Evoking Episodic and Semantic Details with Instructional Manipulation During Autobiographical Recall

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Field Code Changed

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Abstract

Older adults tend to describe experiences from their past with fewer episodic details, such as spatiotemporal and contextually specific information, but more non-episodic details, particularly personal semantic knowledge, than younger adults. While the reduction in episodic details is interpreted in the context of episodic memory decline typical of aging, interpreting the increased production of semantic details is not as straightforward. We modified the widely used Autobiographical Interview (AI) to create a Semantic Autobiographical Interview (SAI) that explicitly targets personal (P-SAI) and general semantic memories (G-SAI) with the aim of better understanding the production of semantic information in aging depending on instructional manipulation. Overall, older adults produced a lower proportion of target details than young adults. There was an intra-individual consistency in the production of target details in the AI and P-SAI, suggesting a trait level in the production of personal target details, or a consistency in the narrative style and communicative goals adopted across interviews. Older adults consistently produced autobiographical facts and self-knowledge across interviews, suggesting that they are biased towards the production of personal semantic information regardless of instructions. These results cannot be easily accommodated by accounts of aging and memory emphasizing reduced cognitive control or compensation for episodic memory impairment. Nevertheless, future work is needed to fully disentangle between these accounts.

Keywords: autobiographical memory, episodic memory, personal semantic memory, aging, retrieval

Public Significance Statement

Older adults produce an excess of semantic details when asked to describe specific events from their past. To better understand this phenomenon, we introduced a Semantic Autobiographical Interview that targets personal and general semantic memories alongside episodic memories with instructional manipulation. Our findings indicate that the increased production of semantic details in aging reflects a shift in narrative style in remembering the past rather than merely an episodic memory deficit.

Introduction

Autobiographical remembering varies on a continuum from highly detailed episodic memories to more abstract and general forms of personal semantic knowledge (Conway, 2009; Irish & Piguet, 2013; Renoult et al., 2012). Several memory tests allow a naturalistic evaluation of human memory via the recall of personal narratives, typically instructing participants to recall specific past events (e.g., "I remember the last time I went on campus before lockdown"; e.g., Kopelman et al., 1989; Levine et al., 2002; Williams & Broadbent, 1986). Although the instructions require participants to recall unique events, the narratives usually include not only episodic details (e.g., "there was a blue table on the left") but also non-episodic information, such as personal knowledge about one's life circumstances (e.g., "I used to cycle to campus") or general knowledge about the world (e.g., "Covid hit the world in 2019"; Renoult et al., 2020; Strikwerda-Brown et al., 2019).

Research on aging using these naturalistic tests reveals that older individuals tend to describe experiences from their past differently than young adults (for a review, see Schacter et al., 2013). In particular, older adults' narratives of past events are characterized by a reduction in episodic details, such as spatiotemporal and contextually specific information, and an increase in non-episodic details, particularly semantic knowledge (e.g., Addis et al., 2008; Levine et al., 2002; St. Jacques & Levine, 2007; Piolino et al., 2002). While the reduced production of episodic details has been related to the decline in episodic memory typical of aging (for a review, see Simpson et al., 2023), the interpretation of the increased production of semantic details is not as straightforward. Crucially, as these semantic details are incidental or unprompted in the instructions, they cannot be taken to directly assess semantic processing capacity, as illustrated by the fact that they are sparsest in healthy young participants who presumably have intact semantic processing.

Various explanations for this shift from episodic to semantic detail production in aging have been proposed. Older adults may produce more semantic content in their narratives to compensate for episodic recollections that are impoverished due to the episodic decline typical of aging (Devitt et al., 2017; for a more general view on compensatory processes in aging see Festini et al., 2018; Reuter-Lorenz & Cappell, 2008). However, the connection between a decrease in episodic detail production and an increase in

semantic elements has not been consistently established. Some studies have not reported a decrease in episodic details but only an increase in semantic production in aging (e.g., Aizpurua & Koutstaal, 2015; Mair et al., 2017). Furthermore, a recent study showed how the relationship between the production of episodic and semantic details may vary in different episodic memory tasks (Mair et al., 2021). Therefore, although a compensatory strategy may be present, other mechanisms are likely to be involved.

Another potential explanation for the increase in semantic details production during autobiographical memory recall in aging suggests a general shift from fluid abilities, dependent on flexible cognitive control, towards more crystalized cognition in older adults, reliant on prior semantic knowledge (Craik & Bialystok, 2006; Spreng et al., 2018; Turner & Spreng, 2015). Support for this interpretation comes from studies that reported an association between the production of episodic details and measures of executive functions (e.g., Piolino et al., 2010; see Wilson & Gregory, 2018, for a review).

A related perspective on the relevance of reduced efficiency of cognitive control describes older adults' recollections as more cluttered and containing more non-target information due to a decline in inhibitory mechanisms (Amer et al., 2019; Amer et al., 2022; Hasher & Zacks, 1988). This decline would prevent older adults from inhibiting irrelevant information, such as semantic knowledge, which, according to a hierarchical view of the organization of autobiographical information, would be easier to recall than episodic information (Conway & Pleydell-Pearce, 2000). As a result, while young adults flexibly modify the content of their narratives depending on the specific task demands, older adults may struggle to adapt to the given instructions (Ford et al., 2014; Madore et al., 2014; Strikwerda-Brown et al., 2021).

