Current Aging Science, 2021, *14*, 39-45

RESEARCH ARTICLE

Characteristics of Self-Defining Memories in Middle-Aged and Older Adults

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Abstract: ***Background*:** Self-Defining Memories (SDMs) are a specific type of autobiographical memory, which play a key role in the construction of personal identity.

***Objective*:** We investigated the characteristics of SDMs in elderly subjects. The originality of the present study is to compare our elderly group to middle-aged subjects instead of young adults, as previously reported in the literature, to understand the age-related modifications in SDMs.

***Methods*:** We recruited 41 elderly subjects with normal cognitive functioning and 37 middle-aged adults. They were matched for education level and verbal knowledge.

***Results*:** Older participants recalled the same number of specific memories than middle-aged participants. SDMs were predominantly constituted of episodic characteristics, with specific details, in both the groups. However, middle-aged subjects gave more integrative meaning of SDMs and more redemptive events than older participants. The two samples differed in three content dimensions (exploration/recreation, relationship contents, and not classifiable). As predicted, older participants reported memories that were more positive, on average, than the middle-aged participants' memories.

***Conclusion*:** Our study added some contributions to the understanding of the consequences of aging on the sense of self. Future research should explore the continuity of SDMs characteristics across the lifespan.

ARTICLE HISTORY

Received: March 12, 2020
Revised: May 26, 2020
Accepted: July 02, 2020

DOI:
10.2174/1874609813666201006142514

Keywords: SDMs, autobiographical memory, cognitive functioning, personal identity, education level, verbal knowledge.

1. INTRODUCTION

Remembering personal events creates meaning of these events [1, 2] that could serve adaptive functions [3, 4]. Numerous studies showed that the sense of identity is supported by a subtype of autobiographical memories called the Self-Defining Memories (SDMs). These memories involve recollections of highly significant memories that are vivid, emotionally intense, repetitively recalled, and concern central goals, main preoccupations, or unresolved conflicts [5]. SDMs can be described through several characteristics, including memory structure, integrative meaning, thematic content, affective responses to memory retrieval [5, 6], and tension [7]. As early adulthood is the period of identity construction, several studies have explored SDMs in young adults [6-11]. In one of the rare studies conducted in Europe, Lardi and colleagues [11] showed that 76% of SDMs were specific and 57% of SDMs contained integrative meaning--making statements. Contents of SDMs described mainly relationships (33%), achievement (28%), and life-threatening events (16%). Only a few studies have targeted SDMs in the elderly. Singer and cowriters [10] analyzed SDMs in adults (50 to 85 years) and compared this population to college students. In their study, participants were asked to write down five SDMs. These authors found that in older adults, SDMs were significantly less specific and contained more autobiographical arguments (learning a lesson, personal insights). In addition, they showed that emotional response to SDMs retrieval was more positive in older (mean= 65 years) than in younger adults (mean= 19 years). Some studies reported that older adults tend to remember the events of their lives more positively than younger adults [12-14]. In another study, par-

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1874-6128/21 $65.00+.00

ticipants were asked to report three SDMs [15]. Interviews were coded for several characteristics of autobiographical reasoning. McLean [15] reported that younger (mean= 21 years) and older adults (mean= 72 years) had different self--representations, with younger people constructing the self more in terms of change and transition, and older people constructing the self more in terms of stability with more thematic coherence. More recently, Martinelli and coworkers [16], with a slightly different task, observed that despite episodic memory deficits, older adults (mean age= 75 years) did not differ from young adults (mean age= 22 years) for the specificity of SDMs characterized by high episodicity. Other characteristics of SDMs were not examined.

