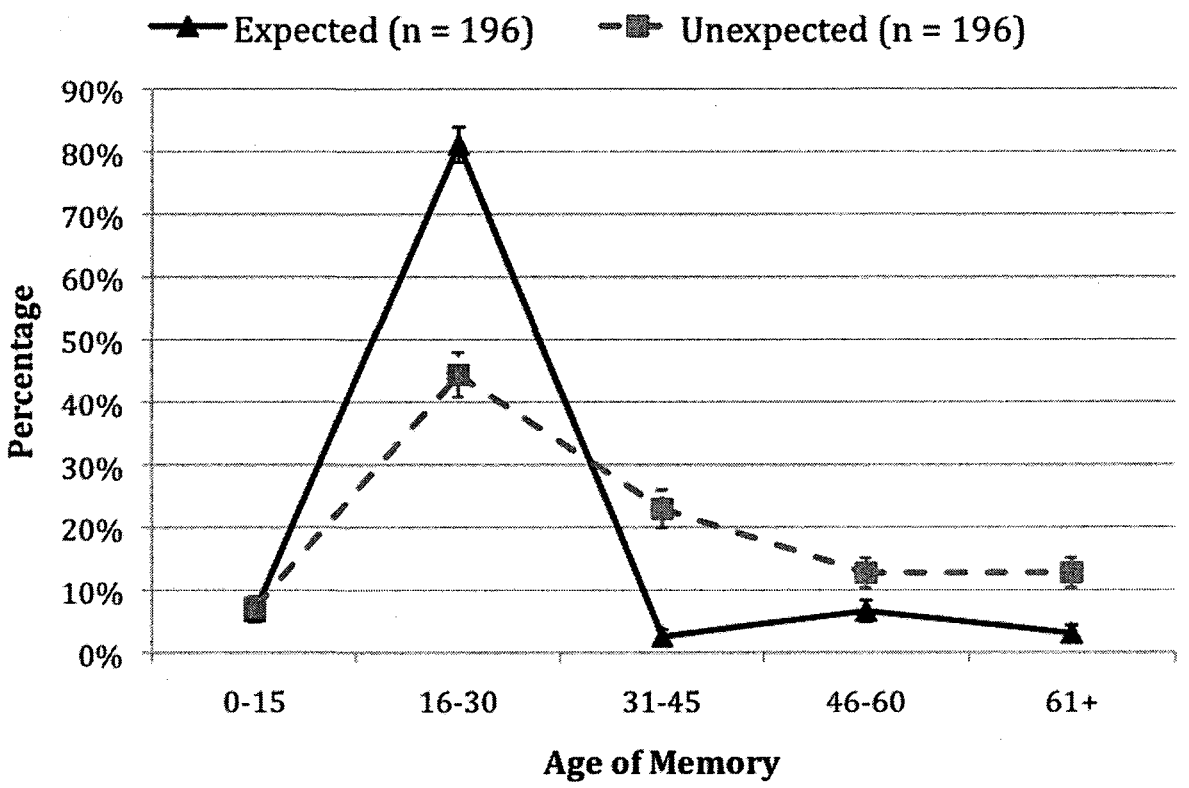

Figure 7. Age distributions of expected and unexpected memories across the lifespan as predicted by college students (Study 4). Error bars represent standard errors.

