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Belief-Related Memories: Autobiographical Memories of the Religious Self

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Abstract

Autobiographical memories play important roles in the development of the self and identity by grounding the self in rich, meaningful experiences. In the present study, we explored whether there is a specific type of autobiographical memories tied to religious belief; namely, belief-related memories. We compared belief-related memories with important and word-cued memories across five religions. We found belief-related memories were characterised as important, positive, intense, vivid, and frequently retrieved. The characteristics of belief-related memories were markedly different from word-cued memories, and they also differed from important memories on several variables. Compared with important memories, belief-related memories were rated as less prevalent, less important, less scripted, and showed a different distribution across the life span. The temporal distributions of belief-related memories varied across religions and showed no reminiscence bump as opposed to important memories and word-cued memories. Our findings suggest belief-related memories form a distinct category of autobiographical memories, consistent with the self being multidimensional and with different types of memories supporting distinct aspects of the self.

Keywords: autobiographical memory, belief-related memory, religion, religious identity

Belief-related Memories: Autobiographical Memories of the Religious Self

Autobiographical memory research has increasingly gained attention since it broke away from traditional, laboratory-based memory research in the 1980s (Berntsen & Rubin, 2012). Research on autobiographical memory has expanded the body of knowledge about memory in general, while also connecting memory research to other related fields, such as personality, clinical psychology, and developmental psychology (Conway & Pleydell-Pearce, 2000). Autobiographical memories, especially important memories, play a vital role in psychological development across the lifespan in many ways. Numerous studies have shown that memories that have personal significance are linked to identity and the sense of self. For instance, autobiographical memory deficits correlate with decreases in the strength and quality of identity (Addis & Tippett, 2010). In addition, current self-view and future goals have been found to relate to the number of autobiographical memories recalled in an autobiographical memory task (Krans et al., 2013, 2017). Finally, people from different cultures are inclined to recall memories that are consistent with their cultural values and backgrounds (Wang & Conway, 2004).

Despite the importance of autobiographical memories in the development of the self, surprisingly few studies have taken into account that self-concept, or identity[1], is multifaceted in nature (Jones & McEwen, 2000; Markus & Wurf, 1987; Marsh, 1990). *Self-concept* refers to knowledge about the self, an idea or set of ideas of "who I am," and it functions as a repository of autobiographical memories that organises experiences, as well as guides emotion and behaviour (Oyserman, 2001). Self-concepts have been categorised into dimensions in many ways. Howard (2000), for example, outlined six dimensions of identity, including ethnicity, sex,

[1] The terms 'self-concept' and 'identity' are closely related. They usually refer to the same definition, "who I am." Thus, we use these terms interchangeably in this article.

gender, class, age, and disability. Frable (1997) outlined only four areas: gender, race and ethnicity, sex, and class. Contemporary research on identity development often look into just one aspect of the self at a time, such as age (Weiss & Lang, 2012), ethnicity (French et al. 2006), gender, (Steensma et al., 2013), profession, (Slay & Smith, 2011), and religion, (Peek, 2005). As a result, the findings provide an understanding of how various aspects of the self develop differentially, thereby allowing for a comparison of identity domains and an exploration of interactions between them. In contrast, autobiographical memory research typically does not identify how important the memories are to a specific aspect of the self (e.g., ethnicity or gender). Here we examine autobiographical memories in relation to one domain of identity: religious identity, by examining memories that the person regards as being related to their religious belief.

Belief-Related Memories

Religious identity is defined as one's religious affiliation or identification with a religious tradition (Bell, 2008). Religious identity plays several key roles in society, including maintaining group identity and solidarity, giving access to psychological and social benefits (e.g., community networks, educational resources, and trust and support), and easing tensions caused by other incongruent identities (Peek, 2005). The strength of religious identity is often measured in terms of *religiosity*—the importance of religion and its involvement in one's personal and social life (Huber & Huber 2012). However, the formation of religious identity, as well as its impact at both the individual and group levels, is complex. In general, identities continuously develop and change over time via exploration and commitment (Waterman & Archer, 1990), and religious identity is no exception. Religious identity formation has been extensively studied in adolescents and immigrants, and it has been found to be closely related to various factors, including religious

service attendance and parental religious involvement and characteristics (e.g., Armet, 2009; Lee et al., 2006; Peek, 2005; Pearce & Thornton, 2007). Furthermore, Whitehouse (2004) suggested that religions are transmitted and retained via two modes of religious rituals: doctrinal and imagistic modes. Doctrine rituals are routine and intensive, enabling the formation of complex religious knowledge (e.g., Muslim prayers [Salah], Mass in the Catholic Church, and almsgiving for Buddhist monks). In contrast, imagistic rituals are infrequent but highly emotionally arousing, embedding vivid memories of the rituals themselves that influence how we contemplate religious topics (as shown in a study of a fire-walking ritual by Xygalatas et al., 2013, where participants formed their memories of the ritual using schema-based constructions that favoured social expectations and cultural norms). These findings suggest that a wide range of memories of events during adolescence may contribute to the development of religious identity.

To probe the relation between autobiographical memory and religious identity, we examine memories that a person perceives as related to their personal religious belief. We coin the term "belief-related memory" to refer to this type of memory. In order to maximise an understanding of this newly proposed type of memory, we compare it with more frequently studied forms of autobiographical memory, including important memories (i.e., memories for life story events) and word-cued memories. Further, by adopting the established paradigm used for examining both important and word-cued memories (e.g., Berntsen & Bohn 2010; Rubin & Schulkind, 1997), we reckon belief-related memories can be culled in the same way by asking participants to recall memories that are central to their beliefs.

Important Memories and Word-Cued Memories

Koppel and Berntsen (2015) classified studies of autobiographical memories into two categories based on the primary research method used in each study: those employing the cue word method and those employing the important memories method. For the cue word method, participants are asked to generate memories in response to given cue words. The cue words vary depending on the aims of a study (e.g., unspecified nouns, affect words, activity verbs). In contrast, the important memories method is an umbrella term referring to memory tasks where participants are either asked to generate important memories from their personal lives, vivid memories, memories to be included in their life story, or to freely recall autobiographical memories without explicit instructions that the memories should be important. Furthermore, Koppel and Berntsen (2015) aggregated the distributions of memories from previous works and found that the lifespan distributions from these two methods were different, with the reminiscence bump for word-cued memories located in earlier years of life than the bump for important memories.

Rubin et al. (1986) found the distributions of word cued autobiographical memories exhibited three components. The first component was a retention function that accounted for the slopes in the distributions, which showed decelerating drops in the number of memories recalled as a function of time measured from an event. Specifically, the number of recent memories recalled was greater than the number of remote memories recalled; however, such deceases became gradually smaller as the time measured from an event increased, following the classic retention function (Ebbinghaus, 1885/1964). The second component was the presence of childhood amnesia—an inability of adults to remember episodic memories from infantile to early childhood (Pillemer & White, 1989)—which accounted for a reduction in the memories from the early years of life. The third component was an increase in the number of memories that took

place during late adolescence to early adulthood, a phenomenon called the reminiscence bump. Furthermore, in a study comparing the distributions of word-cued and important memories in a sample of older participants, it was found that the reminiscence bump for important memories was more pronounced and formed a sharper peak than the bump for word-cued memories, and that the increase of recent memories was absent (Rubin & Schulkind, 1997). There have been several hypotheses proposed to account for the bump (e.g., the identity formation hypothesis, the life script hypothesis, and the cognitive hypothesis). However, the explanatory power of these theoretical accounts is still limited to important memories (Koppel & Berntsen, 2015).

Differences between important and word-cued memories are also observed in other memory characteristics. Berntsen and Bohn (2010) found these two types of memories were significantly different across many characteristics. For example, important memories were perceived as more vivid, more intense, more frequently retrieved, more important, and more central to identity than word-cued memories. However, there was no difference in other characteristics, such as their emotional valence, visual perspective, and distance from the present. No earlier studies have examined characteristics of belief-related memories and compared them with these other memory types.

The Present Study

The aims of the present study are to explore belief-related memories and compare them with important memories and word-cued memories across religions. We define important memories as memories to be included in the life story of the person. We expect belief-related memories to be more similar to life story (i.e., important) memories than to word-cued memories in terms of memory characteristics. Nevertheless, we expect some noteworthy differences between belief-related memories and life story memories as well, particularly for the content of

belief-related memories that should differ from life story memory by strongly emphasizing religious experiences, especially identity-forming experiences, such as family upbringing, rituals, and practices. Furthermore, we expect participants' religious affiliation to have an influence on memory characteristics, particularly the dating of belief-related memories. Some important religious rituals are expected to occur at specific ages (e.g., bar mitzvah at age 13, confirmation around age 14); hence we anticipate participants' age estimates of belief-related memories may vary according to their religions.

It is important to note the participants in this study were from the same sample of participants as Tungjitcharoen and Berntsen (2020). As the survey was extensive and consisted of two separate topics: life scripts and autobiographical memories, we decided to split the data into two separate sets. Tungjitcharoen and Berntsen (2020) examined differences and similarities of life scripts across religions, while the current article focused on different types of personal memories across religions.

Method

Participants

We recruited participants online using the TurkPrime (now known as CloudResearch) PrimePanels platform (Litman et al., 2017). In order to participate in the study, each person must have been at least 18 years old and identified themselves with one of five religions: Buddhism, Christianity, Hinduism, Islam, and Judaism. Initially, we aimed for 80 participants for each religious group. After participant replacement and data cleaning, a total of 435 participants consisted of 82 Buddhists, 104 Christians, 72 Hindus, 77 Muslims, and 100 Jews[2]. Demographic

[2] The number of participants in the present study differs from Tungjitcharoen and Berntsen (2020) because the data were initially spilt into two worksheets. Data cleaning was done separately for each data set after the split. Therefore, some responses may not have qualified for both parts.

information and mean scores on relevant psychological scales are shown in Tables 1 and 2.