Age-related differences in declarative memory and cognitive control are intertwined with different narrative styles (Bluck et al., 1999; Bluck et al., 2016; see also Schacter et al., 2012) and communicative goals (James et al., 1998; Madore et al., 2014; Trunk & Abrams, 2009) adopted by older adults. According to this perspective, content not directly probed by instructions reflects a broader approach to memory retrieval. Older adults may include more *story-asides* to provide context to the listener (Bluck et al., 2016) and to support the sense of self (Pasupathi & Mansour, 2006). The lack of specific details in older adults' narratives of personal events could thus also be attributed to different communication styles and goals, which may convey the transmission of general meaning (James et al., 1998; Trunk & Abrams, 2009).

A recent interpretation similarly reframes the age-related differences in autobiographical recall, shifting away from a deficit-centered approach to emphasize the positive transformations that come with age. This interpretation suggests a transition from highly specific to more gist-like retrieval in aging (Grilli & Sheldon, 2022). Focusing more on gist and general meaning may become natural in aging and in turn may promote the elaboration of narratives with a higher variety of topics in comparison to young adults (Sheldon et al., 2023). Accordingly, connections with other meaningful information may be prioritized over describing additional perceptual and contextual information related to the events. This is consistent with the observation that older adults' autobiographical memories are rich in meaningful autobiographical facts, which refer to knowledge about objective elements of our past, and in self-knowledge, referring to the more subjective aspects such as personality traits and attributes (Renoult et al., 2020).

Current Study

In the present study, we explored differences in autobiographical memory recall between young and older adults, focusing in particular on how they access and describe personal and general semantic memories when explicitly instructed to do so. Understanding whether the age differences documented when participants are required to describe events from their past also emerge when required to produce personal and semantic knowledge may help to disentangle the various explanations for the shift from episodic to more semanticized memories in aging.

To this end, we designed a new version of the Autobiographical Interview (AI; Levine et al., 2002) that directly targets personal and general semantic knowledge, alongside episodic memory, in different sections of the interview. In the AI, participants were instructed to describe in detail unique events from their past and then are probed with specific questions designed to elicit additional episodic information related to the event that was not spontaneously recalled. In the personal semantic section (P-SAI), participants were asked to provide a brief overview of what a specific period in their life was like for them, while in the general semantic section (G-SAI) they were instructed to describe what was going on in their community, country and/or in the world at that time. The specific probing included questions targeting specific types of personal knowledge and general knowledge, based on our taxonomy (Renoult et al., 2012; Renoult et al., 2020). Narratives were then scored to identify and categorize episodic information and

different subtypes of semantic details, such as general semantic knowledge and various types of personal semantic details (Renoult et al., 2020).

Our investigation focused on the occurrence of different types of details in the distinct sections of the interview. We were interested in the overall production of probed details, those consistent with the instructions, across interviews (for example, the presence of general semantic knowledge in the general semantic section of the interview, or episodic details in the classic autobiographical interview) as a measure of on-task or target recall. An elevation of non-probed details in older adults' narratives across sections would be consistent with a decline in cognitive control and inhibitory mechanisms (Amer et al., 2018; Amer et al., 2022; Spreng et al., 2018). A compensatory mechanism, such as an increased production of semantic information to overcome the impoverished episodic recollections (Devitt et al., 2017), would not be necessary to explain such findings, as the elevation in non-probed details may reflect a trait-like inability to adhere to task instructions regardless the type of memory recalled. Finally, in the semantic sections of the interviews, an absence of age difference, or an increase in semantic details in older adults, would be consistent with a preference towards the recall of more semantic and gist-like information when older adults remember the past (e.g., Grilli & Sheldon, 2022).

Method

Transparency and Openness

Scored data and analysis code are available at https://osf.io/srw2c/ (raw data cannot be released as these data cannot be fully anonymized). This study's design and its analysis were not pre-registered. Data were analyzed using the R statistical software version 4.1.2. (R Core Team, 2020).

Participants

Fifty-two young and older adults took part in the study. This sample size was based on previous work investigating autobiographical memories using different tasks and interviews (Acevedo-Molina et al., 2020; Levine et al., 2002; Madore et al., 2014; Piolino et al., 2002). Twenty-six young adults (19 female, 7 male) were undergraduate psychology students from the University of East Anglia recruited online and awarded with course credits. Twenty-six older adults (20 female, 6 male) were recruited through a local cohort and received an e-voucher as compensation for their participation. Participants were native English