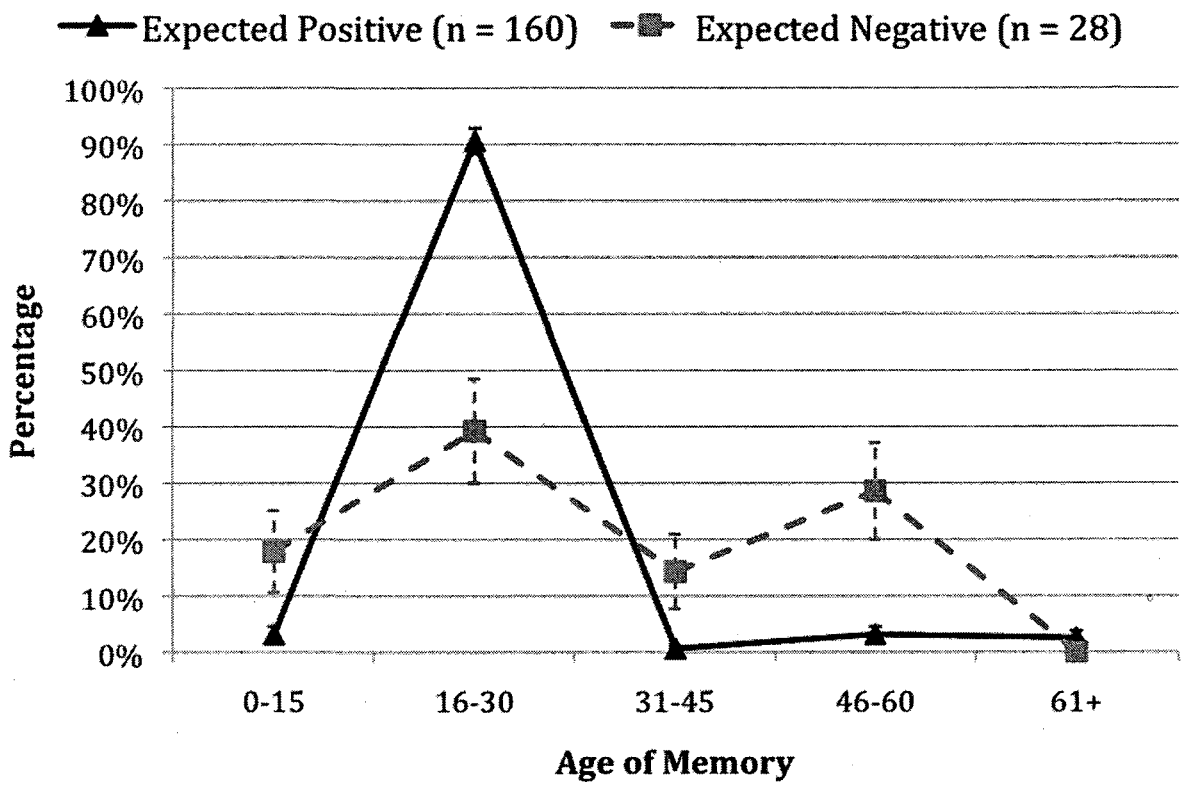

Figure 8. Age distributions of expected positive and negative memories across the lifespan as predicted by college students (Study 4). Error bars represent standard errors.