The majority of the participants were female (63%). However, gender was equally distributed in the Christian and Muslim groups. Participants' ages varied across religions (see Table 2, $\eta^2 = 0.162$), with a post hoc comparison using Tukey HSD showing Jews were older than the other groups ($p < .001$), while Christians were found to be older than Hindus ($p = .001$) and Muslims ($p = .004$).

Materials

Participants first answered demographic questions, including those assessing age, gender, religious belief, and country of residence. They then proceeded to the life script task (see Tungjitcharoen & Berntsen, 2020). Afterwards, they were asked to complete three sets of autobiographical memory tasks: the life story memory task, the word-cued memory task, and the belief-related memory task, respectively. We presented these tasks in this order to make sure that the belief-related memory task and the life story memory task were separated, and to ensure that the belief-related memory task would show no carry-over effects to the other two memory tasks. At the end of the survey, participants completed additional psychological scales, including measurements of religiosity, life satisfaction, and affect.

Life Story Memory Task

In this task, participants were asked to elicit seven important life story memories, following the procedure and instructions introduced by Rubin et al. (2009). First, the participants were asked to imagine that they were about to tell their life stories to a new friend they had just met. It was a friend they considered to be a close confidant with whom they could be completely honest. Their task was to note seven memories about events from their own personal lives—from birth to their present age—they thought were most central to their life story and they wanted to

tell this friend. They were asked to write those events in the same order as they came to mind and to give each event a title in the blank. After the participants had retrieved the memories, they were asked to answer event characteristics for each remembered event, one at a time. The characteristics were an age estimate (i.e., when an event took place), prevalence, importance, valence, intensity, vividness, retrieval frequency, and visual perspectives. Table 3 shows the questions in the life story memory task and their corresponding scales. For the age estimate, participants freely chose to enter a specific age or an age range as they saw fit. The age ranges were then converted to mid-ranges. First- and third-person perspectives were assessed on separate questions, as they are not in opposition to one another empirically (Rice & Rubin, 2009). Retention time was calculated afterward using a participant's current age minus the age estimate of an event. Retention time reflects how long a memory has been kept since the event occurred.

Belief-Related Memory Task

The instructions of this task were adapted from the life story task (Rubin et al., 2009). However, instead of asking participants to recall seven important memories from their life in general, we asked them to recall three memories that were central to their personal religious beliefs. This change was made to ensure that all participants had enough memories to report to solve the task. Furthermore, we asked them to provide short descriptive summaries of memories, rather than short titles of the memories, so that we would get more elaborate responses for further analyses. After generating three memories, they rated the event characteristics, including the 7-item version of the Centrality of Event Scale (CES) by Berntsen and Rubin (2006). The scale was used for capturing to what extent an event was central to a person's identity. However, we did not use it to measure life story memories, as it would unnecessarily lengthen the survey.

Otherwise, the questions were identical to the ones in the life story event and word cued memory tasks.

Word-Cued Memory Task

The participants were asked to recall three memories related to given cue words: PENCIL, SQUARE, and DOOR, selected from Rubin (1980). The cue words were selected on the basis of high imaginability and familiarity, as they served the purpose of inducing memories that were easy to recall. We also instructed the participants that the events they recalled did not have to be important or interesting but rather only related to the cue words. To begin with, participants provided brief descriptions of all three memories. Then, they were asked to rate the event characteristics of each memory one at a time. The characteristics of the events they rated were in line with those of the life story task, plus the 7-item version of the CES (Berntsen & *Rubin, 2006).*

Additional Psychological Scales

We also included measurements of religiosity, life satisfaction, and affect. Religiosity was measured by the Centrality of Religiosity Scale interreligion 7-item version (CRSi7; α = 0.72; Huber & Huber, 2012). The scale measures religiosity along five dimensions: Intellectual dimension, ideology, public practice, private practice, and religious experience. This version of the CRS allows comparisons between religions that differ in concepts of a higher power and religious practices. Life satisfaction was measured using the Satisfaction with Life Scale (SWLS; α = 0.89; Diener at el., 1985), while affect was measured by the Positive and Negative Affect Schedule (PANAS; $\alpha_{\text{positive affect}} = 0.91$, $\alpha_{\text{negative affect}} = 0.92$; Watson et al., 1988).

Coding and Categorization of the Belief-Related Memories

As belief-related memories had never been explored in the context of autobiographical memory, no standard coding scheme was available. We, therefore, categorised belief-related events by adapting an approach for categorizing life scripts and life stories (see Berntsen & Rubin, 2004; Rubin et al., 2009; Zaragoza Scherman et al., 2017) to the present context. To begin with, the first coder (Worawach Tungjitcharoen) read and gave a title of a category to each description of memory. If a description fit into an existing category, then a tally was added to that category; otherwise, a new category was created. After that, all categories that had a frequency of less than 5% of the participants in a religious group were collapsed into "others." A student assistant who worked as a second coder then read and classified the descriptions based on these categories. The two coders agreed in 84.5% of the cases, indicating a high level of agreement. Disagreements were resolved through discussion between coders.

Results

We present the results in the following order. First, we examined the psychological characteristics of the participants. Second, we analysed the effects of Memory type and Religion on the participants' ratings of memory characteristics. Third, we examined the temporal distribution of the three types of memories to examine whether the distributions vary between religious groups and whether the distributions show a reminiscence bump. Fourth, we analysed the content of religion-related memories, and whether they correspond to life scripts. Finally, we explored associations between religiosity and characteristics of the memories.

Characteristics of the Participants

For the relevant psychological scales, we found an effect of religion on the religiosity score ($\eta^2 = 0.150$). Tukey HSD tests revealed Muslims, Christians, and Hindus scored higher on

religiosity than Buddhists and Jews ($p < .001$)[3]. There were also significant differences in life satisfaction ($\eta^2 = 0.028$) and positive affect ($\eta^2 = 0.038$) across religions. Specifically, although the effect sizes were relatively weak, Hindus scored higher on the life satisfaction and positive affect scales than Jews. Muslims scored higher in positive affect than Jews.

Effects of Memory Type and Religion on Memory Characteristics

First, we calculated the mean scores of the ratings of each type of memory for every participant. We then conducted a series of 3 (Memory type: Life story, word-cued, and belief-related memories) × 5 (Religion: Buddhism, Christianity, Hinduism, Islam, and Judaism) mixed factorial ANOVAs, with memory type as the within-subjects factor and religion as the between-subject factor. Table 4 shows the results of the ANOVAs for each memory characteristic, while Figure 1 illustrates the means and standard errors of memory characteristics across memory types and religions. In general, main effects of both memory type and religion were significant for every memory characteristic. While the main effects of memory type were considerably large (η_p^2 ranging from 0.064 to 0.446), the main effects of religion were comparatively smaller (η_p^2 ranging from 0.024 to 0.090). Interactions between the two factors were significant for the characteristics of importance, intensity, and retrieval frequency. Nevertheless, the effect sizes of the significant interactions were small (η_p^2 ranging from 0.019 to 0.047). In the following, we first follow up on effects of memory type, and, next, effects of religion. *[Insert Table 4 here]*

Effects of Memory Type

As illustrated in Figure 1, most of the memory type effects reflected that word-cued memories were rated differently than life-story and belief-related memories. Bonferroni adjusted

[3] These results are consistent with the norms from Huber and Huber (2012), which demonstrated that norm values of the CRSi7 from the USA (where the population is predominantly Christian), Islamic countries (e.g., Morocco, Indonesia, and Turkey) and India (Hindu) were higher than those from Thailand (Buddhist) and Israel (Jewish).

pairwise comparisons of the main effects of memory type on the characteristics of memory (see Supplementary Table S1) showed that life story memories were generally rated higher than word-cued memories for every memory characteristic. Belief-related memories were also rated higher than word-cued memories for every characteristic except prevalence. The comparisons between the ratings of life story memories and belief-related memories showed some important differences. Belief-related memories were rated as less prevalent ($p < .001$), less important ($p < .001$), less intense ($p = .002$), less frequently rehearsed ($p = .046$), and seen less from a third-person perspective ($p = .038$) compared with life story memories. However, the comparisons also revealed these two types of memory showed some similarities. There were no significant differences between life story and belief-related memories regarding the ratings of valence, vividness, and first-person perspective[4] (see Figure 1 for illustration).

Effects of Religion and Interactions with Memory Type

Pairwise comparisons of the main effects of religion showed a relatively stable pattern of differences. Muslims had higher ratings of memory characteristics compared to the other religious groups. In contrast, Jews rated their memory characteristics lowest. There were significant differences between the ratings of Muslims and Jews on every characteristic. Buddhists also scored low on several characteristics. Significant differences between ratings of

[4] Because the numbers of memories retrieved in different tasks were unequal (seven for life story memory task versus three for belief-related memory and word-cued memory tasks), we ran a series of 2 (Memory type: Life story and belief-related memories) × 5 (Religion) mixed factorial ANOVAs for every memory characteristic using the first three life story memories, rather than all seven memories, to ensure that the results would hold if participants had been asked to recall only three life story memories rather than seven. We found that important memories were still rated as more prevalent and important than belief-related memories, and no difference was seen on valence ratings. However, in this new analysis, previously significant differences of the ratings of intensity and third-person perspective became non-significant. Additionally, some new effects emerged. Belief related memories were now rated as more vivid, more rehearsed and having more first-person perspective. See Supplementary tables S3 and S4 for details on these analyses. In short, even when limiting the analyses to the first three important memories, we observed clear differences between the two memory types.