These studies compared memories of elderly to undergraduates. However, the major psychosocial function of adolescence is identity development [17-19] and undergraduates are in a period of discovery, first-time experiences, or unique events. Indeed, emerging adulthood is marked by major events that build the self until it reaches certain stability. To our knowledge, no study has compared middle-aged and elderly participants. The midlife refers to the period of lifespan between young adulthood and old age. The definition of this period varies in studies, depending particularly on the cognitive tasks studied. Research on this period of life is relatively new as it is related to the increase in life expectancy. Many aspects of midlife are still being explored. Middle-aged rather than young participants would be more accurate as a control group because this population has experienced most of the events deemed to be central to the life story that usually occurs in early adulthood at the time of the reminiscence bump, i.e. between the ages of 10 to 30 [20]. Their central issues apply mainly to generativity, caring, and concern for others in the work and family spheres [21, 22]. Moreover, this period of life is special; most individuals in midlife are relatively healthy, but they are also assuming important changes in the physical and psychological plan [23]. For example, the middle-aged population is increasingly vulnerable to chronic disease and reduction of physical capacity. The psychological changes experienced in midlife are usually associated with positive changes [23]. These may include better emotional regulation [24], or a strong sense of mastery [25]. During middle-life peak, individuals are reaping the rewards of career,family, and their personal interests [26]. Thus, midlife people and elderly share more similar preoccupations than those of young adults. In the same vein, Pasupathi and Mansour [27] observed more explicit autobiographical reasoning in narratives from middle-aged and older adults than in younger adults.

In this research, our aim was to improve our understanding of age-related modifications in SDMs. Considering the developing complexity of self during the adolescence period; young adults represent a less pertinent comparison group than the middle-aged population that has already experienced major events of the reminiscence bump [20]. As previous research has demonstrated that the elderly have impairment in recalling specific or detailed memories, we hypothesized that SDMs in the elderly would display a lower level of specificity than in the middle-aged group. Due to the positivity effect, older adults place greater emphasis and process more thoroughly on positive emotions [28]. So, we hypothesized that the elderly would report more positive and less negative emotional responses to their SDMs than the middle-aged sample. McAdams *et al*. [29], reported contaminative and redemptive events in the stories of adults and McKay and cowriters [30] proposed that redemptive sequences reflect a healthy adjustment and adapted personal development. Furthermore, as meaning-making declines during the lifespan, because it is part of the process of directing the future [31], we hypothesized that older adults' SDMs, would less likely to contain integrative meaning.

2. MATERIALS AND METHODS

2.1. Participants

Two groups of healthy subjects, 41 elderly (21 women, 20 men) and 37 middle-aged adults (17 women, 20 men) without memory impairment, participated in the study. Their mean age was 70.7 years (range= 62-79) and 42.4 years (range= 31-55) respectively. The two groups were matched for education and verbal knowledge (Mill Hill vocabulary scale) [32]. The characteristics of these samples are presented in Table **1**.

Older adults were selected by their age, according to the WHO defined cut-off of the elderly population (> 60 years-old) and by their work status (retired). They were recruited through talks at community organizations, such as the local senior centers, clubs. They were all living independently in the community. Older participants were screened for cognitive impairment prior to participation with the Mini-Mental State Examination (M.M.S.E.) [33] (score> 27/30) (Table **1**). A list of medications associated with memory impairment was also used to exclude older adults from participation.

Table 1. Characteristics of middle-aged adults and older adults.

Characteristics	**Middle-Aged Adults (*n* = 37)**		**Older Adults (*n* = 41)**		-	-
-	***M***	**(*SD*)**	***M***	**(*SD*)**	***t***	***p***
Age (years)	42.4	(7.4)	70.7	(5.0)	-19.905	<0.001***
Education (high school level)	12.1	(2.6)	11.5	(3.3)	0.989	0.326
Mill-Hill MMSE	33.4 n.a.	(5.1) n.a.	35 29.1	(5.9) (0.9)	-1.256 n.a.	0.213 n.a.
n.a.: not available						

Participants with a history of neurological and psychiatric disorders (according to DSM-IV-TR criteria) were excluded from the study. To be included in the present study, participants had to be native French speakers. Participants with sensory deficits (vision or hearing) were asked to bring their aids to the research study.

2.2. SDMs

Three SDMs were collected through the SDMs questionnaire [9]. The task was presented with the verbal definition of an SDM, and its specific attributes. Thus, to be considered as an SDM, recollected events have to belong to one's personal memory event and to display specific attributes ([34] for more details). Thereafter, participants had to rate their emotions associated with each SDM at the time of recall on a 7-point rating scale (negative: -3 through -1; neutral: 0; positive: 1 through 3).

Each SDM was independently scored by two raters for specificity, meaning-making, and content, following the criteria proposed by Singer and Blagov [2], Thorne and McLean [35]. In the few cases, where the two ratings differed, the final rating was discussed and agreed by the two raters. Inter-rater reliability (Cohen's kappa) was good for all scores (k_s>.75).