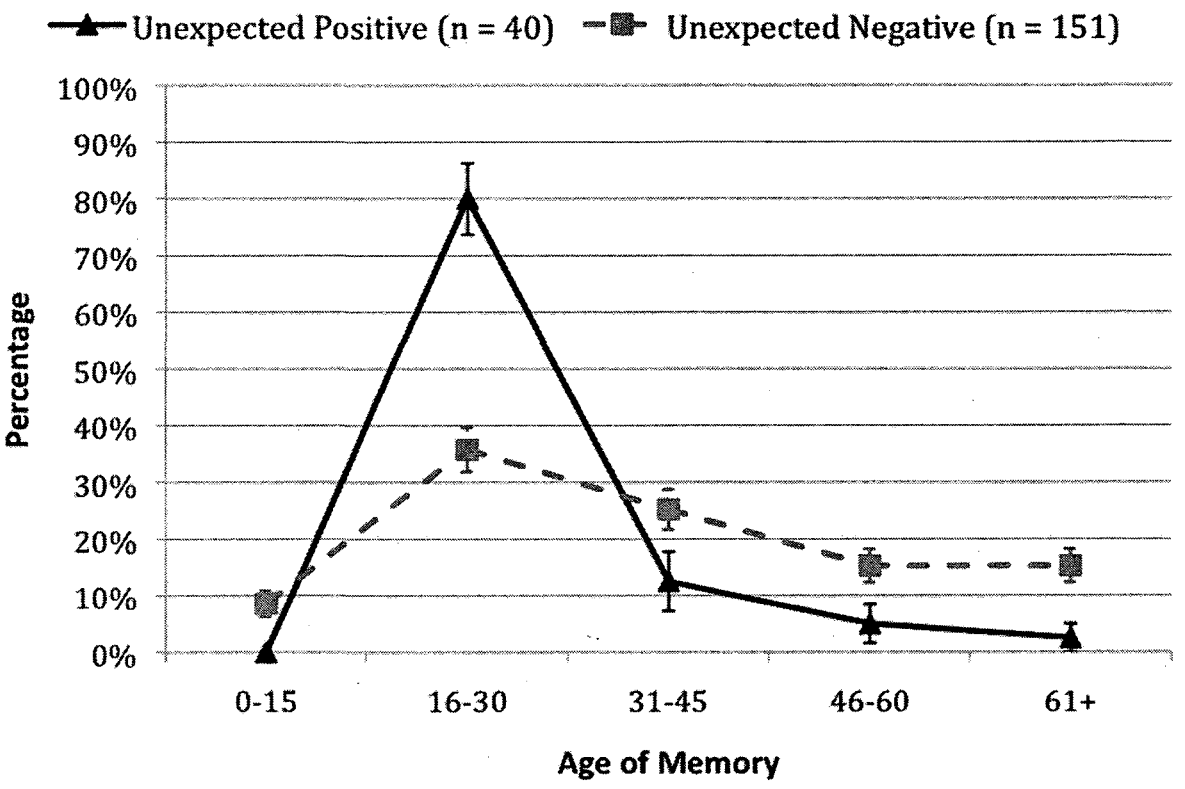

Figure 9. Age distributions of unexpected positive and negative memories across the lifespan as predicted by college students (Study 4). Error bars represent standard errors.

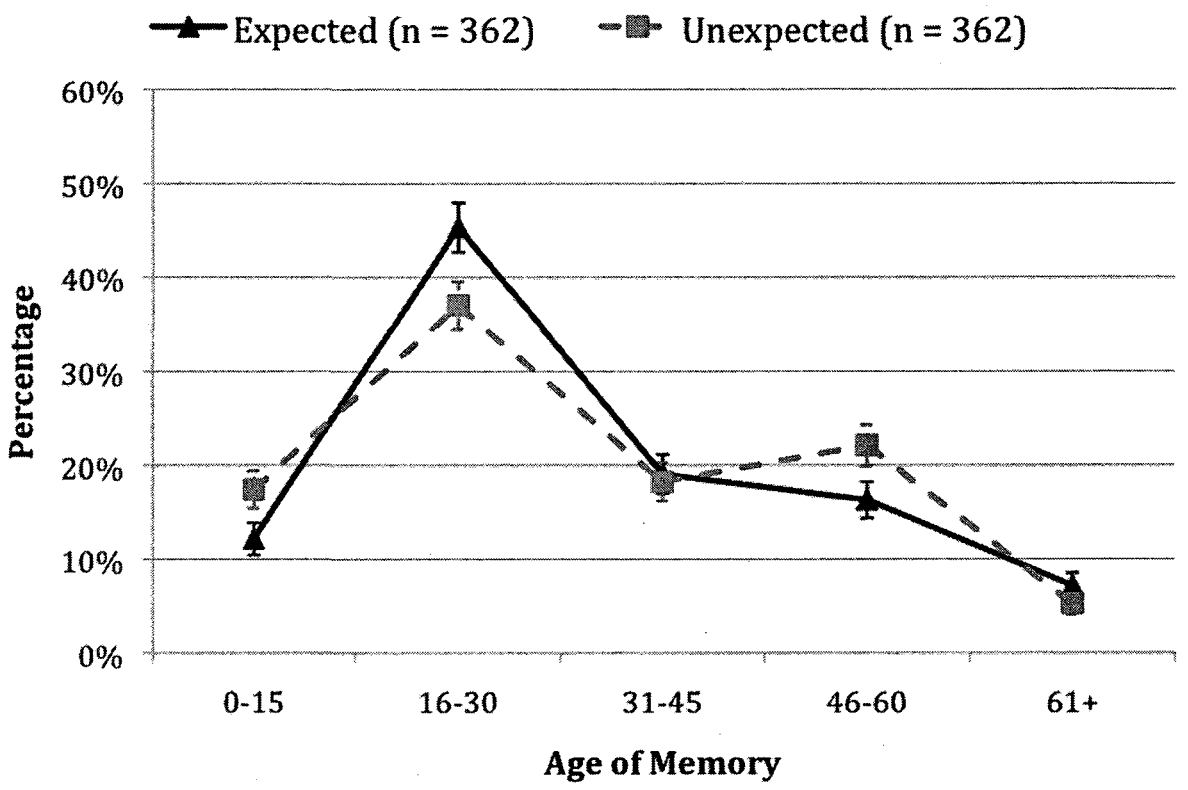

Figure 10. Age distributions of expected and unexpected memories across the lifespan for older adults (Study 5). Error bars represent standard errors.