Muslims and Buddhists were found on many characteristics including prevalence, importance, valence, retrieval frequency, third-person perspective, and CES (see Supplementary Table S1).

To explore more closely the differences between belief-related memories and life story memories and their interaction with religion, we ran 2 (Memory type: Life story and belief-related memories) × 5 (Religion: Buddhism, Christianity, Hinduism, Islam, and Judaism) mixed factorial ANOVAs. We did so in order to abstract from the interaction effects that were driven by word-cued memory (the memory type that served as a baseline for comparison), and focus on the two memory types of key interest. The results reproduced most interaction effects from the initial analyses that had included all three types of memories, except for intensity, for which the interaction effect became non-significant ($F(4, 430) = 2.40$, $p = .050$, $\eta_p^2 = 0.022$). This suggests the significant interaction effect found in the 3 × 5 ANOVA on intensity was caused by the variation in word-cued memory relative to the other two types of memories.

As importance and retrieval frequency showed significant interaction effects in the 2 × 5 factorial ANOVAs ($F(4, 430) = 4.70$, $p = .001$, $\eta_p^2 = 0.042$; $F(4, 430) = 3.10$, $p = .016$, $\eta_p^2 = 0.028$, respectively), we conducted simple effect analyses to unpack these interactions. For importance, there were significant differences in the ratings of life story memories and belief-related memories in the Buddhism, Hinduism, and Judaism groups (Buddhism: $t(81) = 2.37$, $p = .020$, $d = 0.262$; Hinduism: $t(71) = 2.02$, $p = .047$, $d = 0.238$; Judaism: $t(99) = 4.12$, $p < .001$, $d = 0.412$), whereas there were no significant difference in the Christianity and Islam groups. Across religions, we found a significant difference in the importance ratings of belief-related memories ($F(4,430) = 5.32$, $p < .001$, $\eta_p^2 = 0.047$). Tukey HSD tests revealed that Muslims ($M = 6.54$, $SD = 0.78$) rated their belief-related memories as more important than Buddhists ($M = 6.05$, $SD =$

1.05), Hindus (M = 6.01, SD = 1.23), and Jews (M = 5.92, SD = 1.04). On the contrary, no significant difference was found in the importance ratings of life story memories across religions.

For retrieval frequency, the ratings of life story memories and belief-related memories differed in the Buddhist and Jewish groups (Buddhism: $t(81) = 2.13$, $p = .037$, $d = 0.235$; Judaism: $t(99) = 2.87$, $p = .005$, $d = 0.287$). Christians, Hindus, and Jews, however, showed no significant difference in their ratings of retrieval frequency. Across religions, inconsistent patterns of differences were shown. As for life story memories, Muslims (M = 5.50, SD = 1.08) rated the memories as more frequently retrieved than Jews (M = 4.99, SD = 1.19). However, for belief-related memories, the difference was more complex. Muslims (M = 5.69, SD = 1.21) thought or talked about belief-related more frequently than Buddhists (M = 4.73, SD = 1.59) and Jews (M = 4.60, SD = 1.50). Christians (M = 5.24, SD = 1.47) and Hindus (M = 5.24, SD = 1.57) also thought or talked about them more frequently than Jews did.

Temporal Distribution

To create temporal distributions of memories that were not biased by participant age, we selected only participants who were 30 years old or above (n_{Buddhism} = 59, $n_{\text{Christianity}}$ = 79, n_{Hinduism} = 51, n_{Islam} = 52, n_{Judaism} = 82, N = 323). Next, we included only memories of events that were estimated to take place up to the age of 35. After that, we plotted graphs with five-year intervals. However, participants who were between 31 and 34 years of age had not lived through the last age interval, 31 to 35 years of age. We therefore adjusted the numbers of memories occurring in the age interval 31-35 years using the correction procedure[5] in Rubin and Berntsen (2003). This

[5] The procedure can be described as follows. First, extract a number of participants who were between 31 and 35 years of age. These participants could not produce memories that were estimated to occur above their ages. Then, calculate a mean age of the participants. Add 0.5 years to the mean age because on average they had lived 6 months through their currant ages. Subtract 31 from the mean age to get a mean year these participants had lived through 31 years old, which was the lower bound of this age interval. After that, count the numbers of memories these

procedure corrected the numbers of memories in the last age interval by adding up numbers of memories the participants who had not lived through the period would have produced had they been born five years earlier. Figure 2 compares the temporal distributions of the three types of memories across religions. The solid lines represent the temporal distributions of memories across the lifespan from birth to 35 years of age collapsed across religions. The other lines represent the distribution across religions following the legend in the figure. All temporal distributions displayed low percentages of memories during the first five years of life by cause of childhood amnesia. We next examine the reminiscence bump (Rubin et al., 1986, 1998). To evaluate the presence of a bump, two criteria are relevant. One is whether a clear and identifiable peak in the distribution of memories can be identified. The other is whether different religious groups show similar distributions.

Following the first criterion, a bump was clearly found in the temporal distribution of life story memories. In this sample, the peak of the bump occurred during the ages of 16 to 20 (432 counts, 21.9%). The bump was less pronounced and moved to an earlier interval in the temporal distribution of word-cued memories, consistent with previous work (see Koppel & Berntsen, 2016, for a recent review). The peak of the bump of the word-cued memory distribution was during the ages of 6 to 10 (192 counts, 23.1%). For belief-related memory, there was a slight increase in the number of memories between the ages of 11 and 15 (146 counts, 18.5%).

participants produced that were dated between the ages of 31 and 35. Based on the assumption that if these participants had lived past this age interval, they would have generated more memories in proportion to their mean age, we divided the number of memories in the age interval 31-35 by the mean years these participants had lived through 31 years old to get an average number of memories produced per year. Finally, multiply the average number of memories procured per year by 5, which resulted in an estimated number of memories they could have produced had they all lived through the age interval. To illustrate, there were 14 Buddhist participants aged between 31 and 35 years old. Their mean age was 32.71 years. Therefore, on the average they had lived past through their 31st birthday for (32.71 + 0.5) - 31 = 2.21 years. These participants generated 6 belief-related memories in the age interval of 31 to 35 years. Per year, they generated 6 ÷ 2.21 = 2.71 memories. If they had lived past this age interval, they would have generated 2.71 × 5 = 13.55 memories. Thus, we added 7.55 memories to the number of memories the participants produced in this age interval.

However, there was no clear bump at any age interval. (See Supplementary Table S2 for the frequencies and percentages of the memories in every interval across religions and memory types.)

Following the second criterion, across religions, we found good agreement of the temporal distributions of life story memories. As shown in Figure 2, the lines that represent the distributions of life story memories across religions did not vary much from the solid line that represents the average. The peaks of memory frequencies remained the same at the age interval 16 - 20 years. In contrast, there was considerable variation in the distributions of word-cued memories and belief-related memories. However, despite the variation of the distributions of word-cued memories across religions, the numbers of memories peaked between the ages of 6 and 10 for all religions. For belief-related memories, the distributions across religions deviated from the solid line (indicating the score aggregated across groups) to a great extent. There were bumps in some religious groups including Judaism, between the ages of 11 and 15 (55 counts, 30.9%), and Hinduism, between the ages of 26 and 30 (39 counts, 28.3%). The distributions were more uniform in the Buddhism and Christianity groups. The bump of belief-related memories in the Judaism group was contributed by bar mitzvah, a coming of age ritual, which occurs around the ages of 12 and 14 (34 counts, 19.1%). In sum, we found that the temporal distributions of life story memories and word-cued memories were relatively uniform across religions and showed the expected reminiscence bump, whereas the distributions of belief-related memories were greatly varied and did not show a clear bump.

Content of the Belief-Related Memories

The categories and frequencies of the 20 most frequently mentioned categories of belief-related memories are presented in Table 5. Overall, *taking part in a religious ceremony* was the

most frequently mentioned event category of the belief-related memories (217 counts, 17%), followed by *contemplation of one's own belief* (104 counts, 8.2%), *learning religion* (96 counts, 7.5%), *marriage* (88 counts, 6.9%), and *visiting or mentioning a religious place/figure* (81 counts, 6.4%). Across religions, we found that the ranks of event frequencies were somewhat similar, with *taking part in a religious ceremony* ranked as the most frequently mentioned event type, with the exception of the Buddhist group. For Buddhists, the top three most frequently mentioned categories were *learning religion* (26 counts, 10.7%), *contemplation of one's own belief* (24 counts, 9.9%), and *conversion-related and faith-confirming event* (22 counts, 9.1%). The spearman's rank correlations of event frequencies between Total and each religious group ranged from .67 (Total-Buddhism) to .87 (Total-Islam), suggesting high consistency across religions, despite some variation. Contents of some event categories were unique across religions, as they were based on specific religious teachings and practices. For instance, Jews mentioned Jewish rituals and ceremonies such as bar mitzvah, Hanukkah, and shabbat, whereas Christians mentioned baptism, first communion, and confirmation in the *taking part in a religious ceremony* category (Table 5).