2.2.1. Temporal Distance

We calculated the delay between the event and the present time (in years and months) to obtain a measure of the time frame (years between the described event and the retrieval day) for each SDM.

2.2.2. Specificity

A memory was coded as specific (score= 1) if it described an event that happened at a particular place and time and lasted less than a day. Non-specific (score= 0) SDMs included categorical (summaries or similar repeated events) and extended (events that are longer than a day) memories.

2.2.3. Content of SDMs

The content (the principal theme emphasized in the memory) of a SDM was evaluated using the classification proposed by Thorne and McLean [35]. Contents were distinguished into seven categories: life-threatening events (situations where the subject has been exposed to a deadly accident, assault, or severe physical or mental illness), recreation, relationships, achievement/mastery, guilt/shame, drug/alcohol abuse, and an "events not classifiable" (a narrative that did not fit well into the above categories).

2.2.4. Integrative Meaning

As described by Singer and Blagov [2], the integrative meaning of SDMs was coded in light of the assessment of what the event has taught the participant about himself or herself, someone else, or life in general. An event was considered to be integrated if the individual stepped back from the narration of the event and added a statement about the significance or meaning of the event for him or her (score= 1). In contrast, if the narrative event contained only the event description (without a meaning), it was considered as non-integrative (score= 0).

2.2.5. Tension

SDMs were also coded for the presence (score= 1) or absence of tension (score= 0) [7]. The tension was defined as an explicit reference to discomfort, disagreement, or unease during the narration of the event.

2.2.6. Affective Response

Participants rated the affective response while remembering the event on a 7-point rating scale (3= very negative, 0= neutral, 3= very positive). The valence (*i.e.*, positive, neutral, or negative) and emotional intensity (*i.e.*, the absolute value of the rating) of the affective response to each event was calculated.

2.2.7. Redemption and Contamination

Redemption and contamination were subsequently coded as present (1) or absent (0). A redemptive event had to contain an explicit and clear transformation in the story from an absolutely negative-affect state to an absolutely positive-affect one [22]. The negative state of the event had to be clear and explicit, and had to change into a decidedly positive situation or produce a positive outcome of some kind. A contaminative event had to contain an explicit transformation in the memory narrative from a demonstrably positive affective state to a demonstrably negative affective state.

2.3. Procedure

Participants were interviewed individually in a quiet environment. The experiment was introduced orally by informing participants that they would have to retrieve some important personal memories. They were also informed that identification and personal information will be coded to ensure confidentiality of the collected data. This research was conducted in accordance with the Helsinki Declaration and was approved by the local ethics committee (CERNI n°2017-044). All participants gave their written informed consent before inclusion in the study.

2.4. Statistical Analysis

Data were conducted using STATISTICA® version 13.0 for Windows. Two groups of healthy subjects were compared for socio-demographic variables, verbal knowledge, and SDMs' characteristics using independent t-tests.

3. RESULTS

3.1. Temporal Distance of SDMs

Older participants recalled memories that were more distant (years) from their current age than the middle-aged sample (respectively M = 37.62, SD = 13.79 vs M = 16.26, SD = 9.51; t_{76} = -7.88, p <0001). Mean age at the time of event

Table 2. Memory content percentages for middle-aged adults and older adults.

-	Middle-Aged Adults (*n* = 37)		Older Adults (*n* = 41)	
-	***M***	**(*SD*)**	***M***	**(*SD*)**
SDM content (in %) with:				
Life-threatening events	19.8	(22.8)	11.4	(16.0)
Exploration/recreation	8.1	(16.5)	20.3	(27.8)
Relationship events	45.0	(31.0)	20.3	(27.8)
Achievement events	18.9	(23.0)	23.5	(23.9)
Guilt theme	0.9	(5.5)	5.7	(14.7)
Drug, alcohol, or tobacco	0.9	(5.5)	0.8	(5.2)
Non-classifiable events	6.3	(13.2)	17.9	(21.2)

was higher for older participants than the middle-aged sample (respectively M = 33.13 SD = 9.33 *vs.* M = 26.17, SD = 5.33, t = -2.47; p = .016).

3.2. Specificity

Older participants recalled the same number of specific memories across the three SDMs than middle aged participants (respectively, M = 1.59, SD = 1.1; M = 1.38, SD = 1.1; t_{76} = -0.81, p = .421).