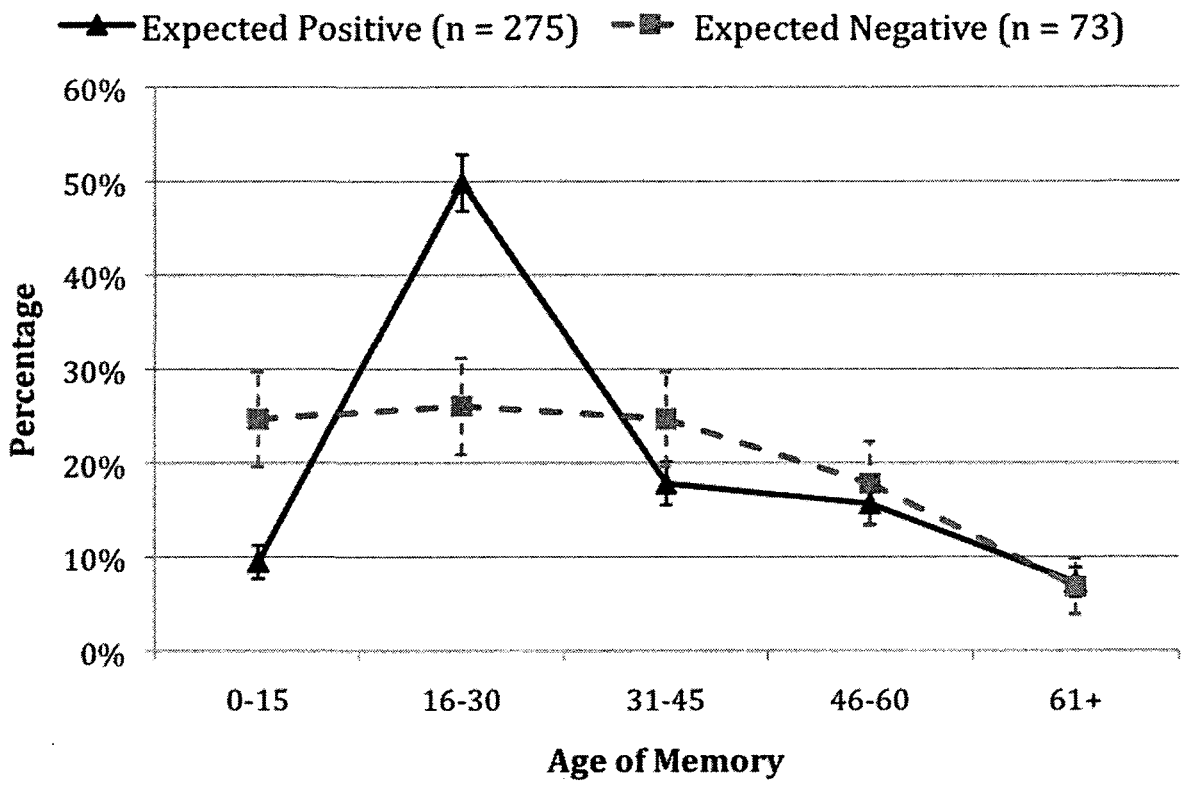

Figure 11. Age distributions of expected positive and negative memories across the lifespan for older adults (Study 5). Error bars represent standard errors.