Belief-related memories contained both episodic and semantic components, as autobiographical memories generally do (e.g., Conway & Pleydell-Pearce, 2000; Levine et al., 2002). The episodic component refers to how, where, and when an event took place, including emotions and feelings that occurred while experiencing the event, whereas the semantic component refers to general knowledge, knowledge of the self, as well as meta-cognitive statements (Levine et al., 2002). Although we only asked participants to give short descriptive summaries of what they recalled, the responses ranged from single words to stories. In long responses, they often displayed both episodic and semantic components; for example,

> My freshman year of college. My roommate stared at me strangely when I spoke Hebrew on the phone. There was no kosher food to be found anywhere. We had classes on every holiday from Rosh Hashanah to Yom Kippur, and we had exams on shabbat. There was no kosher restaurants or stores in the entire city and had to rely on the Chabad house and eating vegetarian meals. It was the first time I really left my Jewish bubble and realised that we really were the minority.

Some responses seem not to refer to specific events but rather self-knowledge and -reflection, especially those in the category, *contemplation of their own belief*, which comprised 8.2% of the belief-related memories, for instance, "I am proud to be a Hindu," "realizing that strong emotional attachment causes pain and suffering," and "I started to trust in Allah and the messenger (Mohammad) when I was 5 years old and I keep this to now." However, participants were able to indicate at what age or since when they had experienced the events upon which these memories were based. This suggests that belief-related memories may include metacognitive knowledge, awareness, and justification of one's own belief, as well as episodic components. Belief-related memories did not seem less episodic than life story memories, consistent with the highly comparable ratings on vividness, intensity, and first-person perspective (Figure 1).

Scriptedness: Overlaps Between Life Script Events and Memories

An overlap between life script events and memories shows to what extent an individual's remembered life follows a typical life course (Berntsen & Rubin, 2004). To examine the percentages of overlap, we coded whether the memories fell into one of the event categories (except "others") from the list of life script events in Supplementary Table S2 in Tungjitcharoen & Berntsen (2020). The percentages of overlaps between life script events and life story, belief-

related, and word-cued memories were 66.3%, 48.2%, and 4.8%, respectively. In addition, we tested the relationship between memory type (life story and belief-related memory) and scriptedness. We did not include word-cued memories in the test since the percentages of overlap were highly different from the other memory types. The analysis showed a significant association between memory type and scriptedness of memory, $\chi^2(1) = 124.66$, $p < .001$. Thus, life story memories conformed to life script more than belief-related memories did.

The Effects of Religiosity

The religiosity scores significantly correlated with 24 of the 29 memory characteristics (Pearson's correlations ranged from -.10 to .35), though the associations were generally negligible. Three of the significant correlations were above .30, indicating weak positive associations between religiosity and some characteristics of belief-related memories, including importance, vividness, and centrality of event ($r_{(\text{importance, CRS})} = .35$, $p < .001$; $r_{(\text{vividness, CRS})} = .30$, $p < .001$; and $r_{(\text{CES, CRS})} = .34$, $p < .001$).

We further investigated effects of religiosity on the memory characteristics in relation to memory type. We grouped the participants into 3 groups based on their religiosity scores: low (155 participants), moderate (127 participants), and high (153 participants), using the 33rd (CRSi7 score = 3.4) and 67th (CRSi7 score = 4.2) percentiles as cutoffs. We then ran mixed design ANOVAs replacing religion with religiosity group as a between-subjects effect. We found significant main effects of religiosity on every characteristic (all ps $< .001$, η_p^2 ranging from 0.044 to 0.093) except for prevalence ($F(2, 432) = 0.95$, $p = .386$, $\eta_p^2 = 0.004$). Post hoc tests revealed that participants in the high group generally rated their memories significantly higher than participants in the low group in every characteristic. The interaction effects between memory type and level of religiosity were also significant for some characteristics, including

importance ($F(2.93, 632.87) = 6.89$, $p < .001$, $\eta_p^2 = 0.031$), valence ($F(3.83, 827.34) = 3.32$, $p = .012$, $\eta_p^2 = 0.015$), intensity ($F(3.45, 744.86) = 2.69$, $p = .038$, $\eta_p^2 = 0.012$), retrieval frequency ($F(3.65, 789.19) = 2.55$, $p = .043$, $\eta_p^2 = 0.012$), and first-person perspective ($F(3.80, 820.13) = 2.66$, $p = .034$, $\eta_p^2 = 0.012$). Simple effects tests of religiosity group using one-way ANOVAs revealed that participants at different levels of religiosity rated the characteristics of belief-related memories more differently than the characteristics of life story and word-cued memories (the effect sizes [η^2] of the characteristics of belief-related memories ranged between 0.047 to 0.110; the effect sizes of the characteristics of life story memories ranged between 0.014 to 0.056; the effect sizes of the characteristics of word-cued memories ranged between 0.014 to 0.048.). In particular, participants in the low group generally rated the characteristics of the belief-related memories much lower than participants in the other groups; the differences of the characteristics between religiosity groups were either absent or less pronounced for the other two memory types. These findings emphasize that religiosity is positively related to memories, particularly those linked to religious belief.

Discussion

In this study, we aimed to examine memories related to a specific type of identity; namely, religious identity. We defined this type of memories as belief-related memory. Such belief-related memories are central to personal religious belief and come to mind when a person is asked to generate memories that are testimonies of their religious belief. We further compared belief-related memories with both life story memories and word-cued memories to explore similarities and differences between these memories. We asked participants to recall events related to the three types of memories and rate the characteristics of each memory they generated. Our findings revealed belief-related memories were characterised as important,

positive, intense, vivid, and frequently retrieved. When compared to the other two types of memories, belief-related memories were found to be more similar to life story memories than word-cued memories in most respects. Nevertheless, belief-related memories reliably differed from life story memories in terms of prevalence, importance, memory content, scriptedness, and memory distribution throughout the lifespan. Strikingly, we also found the temporal distributions of belief-related memories varied across religions, as opposed to life story memories, which showed uniformity in the distributions across religions.

Although several memory characteristics of belief-related and life story memories were found to be statistically different, most of the differences were relatively minor, except for prevalence, temporal distribution, and memory content (see Figures 1 and 2). Prevalence of belief-related memories was on par with prevalence of word-cued memories, and was greatly lower than life story memories. This suggests belief-related memories were thought to be less commonly experienced by people in general than life story memories, and showed some degree of uniqueness.

The deviating temporal distributions of belief-related memories together with unclear reminiscence bumps across religions differentiated the belief-related memories from life story memories. One potential factor that contributed to the variation might be the difference in event frequencies across religions. Some belief-related event categories are scripted for when in life it should take place, particularly religious rituals and practices, marriage, and giving birth. For instance, we found that a great proportion of the reminiscence bump within the age 11-15 interval in the distribution of belief-related memories of the Jewish group was comprised of bar mitzvah, a Jewish rite of passage, corresponding to a high proportion of bar mitzvah in the religion-related event category of the Jewish life script (Tungjitcharoen & Berntsen, 2020).

However, we did not identify any specific religious events contributing to the distributions in the other religious groups.

For memory content, the instructions to recall memories related to their religious beliefs resulted in participants producing memories that were greatly different from life story memories. Life story memories typically consist of important life events that mark turning points, high points, and low points in one's life narrative (McAdam, 2001). Events, such as marriage, having children, death of a loved one, and special days at college and work, are overwhelmingly present in life stories, as evidenced by previous studies on life story memories (e.g., Bohn, 2010; Rubin et al., 2009; Zaragoza Scherman et al. 2015). In the present study, such life script events also contributed to belief-related memories, but their frequencies were considerably lower than for life story memories. New event categories presented in Table 5 indicated the content of memories thought to be central to one's belief, although overlapping, were not identical to the typical content of life story memories (e.g., Bohn, 2010; Rubin et al., 2009). Religious rituals, reflection on one's own belief, religious socialization, religious conversion, life problems and their solutions, miracles, and several other event categories rendered these memories distinct. Their uniqueness was further supported by the absence of a clear reminiscence bump. Given the relative ubiquity of the reminiscence bump in research on autobiographical memory (e.g., Rubin et al., 1998; Koppel & Rubin, 2016), alongside the differences in some memory characteristics of life story memories and belief-related memories found in this study, our findings suggest belief-related memories form a somewhat distinct category of memory.

While memory types exerted clear effects on the characteristics and content of the memories, effects of religious group were modest. We found religion contributed to the differences in the ratings of the memory characteristics, though to a lesser extent. The results

show a general tendency for Muslim participants to rate the characteristics of their memory higher than the other religious groups, while Jewish participants rated their memory characteristics lower than the other groups. This may suggest that Muslims put more emphasis on their memories relative to Jews. These results contradict, to some extent, Ottsen and Berntsen (2015), who showed that Middle Easterners, representing Islamic culture, rated several phenomenological characteristics of their memories for important events lower than Scandinavians, representing a traditionally Protestant though contemporarily non-religious culture. However, these two studies are not comparable, as Ottsen and Berntsen (2015) did not ask specifically for memories of religious events. Moreover, degree of religiosity varied between religions and may be an important underlying factor for these results. Exploratory analyses showed consistent associations between level of religiosity and ratings of memory characteristics. Notably, event type effects interacted with levels of religiosity, with levels of religiosity contributing to the differences in the characteristics of belief-related memories greater than the other memory types.

Broader Implications and Future Directions

The finding that both characteristics and temporal distribution of belief-related memories differ from life story memories and word-cued memories support the notion that identity is comprised of multiple dimensions (Jones & McEwen, 2000), a phenomenon which has been largely overlooked in the field of autobiographical memory research. One can identify oneself with multiple aspects of the self, such as gender, ethnicity, social class, and religion (McEwen, 1996). The categories shown in Table 5 resonate well with the previous findings of religious identity development, in that people develop their religious identities chiefly through religious activity participation, family religious affiliation, and family upbringing (e.g., Pearce &

Thornton, 2007; Peek 2005; Swann et al., 2012). High numbers of events in categories such as *take part in a religious ceremony*, *learn religion*, *marriage*, and, *spend time with family, kids, and friends*, indicate these events were considered important memories contributing to participants' current religious beliefs.