3.3. Memory Content of SDMs

The percentage of SDMs, according to their content is presented in Table **2**.

The two samples differed in three content dimensions. The number of SDMs characterized by exploration/recreation and not classifiable contents were lower for middle-aged participants than older participants (respectively M = .24, SD = .5 *vs.* M = .61, SD = .48; t_{76} = -2.33, p = .002 and M = .19, SD = .40 *vs.* M = .54, SD = .64; t_{76} = -2.86, p = .006). However, the number of SDMs characterized by relationship contents was lower for older participants than middle-aged participants (M = 1.35, SD = .40 *vs.* M = .54, SD = 64; t_{76} = -2.86, p = 0.006).

3.4. Integrative Meaning

There was a significant difference in integrative meaning of SDMs between middle-aged and older participants (respectively, M = 1.43, SD = 1.2 *vs.* M = .84, SD = 1.0; t_{76} = 2.54, p = 0.013).

3.5. Tension

A tension was reported more frequently in middle-aged participants than in elderly participants; the difference was significant (respectively, M = .92, SD = .9 *vs.* M = .37, SD = .7; t_{76} = 3.20, p = 0.002).

3.6. Affective Response

As predicted, older participants reported memories that on average were more positive (M = 1.51, SD = 1.3) than middle-aged participants' memories (M = .78, SD = 1.4; t_{76} = -2.40, p =.019). Additionally, older participants reported memories that were on average less negative (M = .76, SD = .9) than middle-aged participants' memories (M = 1.19, SD = .9; t_{76} = 2.13, p = .037).

With regard to emotional intensity of SDMs in age groups, we found significant differences between the two groups for negative memories. The intensity of negative responses was significantly higher in middle-aged participants than in older participants (respectively, M = 1.19, SD = .91 *vs.* M = .76, SD = .89; t_{76} = 2.13, p = .037), whereas the intensity of positive responses was significantly lower (respectively, M = 1.76, SD = .89 *vs.* M = 2.24, SD = .89; t_{86} = -2.41, p = .018).

3.7. Redemption-Contamination

The proportion of redemptive-contaminative events was low for the two groups. Middle-aged participants gave much more redemptive events (M = 9.0%, SD = 15.0) than older participants (M = 3.3%, SD = 10.0), the difference was significant (t_{76} = 2.01, p < .05). On the contrary, no significant difference was found for contaminative events (M = .9%, SD = 5.5 vs M = 2.4%, SD = 11.5).

4. DISCUSSION

To our knowledge, this research is the first to compare SDMs characteristics between older and middle-aged adults. There is much to learn about the latter group, as midlife remains the least studied period of the lifespan. First of all, in our results, SDMs were as specific in the elderly as in middle-aged participants. Integrative meaning and relationship contents were less observed in the elderly. Compared to middle-aged adults, the elderly population showed more leisure contents and more positive SDMs, but less tension and redemptive events.

Autobiographical memories of older adults show fewer episodic and more non-episodic elements than those of younger adults [36, 37]. Regarding SDMs, Singer and colleagues [10] found that SDMs recalled by older people were significantly less specific than those of college students. Contrastingly, Martinelli and co-workers [16] assume that SDMs of older adults consist of rich episodic memories, more central and more repetitively recalled events than other

memories. High episodicity suggests that older people can retrieve episodic memories better when they are highly self-relevant. In our study, older participants recalled the same proportion of specific memories as middle-aged participants. In fact, when we consider the proportion of specific events in our elderly group and compare it to the results of Singer and coauthors [10], we find a similar proportion of specific SDMs in those two elderly populations (52.6% *vs.* 45.4% respectively). The difference between these two studies is the control group, with middle-aged participants in our research and college students in Singer and coauthors' study (46% of specific SDMs *vs.* 73.8% respectively). These results highlight that middle-aged participants are an impressive comparison group.