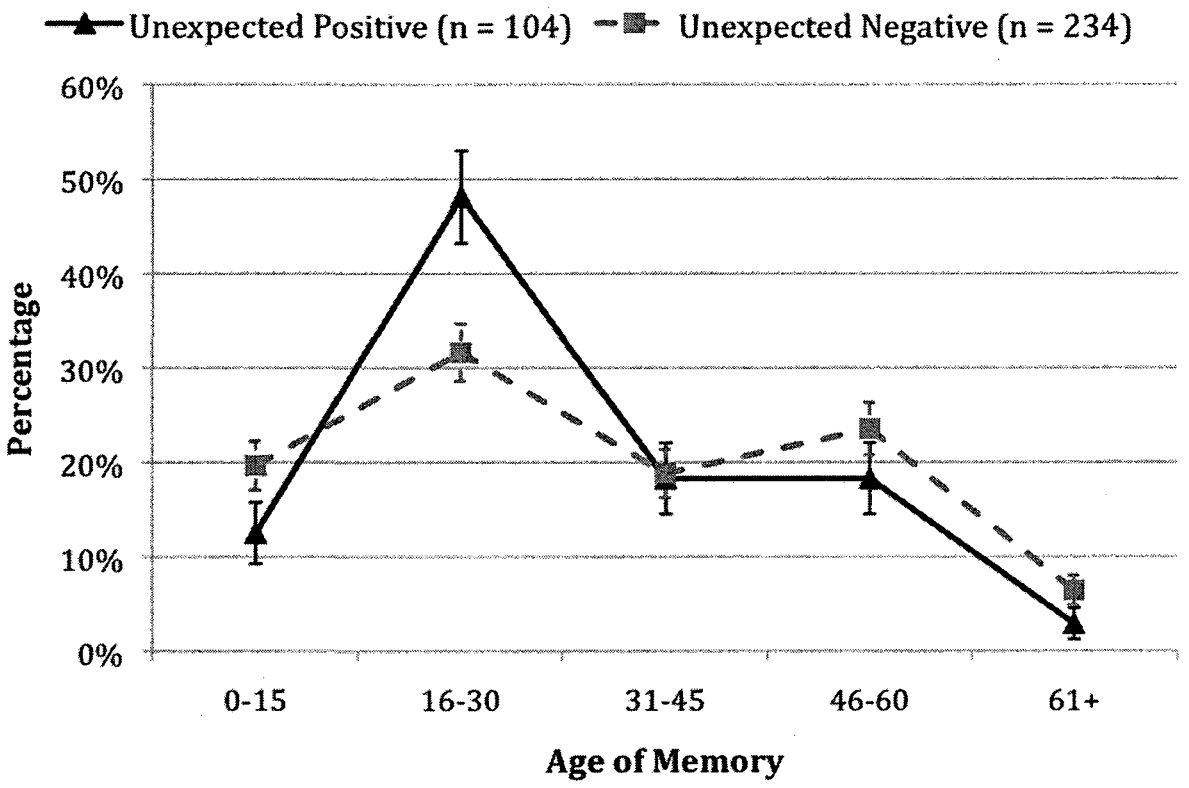

Figure 12. Age distributions of unexpected positive and negative memories across the lifespan for older adults (Study 5). Error bars represent standard errors.

APPENDIX C: INSTITUTIONAL REVIEW BOARD APPROVAL

University of New Hampshire
Institutional Review Board for the Protection of Human Subjects in Research
Departmental Review Committee Exemption Classification Sheet

Name: Ryan Dickson **IRB #:** 1

Dept: Psychology **Reviewer:** _____

Study: Autobiographical memories of expected and surprising events: A test of the Cultural Life-Script hypothesis.

Exempt Review

46.101(b)(1) ____ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:
(i) research on regular or special educational instructional strategies, or
(ii) research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.

46.101(b)(2) ✓ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to subjects' financial standing, employability, or reputation.

46.101(b)(3) ____ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under category (b)(2) if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or
(ii) federal statute(s) require(s) without exception that confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

46.101(b)(4) ____ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

46.101(b)(5) ____ Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

46.101(b)(6) ____ Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration, or approved by the Environmental Protection Agency, or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

____ **Protocol is approved as presented in the category checked**
____ **Protocol is approved with the following contingencies/comments (attach sheets if necessary)**
____ **Protocol is referred to the IRB for Expedited or Full Board review**
____ **Protocol cannot be approved as presented (cite reasons on separate sheet)**

DRC Reviewer: _____ **Date:** 9/14/10

University of New Hampshire
Institutional Review Board for the Protection of Human Subjects in Research
Departmental Review Committee Exemption Classification Sheet

Name: Ryan A. Dickson **IRB #:** 9
Dept: Psychology **Reviewer:** _____
Study: Autobiographical Memories of Expected and Surprising Events: A Test of the Cultural Life-Script Hypothesis

Exempt Review

46.101(b)(1) ____ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:
(i) research on regular or special educational instructional strategies, or
(ii) research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.