The results also extend the conception of the self-memory system (Conway & Pleydell-Pearce, 2000; Conway, 2005) by suggesting that religious belief is one of the themes in the autobiographical memory knowledge base that has its own set of memories that may be elicited by asking specifically about the religious aspect of life. Whether this is a universal characteristic or one only present in people who identify themselves as believers in a specific religion is a question for future research.

By using a survey as a research tool, we were able to quantify and compare the characteristics of the different types of memories. However, the relatively sparse memory descriptions did not allow for more extensive analyses of content and narrative structure. An interview study is required to further explore how belief-related memories are organised as a narrative and how they reflect religious identity. Future studies also may look into factors that contribute to the variations of belief-related memories across religions, including religious teachings, socio-cultural context, and individual differences. Additionally, this study opens new avenues of investigation for memories that are related to other types of identities, such as gender, political ideology, family role, or profession, as these memories may differ from life story memories in general.

Conclusion

Here we identified a new class of autobiographical memories, namely belief-related memories. Belief-related memories shared many characteristic similarities with life story

memories, by being important, positive, intense, vivid, and frequently retrieved. However, the two types of memories were different in their content and some memory characteristics. Belief-related memories were markedly less prevalent and less scripted by the life script than life story memories. Furthermore, unlike life story memories, belief-related memories did not show a clear reminiscence bump typically found in the distribution of autobiographical memory, and their life span distribution differed across the religious groups. Religion was found to affect the characteristics of memory, and interacted with memory type; however, these effects were relatively small in comparison with the effects of memory type.

References

Addis, D. R., & Tippett, L. (2004). Memory of myself: Autobiographical memory and identity in Alzheimer's disease, *Memory, 12*(1), 56-74, https://doi.org/10.1080/09658210244000423

Armet, S. (2009). Religious Socialization and Identity Formation of Adolescents in High Tension Religions. *Review of Religious Research, 50*(3), 277-297. Retrieved September 2, 2020, from http://www.jstor.org/stable/25593742

Bell, D. M. (2008). Development of the religious self: A theoretical foundation for measuring religious identity. In A. Day (Ed.), *Religion and the individual: Belief, practice, and identity* (pp. 127–142). Burlington, VT: Ashgate.

Berntsen, D., & Bohn, A. (2010). Remembering and forecasting: The relation between autobiographical memory and episodic future thinking. *Memory & Cognition, 38*(3), 265–278. https://doi.org/10.3758/MC.38.3.265

Berntsen, D., & Rubin, D. C. (2004). Cultural life scripts structure recall from autobiographical memory. *Memory & Cognition 32*, 427–442. https://doi.org/10.3758/BF03195836

Berntsen, D., & Rubin, D. C. (2006). The centrality of event scale: A measure of integrating a trauma into one's identity and its relation to post-traumatic stress disorder symptoms. *Behaviour Research and Therapy, 44*(2), 219–231. https://doi.org/10.1016/j.brat.2005.01.009

Bohn, A. (2010). Generational differences in cultural life scripts and life story memories of younger and older adults. *Applied Cognitive Psychology, 24*(9), 1324–1345. https://doi.org/10.1002/acp.1641

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language, 53*(4), 594–628. https://doi.org/10.1016/j.jml.2005.08.005

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*(2), 261–288. https://doi.org/10.1037/0033-295x.107.2.261

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Ebbinghaus, H. (1964). *Memory: A contribution to experimental psychology.* Dover.

Frable, D. E. S. (1997). Gender, racial, ethnic, sexual, and class identities. *Annual Review of Psychology, 48,* 139–162. https://doi.org/10.1146/annurev.psych.48.1.139

French, S. E., Seidman, E., Allen, L., & Aber, J. L. (2006). The development of ethnic identity during adolescence. *Developmental Psychology, 42*(1), 1–10. https://doi.org/10.1037/0012-1649.42.1.1

Howard, J. A. (2000). Social psychology of identities. *Annual Review of Sociology, 26,* 367–393. https://doi.org/10.1146/annurev.soc.26.1.367

Huber, S., & Huber, O. W. (2012). The Centrality of Religiosity Scale (CRS). *Religions, 3*(3), 710–724. https://doi.org/10.3390/rel3030710

Jones, S. R., & McEwen, M. K. (2000). A conceptual model of multiple dimensions of identity. *Journal of college student development*, *41*(4), 405–414.

Koppel, J., & Berntsen, D. (2015). The peaks of life: The differential temporal locations of the reminiscence bump across disparate cueing methods. *Journal of Applied Research in Memory and Cognition, 4*(1), 66–80. https://doi.org/10.1016/j.jarmac.2014.11.004

Koppel, J., & Rubin, D. C. (2016). Recent Advances in Understanding the Reminiscence Bump: The Importance of Cues in Guiding Recall from Autobiographical Memory. *Current directions in psychological science*, *25*(2), 135–149. https://doi.org/10.1177/0963721416631955

Krans, J., de Bree, J., & Bryant, R. A. (2014). Autobiographical memory bias in social anxiety. *Memory, 22*(8), 890–897. https://doi.org/10.1080/09658211.2013.844261

Krans, J., Peeters, M., Näring, G., Brown, A. D., de Bree, J., & van Minnen, A. (2017). Examining temporal alterations in Social Anxiety Disorder and Posttraumatic Stress Disorder: The relation between autobiographical memory, future goals, and current self-views. *Journal of Anxiety Disorders, 52,* 34–42. https://doi.org/10.1016/j.janxdis.2017.09.007

Lee, J., Miller, L., & Chang, E. S. (2006). Religious Identity among Christian Korean-American Adolescents. *Psychological Reports*, *98*(1), 43–56. https://doi.org/10.2466/pr0.98.1.43-56

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: Dissociating episodic from semantic retrieval. *Psychology and Aging, 17*(4), 677–689. https://doi.org/10.1037/0882-7974.17.4.677

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology, 38,* 299–337. https://doi.org/10.1146/annurev.ps.38.020187.001503

Marsh, H. W. (1990). A multidimensional, hierarchical model of self-concept: Theoretical and empirical justification. *Educational Psychology Review, 2*, 77–172. https://doi.org/10.1007/BF01322177

McAdams, D. P. (2001). The psychology of life stories. *Review of General Psychology*, *5*(2), 100–122. https://doi.org/10.1037/1089-2680.5.2.100

McEwen, M. K. (1996). New perspectives on identity development. In S. R. Komives & D. B. Woodard Jr. (Eds.), *Student services: A handbook for the profession* (3rd ed., pp. 188-217). San Francisco: Jossey-Bass.

Ottsen, C. L., & Berntsen, D. (2015). Prescribed journeys through life: Cultural differences in mental time travel between Middle Easterners and Scandinavians. *Consciousness and Cognition, 37*, 180-193. https://doi.org/10.1016/j.concog.2015.09.007

Oyserman, D. (2001). Self-concept and identity. In A. Tesser & N. Schwarz (Eds.), *Blackwell handbook of social psychology* (pp. 499-517). Malden, MA: Blackwell Press.

Pearce, L. D., & Thornton, A. (2007). Religious identity and family ideologies in the transition to adulthood. *Journal of Marriage and Family*, 69, 1227–1243. https://doi.org/10.1111/j.1741-3737.2007.00443.x

Peek, L. (2005). Becoming Muslim: The development of a religious identity. Sociology of Religion, 66(3), 215–242. https://doi.org/10.2307/4153097

Pillemer, D. B., & White, S. H. (1989). Childhood events recalled by children and adults. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 21, pp. 297–340). New York, NY: Academic Press.

Rice, H. J., & Rubin, D. C. (2009). I can see it both ways: First- and third-person visual perspectives at retrieval. *Consciousness and Cognition, 18*(4), 877–890. https://doi.org/10.1016/j.concog.2009.07.004

Rubin, D. C. (1980). Properties of 125 words: A unit analysis of verbal behavior. *Journal of Verbal Learning and Verbal Behavior, 19*(6), 736–755. https://doi.org/10.1016/S0022-5371(80)90415-6

Rubin, D. C., & Berntsen, D. (2003). Life scripts help to maintain autobiographical memories of highly positive, but not highly negative, events. *Memory & Cognition, 31*(1), 1–14. https://doi.org/10.3758/BF03196077

Rubin, D. C., Berntsen, D., & Hutson, M. (2009). The normative and the personal life: individual differences in life scripts and life story events among USA and Danish undergraduates. *Memory, 17*(1), 54–-68. https://doi.org/10.1080/09658210802541442

Rubin, D. C., Rahhal, T. A., & Poon, L. W. (1998). Things learned in early adulthood are remembered best. *Memory & Cognition, 26*, 3–19. https://doi.org/10.3758/BF03211366

Rubin, D. C., & Schulkind, M. D. (1997). Distribution of important and word-cued autobiographical memories in 20-, 35-, and 70-year-old adults. *Psychology and Aging, 12*(3), 524–535. https://doi.org/10.1037/0882-7974.12.3.524

Rubin, D. C., Wetzler, S. E., & Nebes, R. D. (1986). *Autobiographical memory across the adult lifespan*. In D. C. Rubin (Ed.), *Autobiographical memory* (pp. 202-221). New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511558313.018