Furthermore, we observed less integrative meaning of SDMs for older participants when compared to middle-aged ones. We also found less integrative meaning in our elderly group compared to Singer and co-workers [10] (28% vs. 46% respectively). This difference might come from the testing circumstances; in Singer and colleagues' study [10], questionnaires (self-reported) were posted by mail to participants or were handed in person. This methodology might constitute a selection bias, partially explaining the difference between the two studies. In our study, the difference between the elderly and middle-aged suggests a different analysis of life's events. Older adults are less in the analysis of past events, perhaps because they do not seek to draw lessons from the past to anticipate the future [31]. Indeed, SDMs are important to plan the future and ground the self [38], and integrative meaning is necessary to project oneself into the future. The elderly population might not project themselves into the future as the middle-aged population does. Furthermore, middle-aged participants are more into thinking about themselves as a time for reflection. In middle-life, people look back to see what has come before or to evaluate what has been accomplished and to look ahead to determine what comes next or remains to be done [23]. Consolidation and integration of memories in a coherent life story extend through middle age [39]. Habermas and co-workers [37] found an increase of search for meaning (interpretation, life story integration) in middle adulthood, not for the elderly. Another aspect to take into account to interpret the differences in meaning responses between groups, is the possible impact of the cultural differences (North American *vs.* French). Furthermore, our elderly participants had a mean of 11 years of education versus 17 years to Singer's participants.

We found that SDMs in older adults referred more to leisure and not classifiable contents and less to relationships than middle-aged ones. Thus, the concerns of these two groups appear different. Older adults' memories focus on leisure contents, which would be related to their current social status once retired. Therefore, in the middle life period, the most important concern seems to be relationships with friends and family, consistently with a younger population [11].

Regarding the emotion and tension dimensions jointly, we found that older adults reported memories that, on average, were more positive, less tensed, and less intense than the middle-aged participants' memories. Older adults place greater emphasis and process more thoroughly on positive emotions: this phenomenon is known as the positivity effect. Positive autobiographical memories of older adults are also more long-lasting and fade slowly [28]. Thereby, elderly adults would favor positive emotions, bringing them immediate gratifications over negative emotions, which would no longer be useful to build and invest in the future. The positive emotions do not result from a congruence effect to the mood [40]. Middle-aged adults tend to process negative information more thoroughly than positive information and weigh negative information more heavily in impression formation and memory. With age, positive memories become more sustainable and are accessible for a longer time than negative memories, whereas the reverse phenomenon is observed among younger participants [41]. Moreover, young participants exhibit higher levels of current stress that might contribute to more negative responses to their memories [10].

Another result of the present study concerns the fact that older participants gave less redemptive events than middle-aged participants. This characteristic might be linked to the emotional aspect of SDMs. There are two possible explanations: the first assumes that SDMs might have been a negative memory in the past that has already shifted to positive memory due to the redemption process; the second assumes that elderly participants had more positive SDMs that cannot be redemptive. These explanations are in accordance with the positivity effect observed in the elderly. In the middle-aged population, the redemptive self is a particular kind of life story often found in middle life American adults to understand their own development [21]. Redemptive sequences reflect a higher level of psychological adjustment and personal growth [31]. The middle life period requires psychosocial adjustments and redemption sequences can be a narrative strategy that is similar to benefit-finding in the face of adversity [21]. Redemption would provide the hope of a better future.

CONCLUSION

Our study added some contributions to the understanding of the consequences of aging on the self, but some limitations of our work should be acknowledged. The first limitation would be the absence of an administrative task in our study because impairment in this domain has been previously reported as a potential confounding factor in autobiographical memory evaluation and meaning-making [42]. Moreover, El Haj, Gallouj *et al*. [43], demonstrated that the updating ability (but not shifting and inhibition) is positively correlated with the ability to produce SDM in normal aging. A second limitation would be that middle life is a broad period and implies many potential events and personal changes. Future research should explore the continuity of SDMs characteristics across the lifespan. A longitudinal design would allow examining reciprocal relations between SDMs and personality change over the course of life.

ABBREVIATION

SDMs = Self Defining Memories

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research was conducted in accordance with the Helsinki Declarationt and was approved by the local ethics committee (Comité d'Ethique pour la Recherche Non Interventionnelle, CERNI no. 2017-044, Université de Toulouse, France).

HUMANS AND ANIMALS RIGHTS

No animals were used in this study. All human procedures were followed in accordance with the Helsinki Declaration of 1975 as revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

CONSENT FOR PUBLICATION

Written informed consent was obtained from participants prior to the commencement of study procedures.

AVAILABILITY OF DATA AND MATERIAL

Not applicable.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

We are grateful to Laetitia N'dong and Margot Domange for their contribution to testing participants.

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