46.101(b)(2) ✓ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to subjects' financial standing, employability, or reputation.

46.101(b)(3) ____ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under category (b)(2) if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or
(ii) federal statute(s) require(s) without exception that confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

46.101(b)(4) ____ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

46.101(b)(5) ____ Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

46.101(b)(6) ____ Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) or if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration, or approved by the Environmental Protection Agency, or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

✓ **Protocol is approved as presented in the category checked**
____ **Protocol is approved with the following contingencies/comments (attach sheets if necessary)**
____ **Protocol is referred to the IRB for Expedited or Full Board review**
____ **Protocol cannot be approved as presented (cite reasons on separate sheet)**

DRC Reviewer: John Lumber **Date:** 1/29/08

University of New Hampshire
Institutional Review Board for the Protection of Human Subjects in Research
Departmental Review Committee Exemption Classification Sheet

Name: Ryan Dickson **IRB #:** _____
Dept: Psychology **Reviewer:** _____
Study: Predicting Life Script Events Across the Life Span

Exempt Review

46.101(b)(1) ____ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:
(i) research on regular or special educational instructional strategies, or
(ii) research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.

46.101(b)(2) ✓ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to subjects' financial standing, employability, or reputation.

46.101(b)(3) ____ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under category (b)(2) if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or
(ii) federal statute(s) require(s) without exception that confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

46.101(b)(4) ____ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

46.101(b)(5) ____ Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

46.101(b)(6) ____ Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) or if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration, or approved by the Environmental Protection Agency, or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

____ **Protocol is approved as presented in the category checked**
____ **Protocol is approved with the following contingencies/comments (attach sheets if necessary)**
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____ **Protocol cannot be approved as presented (cite reasons on separate sheet)**

DRC Reviewer: _____ **Date:** 5/16/08

University *of* New Hampshire

Research Conduct and Compliance Services, Office of Sponsored Research
Service Building, 51 College Road, Durham, NH 03824-3585
Fax: 603-862-3564

28-Apr-2008

Dickson, Ryan A
Psychology, Conant Hall
98 Henry Law Avenue, Unit 31
Dover, NH 03820

IRB #: 4293
Study: Autobiographical memories of expected and surprising events: A test of the cultural life-script hypothesis
Approval Date: 16-Apr-2008

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b) with the following comment(s):

~ The researcher needs to forward to the UNH IRB for the file a copy of the Cornell IRB approval letter for this study.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects.* (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed pink Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File
Pillemer, David
Sabir, Myra

University *of* New Hampshire

Research Integrity Services, Office of Sponsored Research
Service Building, 51 College Road, Durham, NH 03824-3585
Fax: 603-862-3564

04-May-2009

Dickson, Ryan A
Psychology, Conant Hall
98 Henry Law Avenue, Unit 31
Dover, NH 03820

IRB #: 4293
Study: Autobiographical memories of expected and surprising events: A test of the cultural life-script hypothesis
Study Approval Date: 16-Apr-2008
Modification Approval Date: 28-Apr-2009
Modification: Addition of 300 subjects

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved your modification to this study, as indicated above. Further changes in your study must be submitted to the IRB for review and approval prior to implementation.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the document, *Responsibilities of Directors of Research Studies Involving Human Subjects.* This document is available at http://www.unh.edu/osr/compliance/irb.html or from me.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File
Pillemer, David

Cornell University
395 Pine Tree Rd., Suite 320
Ithaca, NY 14850
Telephone: 607 255-5138
Fax: 607 255-0758

Institutional Review Board for Human Participants

NOTIFICATION OF EXEMPT CLASSIFICATION **Protocol ID#** 08-05-008

To: Myra Sabir

From: Susan R. Lewis, IRB Administrator

Date of approval: May 22, 2008 (*If* you are using a consent form, enter this date at the bottom of it now.)