Slay, H. S., & Smith, D. A. (2011). Professional identity construction: Using narrative to understand the negotiation of professional and stigmatized cultural identities. *Human Relations*, *64*(1), 85–107. https://doi.org/10.1177/0018726710384290

Steensma, T. D., Kreukels, B. P., de Vries, A. L., & Cohen-Kettenis, P. T. (2013). Gender identity development in adolescence. *Hormones and behavior*, *64*(2), 288–297. https://doi.org/10.1016/j.yhbeh.2013.02.020

Swann, W. B., Jr., Jetten, J., Gómez, Á., Whitehouse, H., & Bastian, B. (2012). When group membership gets personal: A theory of identity fusion. *Psychological Review, 119*(3), 441–456. https://doi.org/10.1037/a0028589

Tungjitcharoen, W., & Berntsen, D. (2020). Cultural life scripts across religions: The influences of religion on expectations of life events. *Psychology of Religion and Spirituality.* Advance online publication. https://doi.org/10.1037/rel0000392

Wang, Q., & Conway, M. A. (2004). The stories we keep: autobiographical memory in American and Chinese middle-aged adults. *Journal of personality*, *72*(5), 911–938. https://doi.org/10.1111/j.0022-3506.2004.00285.x

Waterman, A. S., & Archer, S. L. (1990). *A life-span perspective on identity formation: Developments in form, function, and process.* In P. B. Baltes, D. L. Featherman, & R. M. Lerner (Eds.), *Life-span development and behavior, Vol. 10* (p. 29–57). Lawrence Erlbaum Associates, Inc.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Weiss, D., & Lang, F. R. (2012). The two faces of age identity. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry, 25*(1), 5–14. https://doi.org/10.1024/1662-9647/a000050

Whitehouse, H. (2004). *Modes of religiosity: A cognitive theory of religious transmission*. Rowman Altamira.

Xygalatas, D., Schjoedt, U., Bulbulia, J., Konvalinka, I., Jegindø, E., Reddish, P., Geertz, A. W., & Roepstoff, A. (2013). Autobiographical memory in a fire-walking ritual, *Journal of Cognition and Culture, 13*(1-2), 1-16. https://doi.org/10.1163/15685373-12342081

Zaragoza Scherman, A., Salgado, S., Shao, Z., & Berntsen, D. (2015). Life span distribution and content of positive and negative autobiographical memories across cultures. *Psychology of Consciousness: Theory, Research, and Practice, 2*(4), 475–489. https://doi.org/10.1037/cns0000070

Zaragoza Scherman, A., Salgado, S., Shao, Z., & Berntsen D. (2017). Life script events and autobiographical memories of important life story events in Mexico, Greenland, China, and Denmark. *Journal of Applied Research in Memory and Cognition, 6* (1), 60–73. https://doi.org/10.1016/j.jarmac.2016.11.007

Table 1

Number of Participants and Their Gender Across Religions

Religion	Female		Male		Total
	n	%	*n*	%	*n*
Buddhism	59	72.0	23	28.0	82
Christianity	49	47.1	55	52.9	104
Hinduism	52	72.2	20	27.8	72
Islam	42	54.5	35	45.5	77
Judaism	72	72.0	28	28.0	100
Total	274	63.0	161	37.0	435

$\chi^2(4) = 22.54$, $p < .001$.

Table 2

Participant Age, Religiosity Score, Life Satisfaction, and Affect Broken Down by Religion

Variable	Religion												*F*
	Buddhism (n =82)		Christianity (n = 104)		Hinduism (n = 72)		Islam (n = 77)		Judaism (n = 100)		Total (n = 435)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	
Participant age	40.24	14.78	43.60	17.01	35.13	10.44	34.44	12.23	53.00	19.94	42.10	17.07	20.71***
Religiosity	3.42	0.67	3.96	0.66	3.86	0.73	4.13	0.66	3.40	0.79	3.74	0.76	18.98***
Life satisfaction	22.59	7.05	23.27	8.04	24.99	6.63	24.73	7.08	21.65	7.76	23.31	7.47	3.08*
PANAS positive	33.94	8.97	34.80	9.59	35.35	7.84	35.94	9.61	31.07	8.30	34.07	9.05	4.22**
PANAS negative	22.00	10.03	22.33	10.32	21.96	8.71	22.34	10.28	21.73	10.12	22.07	9.92	0.06

*p < .05, **p < .005, ***p < .001
PANAS: Positive and Negative Affect Schedule

Table 3

Questions Addressing Memory Characteristics

Prevalence	How common is the event: Out of a hundred people, how many will experience this event at least once during their life? (Out of a hundred it will happen for about ____ people)
Importance	How important is the event to you? (1 = unimportant, 7 = of the greatest importance)
Age estimate	• Is the memory about a specific event that took place on a certain day in your past, or is it about a general or extended event that occurred regularly? (specific, extended) • How old were you when the event took place? (The event took take when I was ____ years old)
Valence	Is the event emotionally positive or negative? (-3 = very negative, +3 = very positive)
Intensity	Was the event emotionally intense? (1 = not intense at all, 7 = very intense)
Vividness	How vivid is your memory of the event? (1 = not vivid at all, 7 = as vivid as it were happening now)
Retrieval frequency	How often have you thought or talked about your memory of this event? (1 = never, 7 = always)
Visual perspective	• Rate the degree to which the memory comes to you as seen through an observer's eyes (1 = not at all, 7 = completely) • Rate the degree to which the memory comes to you as seen through your own eyes (1 = not at all, 7 = completely)

Table 4

Two-Way ANOVAs for the Effects of Memory Type and Religion on Memory Characteristics

Memory characteristic	*MS*	*F*	*p*	η_p^2
Prevalence				
Memory type	17762.50	43.65	<.001	.092
Religion	4814.84	5.02	.001	.045
Memory type × Religion	477.92	1.17	.313	.011
Importance				
Memory type	442.84	345.60	<.001	.446
Religion	14.46	7.04	<.001	.061
Memory type × Religion	6.75	5.27	<.001	.047
Valence				
Memory type	57.12	44.24	<.001	.093
Religion	19.19	6.62	<.001	.058
Memory type × Religion	1.87	1.45	.175	.013
Intensity				
Memory type	252.62	197.82	<.001	.315
Religion	8.92	2.69	.031	.024
Memory type × Religion	2.66	2.09	.044	.019
Vividness				
Memory type	62.30	81.43	<.001	.159
Religion	11.59	4.66	.001	.042
Memory type × Religion	0.64	0.84	.563	.008
Retrieval frequency				
Memory type	210.85	197.98	<.001	.315
Religion	36.64	8.75	<.001	.075
Memory type × Religion	2.85	2.68	.008	.024
1P perspective				
Memory type	43.09	44.42	<.001	.094
Religion	11.72	3.35	.010	.030
Memory type × Religion	0.81	0.83	.567	.008
3P perspective				
Memory type	29.05	29.52	<.001	.064
Religion	86.23	10.64	<.001	.090
Memory type × Religion	1.13	1.15	.328	.011
CES				
Memory type	394.25	260.79	<.001	.378
Religion	118.83	10.31	<.001	.088
Memory type × Religion	11.01	1.82	.124	.017

Table 5

Top 20 Most Frequently Mentioned Event Categories of the Belief-Related Memory

Event category	Religion																	
	Buddhism			Christianity			Hinduism			Islam			Judaism			Total		
	Count	%	Rank	Count	%	Rank	Count	%	Rank	Count	%	Rank	Count	%	Rank	Count	%	Rank
Taking part in a religious ceremony	13	5.30%	5	52	17.30%	1	33	15.60%	1	33	14.80%	1	85	28.80%	1	216	17.00%	1
Contemplation of their own belief	24	9.90%	2	16	5.30%	5	30	14.20%	2	19	8.50%	3	15	5.10%	7	104	8.20%	2
Learning religion	26	10.70%	1	19	6.30%	3	5	2.40%	9	24	10.80%	2	22	7.50%	3	96	7.50%	3
Marriage	8	3.30%	9	19	6.30%	3	22	10.40%	3	11	4.90%	6	28	9.50%	2	88	6.90%	4
Visiting or mentioning a religious place or a religious figure	9	3.70%	8	27	9.00%	2	10	4.70%	6	18	8.10%	4	17	5.80%	5	81	6.40%	5
Death and funeral	22	9.10%	3	19	6.30%	3	5	2.40%	9	4	1.80%	10	20	6.80%	4	70	5.50%	6
Life crisis, life problem, and its resolution	12	4.90%	6	18	6.00%	4	13	6.10%	4	5	2.20%	9	11	3.70%	8	59	4.60%	7
Spending time with family, kids, friends	7	2.90%	10	15	5.00%	6	13	6.10%	4	14	6.30%	5	6	2.00%	10	55	4.30%	8
Giving birth (and birth-related event)	8	3.30%	9	9	3.00%	8	11	5.20%	5	8	3.60%	8	7	2.40%	9	43	3.40%	9
Following a teaching and religious practice	12	4.90%	6	6	2.00%	9	5	2.40%	9	4	1.80%	10	16	5.40%	6	43	3.40%	9
Praying	4	1.60%	13	6	2.00%	9	13	6.10%	4	19	8.50%	3	1	0.30%	13	43	3.40%	9
Religion-conversion-related event or faith-confirming event	15	6.20%	4	4	1.30%	12	4	1.90%	10	10	4.50%	7	4	1.40%	11	37	2.90%	10
Career, graduation, and success	5	2.10%	12	16	5.30%	5	9	4.20%	7	3	1.30%	11	4	1.40%	11	37	2.90%	10
Miracle and supernatural event	8	3.30%	9	9	3.00%	8	6	2.80%	8	2	0.90%	12	3	1.00%	12	28	2.20%	11
Bad experience from previous belief and faith-crushing event	7	2.90%	10	5	1.70%	11	5	2.40%	9	0	-	-	7	2.40%	9	24	1.90%	12
Observing a religious practice, participating a religious ritual that centers around others	6	2.50%	11	3	1.00%	13	1	0.50%	12	0	-	-	11	3.70%	8	21	1.60%	13
Spiritual feeling: filled with holy spirit, being saved	4	1.60%	13	11	3.70%	7	1	0.50%	12	2	0.90%	12	1	0.30%	13	19	1.50%	14
General concept in religion	10	4.10%	7	3	1.00%	13	2	0.90%	11	2	0.90%	12	1	0.30%	13	18	1.40%	15
Near-death experience and accident	5	2.10%	12	7	2.30%	9	1	0.50%	12	0	-	-	3	1.00%	12	16	1.30%	16

Social support	4	1.60%	13	4	1.30%	12	0	-	-	1	0.40%	13	6	2.00%	10	15	1.20%	17
Other	34	14.00%		32	10.70%		23	10.80%		44	19.70%		27	9.20%		160	12.60%	
Total	243	100.00%		300	100.00%		212	100.00%		223	100.00%		295	100.00%		1273	100.00%	

Figure 1

Mean Scores by Memory Type and Religion for the Memory Characteristics

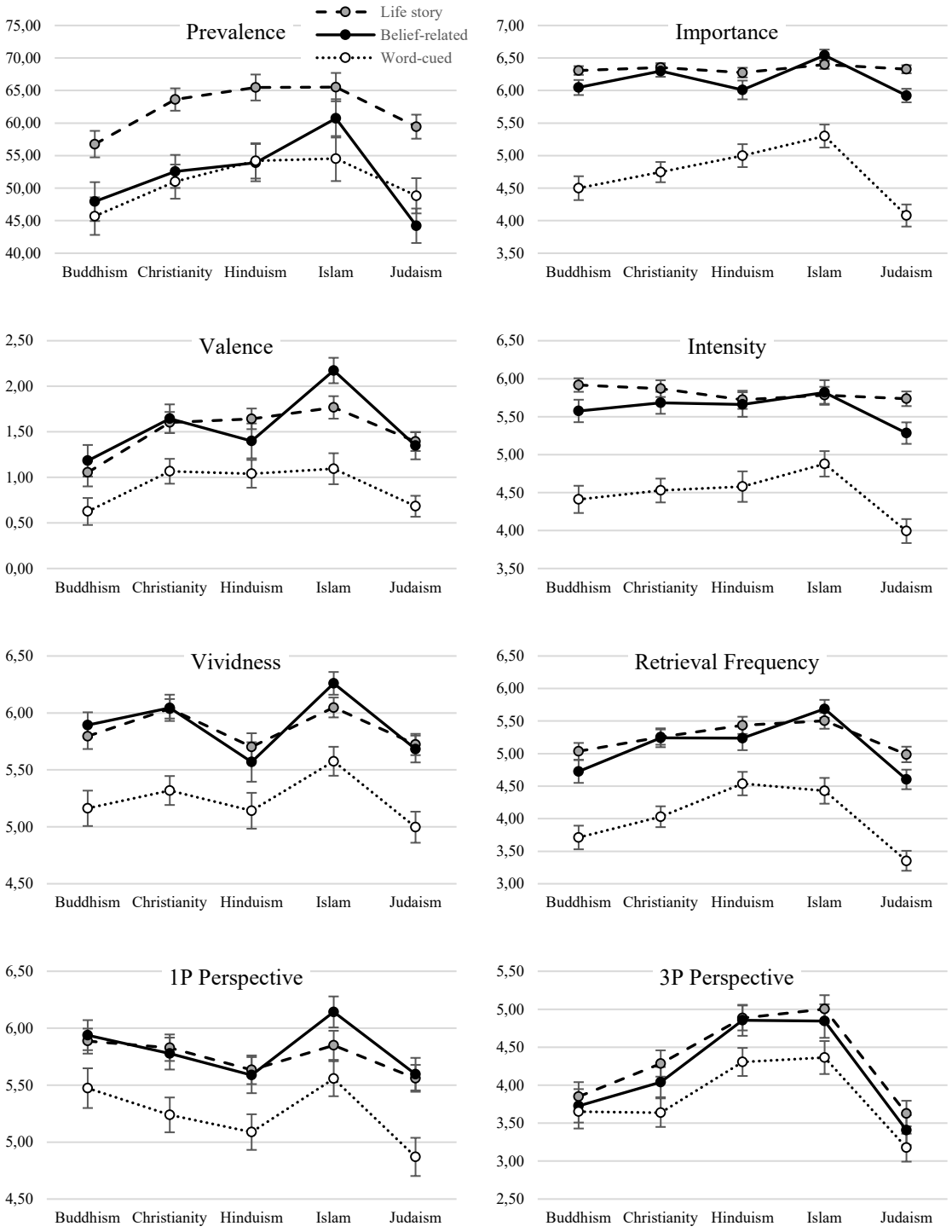
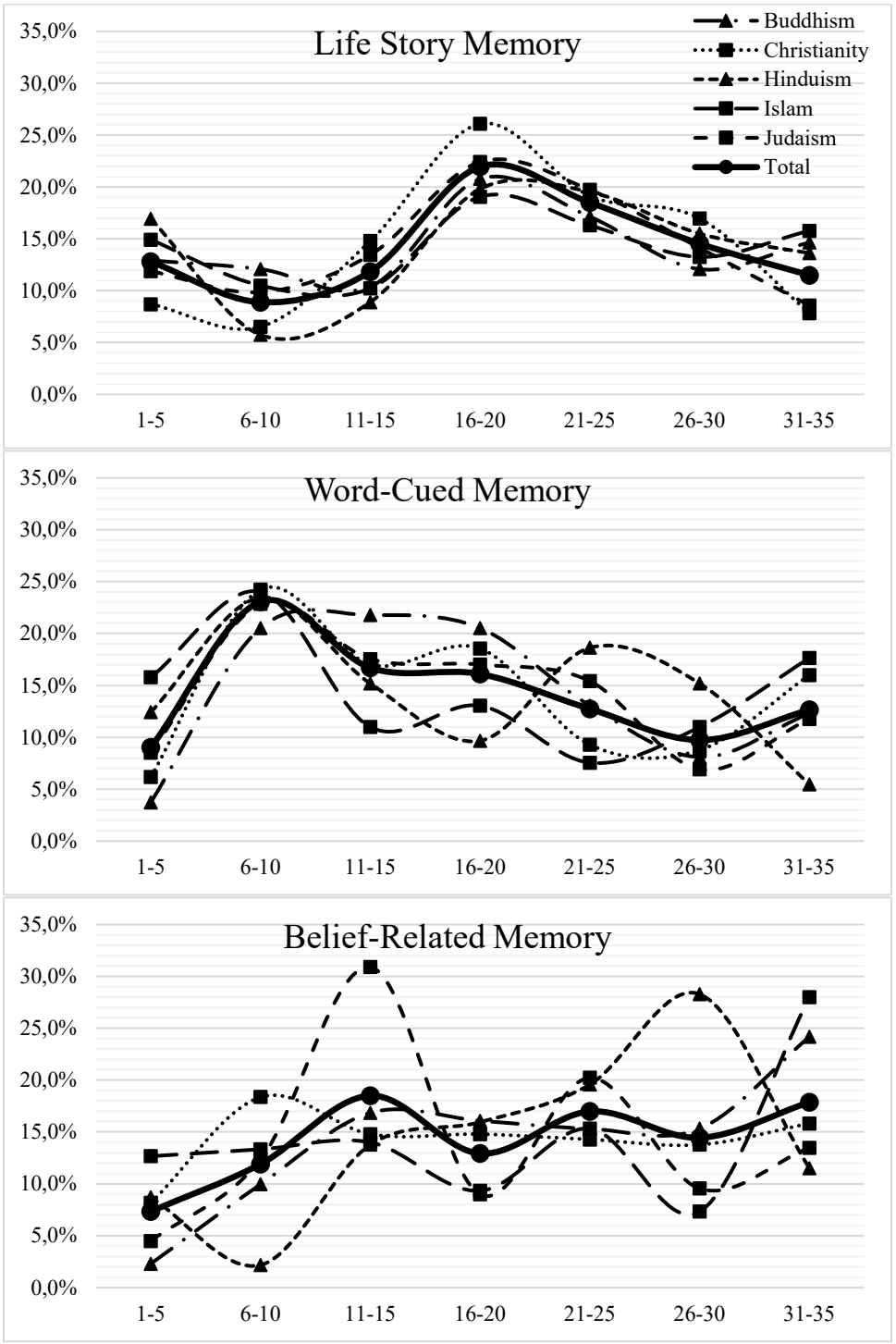


Figure 2

Temporal Distributions for Life Story, Belief-Related, and Word-Cued Memories



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Supplementary table S1

Post Hoc Comparisons of the Main Effects Using Bonferroni Adjusted Pairwise t-tests

Prevalence

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	62.17	0.88	-	10.29***	11.31***	1. Buddhism	50.14	1.98	-	-5.60	-7.73	-10.13**	-0.70
2. Belief-related	51.88	1.26		-	1.02	2. Christianity	55.74	1.75		-	-2.13	-4.53	4.90
3. Word-cued	50.86	1.30			-	3. Hinduism	57.86	2.11			-	-2.41	7.03
						4. Islam	60.67	2.04				-	9.43**
						5. Judaism	50.83	1.79					-