Project(s): ***Autobiographical Memories of Expected and Surprising Events: A Test of the Cultural Life-Script Hypothesis***

A member of the IRB has reviewed the above referenced project and it is Exempt from the Federal Regulation for the Protection of Human Subjects (45 CFR 46). As detailed in the application you submitted, the involvement of human subjects in this research study is ***strictly limited*** to one or more of the exempted categories listed on the attached Citation sheet.

* Exemption does not absolve the investigator from ensuring that the welfare of the subjects participating in the research is protected and that methods used and information provided to gain subject consent are appropriate to the activity. It is your responsiblity as a researcher to familiarize yourself with and conduct the reasearch in accordance with the ethical standards of the *Belmont Report.*
Belmont Report: http://ohrp.osophs.dhhs.gov/humansubjects/guidance/belmont.htm

* You must immediately notify the IRB if any changes or modifications are made in the study's design or procedures that do not fall within one of the categories exempted from the regulations. Any such changes or modifications must be reviewed and approved by the IRB *prior* to their implementation.

* You are not required to submit progress reports or requests for continuing review/approval to the IRB, unless you modify your study protocol.

Please take note of the following:

This protocol is exempt under #2. Note that participants should be reminded at the beginning that they should not write down a memory that involved an illegal activity.

4-30-08 Comments:
-This research can be considered Exempt under Category #2, provided that the participants not record an activity that was illegal or involved with the justice system.
-In the recruitment material and consent form the person only has to record two memories, but there are requests for three in the questionnaire.
-Please send final versions of the questionnaire, consent, and information sheet.

Attachment: Exemption Citation

c:

Office of Research Integrity and Assurance

Cornell University
395 Pine Tree Rd., Ste. 320
Ithaca, NY 14850
Telephone: 607 255-5138
Fax: 607 255-0758

Issued on: 5-22-2008
Protocol ID# 08-05-008

Exemption Citation

Name of Investigator: **Myra Sabir**

Title of Project: **Autobiographical Memories of Expected and Surprising Events: A Test of the Cultural Life-Script Hypothesis**

45 CFR 46.101 (b) Unless otherwise required by [DHHS] department or agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:

___ (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as
(i) research on regular and special education instructional strategies, or
(ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

X (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

___ (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or
(ii) Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

___ (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

___ (5) Research and demonstration projects which are conducted by or subject to the approval of [DHHS] department or agency heads, and which are designed to study, evaluate, or otherwise examine:
(i) Public benefit or service programs;
(ii) procedures for obtaining benefits or services under those programs;
(iii) possible changes in or alternatives to those programs or procedures; or
(iv) possible changes in methods or levels of payment for benefits or services under those programs.

___ (6) Taste and food quality evaluation and consumer acceptance studies,
(i) if wholesome foods without additives are consumed or
(ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

University of New Hampshire
Institutional Review Board for the Protection of Human Subjects in Research
Departmental Review Committee Exemption Classification Sheet

Name: Ryan Dickson
Dept: Psychology
Study: Predicting expected and unexpected events across the Life Span

IRB #: 09F-14
Reviewer: Liber

Exempt Review

46.101(b)(1)	Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as: (i) research on regular or special educational instructional strategies, or (ii) research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.
46.101(b)(2) ✓	Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to subjects' financial standing, employability, or reputation.
46.101(b)(3)	Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under category (b)(2) if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
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Protocol is approved as presented in the category checked
Protocol is approved with the following contingencies/comments (attach sheets if necessary)
Protocol is referred to the IRB for Expedited or Full Board review
Protocol cannot be approved as presented (cite reasons on separate sheet)

DRC Reviewer: _____ **Date:** 10/21/09

University of New Hampshire
Institutional Review Board for the Protection of Human Subjects in Research
Departmental Review Committee Exemption Classification Sheet

Name: Ryan Dickson
Dept: Psychology
Study: Expected and unexpected memories across the lifespan

IRB #: [illegible]
Reviewer: [illegible]

Exempt Review

46.101(b)(1)	Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as: (i) research on regular or special educational instructional strategies, or (ii) research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.
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Protocol is approved with the following contingencies/comments (attach sheets if necessary)
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Protocol cannot be approved as presented (cite reasons on separate sheet)

DRC Reviewer: [signature] **Date:** 10/21/04