Importance

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	6.33	0.03	-	0.17***	1.61***	1. Buddhism	5.62	0.09	-	-0.18	-0.14	-0.46**	0.18
2. Belief-related	6.16	0.05		-	1.44***	2. Christianity	5.80	0.08		-	0.04	-0.28	0.36*
3. Word-cued	4.73	0.08			-	3. Hinduism	5.76	0.10			-	-0.32	0.32
						4. Islam	6.08	0.09				-	0.64***
						5. Judaism	5.44	0.08					-

Valence

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	1.49	0.06	-	-0.06	0.59***	1. Buddhism	0.95	0.11	-	-0.48*	-0.41	-0.73***	-0.19
2. Belief-related	1.55	0.07		-	0.65***	2. Christiaainity	1.44	0.10		-	0.08	-0.24	0.30
3. Word-cued	0.90	0.07			-	3. Hinduism	1.36	0.12			-	-0.32	0.22
						4. Islam	1.68	0.11				-	0.54**
						5. Judaism	1.14	0.10					-

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Intensity

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	5.81	0.05	-	0.20**	1.33***	1. Buddhism	5.30	0.12	-	-0.06	-0.02	-0.19	0.30
2. Belief-related	5.60	0.07		-	1.13***	2. Christianity	5.36	0.10		-	0.04	-0.13	0.36
3. Word-cued	4.48	0.08			-	3. Hinduism	5.32	0.12			-	-0.17	0.32
						4. Islam	5.49	0.12				-	0.49*
						5. Judaism	5.00	0.11					-

Vividness

Event~~y~~ Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	5.86	0.05	-	-0.03	0.62***	1. Buddhism	5.62	0.10	-	-0.18	0.15	-0.34	0.15
2. Belief-related	5.89	0.06		-	0.65***	2. Christianity	5.80	0.09		-	0.33	-0.16	0.33
3. Word-cued	5.24	0.06			-	3. Hinduism	5.47	0.11			-	-0.49*	0.00
						4. Islam	5.96	0.10				-	0.49**
						5. Judaism	5.47	0.09					-

Retrieval frequency

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	5.24	0.06	-	0.14*	1.23***	1. Buddhism	4.49	0.13	-	-0.35	-0.58	-0.72**	0.18
2. Belief-related	5.10	0.07		-	1.09***	2. Christianity	4.84	0.12		-	-0.23	-0.37	0.53*
3. Word-cued	4.01	0.08			-	3. Hinduism	5.07	0.14			-	-.014	0.76***
						4. Islam	5.21	0.14				-	0.89***
						5. Judaism	4.32	0.12					-

1p perspective

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	5.75	0.05	-	-0.06	0.51***	1. Buddhism	5.77	0.12	-	0.15	0.33	-0.08	0.42
2. Belief-related	5.81	0.07		-	0.56***	2. Christianity	5.62	0.11		-	0.18	-0.24	0.27

3. Word-cued	5.25	0.07			-	3. Hinduism	5.44	0.13			-	-0.41	0.10
						4. Islam	5.85	0.12				-	0.51*
						5. Judaism	5.34	0.11					-

3p perspective

Event Type	EMM	SE	1	2	3	Religion	EMM	SE	1	2	3	4	5
1. Life story	4.33	0.08	-	0.16*	0.50***	1. Buddhism	3.74	0.18	-	-0.24	-0.94**	-.099**	0.34
2. Belief-related	4.18	0.09		-	0.35***	2. Christianity	3.99	0.16		-	-0.69	-0.75*	0.59
3. Word-cued	3.89	0.09			-	3. Hinduism	4.68	0.19			-	-0.06	1.28***
						4. Islam	4.74	0.19				-	1.33***
						5. Judaism	3.40	0.16					-

CES

Event Type	EMM	SE	1	2	Religion	EMM	SE	1	2	3	4	5
1. Belief-related	5.15	0.07	-	1.36***	1. Buddhism	4.43	0.13	-	-0.10	-0.19	-0.52	0.59*
2. Word-cued	3.79	0.08		-	2. Christianity	4.53	0.12		-	-0.10	-0.43	0.69**
					3. Hinduism	4.62	0.14			-	-0.33	0.78***
					4. Islam	4.95	0.14				-	1.11***
					5. Judaism	3.84	0.12					-

Note. Mean Differences shown. EMM = estimated marginal mean. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

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Supplementary table S2

Frequencies and Percentages of Memories in Each Age Interval Across Religions and Memory Types

Age range	Religion											
	Buddhism		Christianity		Hinduism		Islam		Judaism		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Life story memory												
1-5	46	35.2%	40	20.4%	59	42.8%	54	36.0%	53	29.8%	252	31.9%
6-10	43	32.9%	30	15.3%	20	14.5%	38	25.3%	44	24.7%	175	22.2%
11-15	37	28.3%	68	34.7%	31	22.5%	37	24.7%	60	33.7%	233	29.5%
16-20	74	56.7%	120	61.2%	69	50.0%	69	46.0%	100	56.2%	432	54.8%
21-25	61	46.7%	88	44.9%	68	49.3%	59	39.3%	88	49.4%	364	46.1%
26-30	43	32.9%	78	39.8%	54	39.2%	48	32.0%	63	35.4%	286	36.2%
31-35*	52.15	39.9%	36	18.4%	47.45	34.4%	57.1	38.1%	38.29	21.5%	226.29	28.7%
Total	130.57	100.0%	196.00	100.0%	137.88	100.0%	149.97	100.0%	178.00	100.0%	788.99	100.0%
Belief-related memory												
1-5	3	2.3%	16	8.2%	12	8.7%	19	12.7%	8	4.5%	58	7.4%
6-10	13	10.0%	36	18.4%	3	2.2%	20	13.3%	22	12.4%	94	11.9%
11-15	22	16.8%	29	14.8%	19	13.8%	21	14.0%	55	30.9%	146	18.5%
16-20	21	16.1%	29	14.8%	22	16.0%	14	9.3%	16	9.0%	102	12.9%
21-25	20	15.3%	28	14.3%	27	19.6%	23	15.3%	36	20.2%	134	17.0%
26-30	20	15.3%	27	13.8%	39	28.3%	11	7.3%	17	9.6%	114	14.4%
31-35*	31.57	24.2%	31	15.8%	15.88	11.5%	41.97	28.0%	24	13.5%	140.99	17.9%
Total	130.57	100.0%	196	100.0%	137.88	100.0%	149.97	100.0%	178	100.0%	788.99	100.0%
Word-cued memory												
1-5	6	3.7%	12	6.2%	18	12.4%	23	15.8%	16	8.5%	75	9.0%
6-10	33	20.5%	47	24.2%	34	23.5%	35	24.0%	43	22.9%	192	23.1%
11-15	35	21.8%	33	17.0%	22	15.2%	16	11.0%	33	17.5%	139	16.7%
16-20	33	20.5%	36	18.6%	14	9.7%	19	13.0%	32	17.0%	134	16.1%
21-25	21	13.1%	18	9.3%	27	18.6%	11	7.5%	29	15.4%	106	12.7%
26-30	13	8.1%	17	8.8%	22	15.2%	16	11.0%	13	6.9%	81	9.7%
31-35*	19.79	12.3%	31	16.0%	7.92	5.5%	25.7	17.6%	22.15	11.8%	105.21	12.6%
Total	160.79	100.0%	194	100.0%	144.92	100.0%	145.7	100.0%	188.15	100.0%	832.21	100.0%

*Counts in the 31-35 age intervals contain decimals because they are adjusted values.

Supplementary table S3

Means and Standard Deviations of the Characteristics of All Seven Life story, First Three Life story, and Belief-related Memories

Event characteristic	All 7 life story memories		First 3 life story memories		Belief-related memories	
	M	SD	M	SD	M	SD
Prevalence	62.01	18.34	67.22	22.94	51.45	26.46
Importance	6.33	0.62	6.28	0.77	6.16	1.03
Valence	1.49	1.16	1.46	1.51	1.54	1.54
Intensity	5.81	0.99	5.64	1.24	5.59	1.42
Vividness	5.87	0.93	5.45	1.29	5.89	1.17
Retrieval frequency	5.23	1.17	4.81	1.41	5.08	1.52
1P perspective	5.75	1.12	5.41	1.38	5.80	1.34
3P perspective	4.28	1.73	4.25	1.70	4.11	2.02

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Supplementary table S4

Comparisons of the Main Effects of Event Type Using All 7 Life Story Memories Versus First 3 Life Story Memories in 2 (Event Type) × 5 (Religion) ANOVAs

Event characteristic	Using all 7 life story memories				Using first 3 life story memories			
	F	*p*	η_p^2	Mean Difference	*F*	*p*	η_p^2	Mean Difference
Prevalence	70.26	<.001	0.140	LS > BR	115.83	<.001	0.212	LS > BR
Importance	14.50	<.001	0.033	LS > BR	5.29	.022	0.012	LS > BR
Valence	0.58	.447	0.001	LS = BR	0.97	.325	0.002	LS = BR
Intensity	12.16	<.001	0.027	LS > BR	0.30	.586	0.001	LS = BR
Vividness	0.36	.552	0.001	LS = BR	45.06	<.001	0.095	LS < BR
Retrieval frequency	5.92	.015	0.014	LS > BR	15.70	<.001	0.035	LS < BR
1P perspective	0.95	.329	0.002	LS = BR	31.09	<.001	0.067	LS < BR
3P perspective	6.25	.013	0.014	LS > BR	2.35	.126	0.005	LS = BR

Note. LS = life story memories, BR = Belief-related memories