speakers or had learned English as young children. Participants were screened for neurological, psychiatric and medical conditions known to compromise brain function and older adults completed the Addenbrooke's Cognitive Examination (ACE-III; Hsieh et al., 2013) as neuropsychological assessment for global cognition. In addition, participants completed a neuropsychological assessment for specific cognitive domains (see **Table 1** for demographic and neuropsychological tests results), including Wechsler's digit span backwards test (1987), the trail making test parts A and B (Reitan et al., 1958) and a word recognition and source memory test. These cognitive tests were completed using the online platform NeurOn (https://neuropsychology.online/). In the word recognition and source memory test, participants learned 15 everyday high-frequency words presented at various locations on the screen (top, bottom, right, or left side). Subsequently, they were asked to recognize these 15 learned words among a set of 15 new everyday high-frequency words. For words correctly identified as previously seen (correct recognition), participants were further asked to recall the specific location on the screen where each word was initially presented (source memory). The discrimination index (d'), measuring the ability to discriminate between "old" and "new" words, was calculated by subtracting the z-score of the false alarm rate from the z-score of the hit rate (d' = z[H] – z[FA]). After screening, one older adult was excluded as not meeting eligibility criteria (as scoring below the threshold of 88 for the ACE; Mioshi et al., 2006). Among the sample of young adults, two participants were excluded due to the poor audio quality of the recorded interviews. The final sample included twenty-five older adults (18 female, 7 male; one participant was born in China, one in Croatia and one in France, while the other participants in the UK) and twenty-four young adults (18 female, 6 male; one participant was born in Bulgaria, one in Colombia, one in Saudi Arabia, one in Singapore, while the other participants in the UK) that were matched in education level. Data was collected online between 2019 and 2022. All participants provided informed consent before undergoing the experiment. The study received ethics approval from the Research Ethics Committee of the School of Psychology at the University of East Anglia (Title: Examining personal semantics within the autobiographical interview; Project reference: 2019-0174-001555).

Materials

Life Chapter Listing and Selection

To facilitate access to episodic and personal semantic information and the elaboration of narratives about the past self, we used personalized life periods as cues to evoke narrative content (Conway & Pleydell-Pearce, 2000; for a similar approach, see Acevedo-Molina et al., 2020). Young adults were instructed to segment their entire life into personal chapters, while older adults were instructed to only focus on the last 30 years. Participants were instructed to list as many chapters as they wanted, giving a title and the beginning and end years, and provided that the chapters were between 1 and 5 years long. Before starting the interview, one recent life chapter including the last year (recent time period) and one chapter from 10 years ago (remote time period) were selected. If multiple chapters were listed for the same years (e.g., 10 years ago), participants were required to select the chapter they were more comfortable describing. Instructing participants to initially list more life chapters than those used as temporal cues in the interviews aimed to minimize the likelihood of reactivating relevant memories prior to the interview.

Autobiographical and Semantic Interviews

We administered three autobiographical and semantic interviews: the standard version with episodic cues (AI; Levine et al., 2002) and two new versions with personal and general semantic cues (P-SAI and G-SAI, respectively). The structure of the interviews followed the classic AI structure: free recall, general probing (to clarify instructions when necessary and encourage to provide more details), and specific probe (in which specific questions were asked to address distinct content categories). The specific probe phase was conducted after completing the free recall and general probe phases for recent and remote memories.

Autobiographical Interview (AI; standard version; Levine et al., 2002). Participants were asked to describe in detail a specific event from each life chapter selected. Specific probe cues elicited spatiotemporal, perceptual and emotional details regarding the event.

Personal Semantic Autobiographical Interview. Personal semantic memory, conceptualized as the knowledge of one's personal past (e.g., Renoult et al., 2012; Renoult et al., 2020), was probed for the same time periods used for the original AI. Participants were instructed to describe what was happening in their life during a particular chapter (instructions: "If you wanted to tell someone what the *early retirement*

chapter was like for you, what would you say?"; see Supplementary Materials for more detailed instructions). The specific probes were based on the taxonomy from Renoult et al. (2012) and targeted *autobiographical facts* (important facts, people and places), *repeated events* (weekly habits and routines, hobbies, other relevant activities) and *self-knowledge* information (personality traits and character, opinions and beliefs, preferences). The order of specific probes was randomized across participants (for full instructions, see Supplementary Materials).

General Semantic Autobiographical Interview. Participants were instructed to recall general semantic information, conceptualized as culturally shared general knowledge (e.g., Tulving et al., 2002). Specifically, participants were asked to describe what was happening locally in their country and/or in the world, focusing on public events, famous people and popular culture (instructions: "If you wanted to tell someone what was going on in your community, in the UK or in the world *during the last year*, what would you say?"; see Supplementary Materials for more detailed instructions). In the specific probe phase of the interview, participants answered specific questions about public events, famous people, trends and other popular things in the last year (for full instructions, see Supplementary Materials). As young adults were less exposed to general semantic information about the remote time period (which for them would typically correspond to the age of 10-12 years), we restricted this section of the interview to the recent time period (i.e., last year).

Design and Procedure

The experiment was conducted online over three sessions for older adults (first: collection of demographic and health information and life chapters; second: neuropsychological testing; third: autobiographical and semantic interviews) and two for young adults (first: collection of demographic and health information and life chapters; second: autobiographical and semantic interviews, and neuropsychological testing). Initially, participants received a link for completing a series of questionnaires on Qualtrics (Qualtrics International, Inc., Provo), including the listing of personal life chapters. After giving consent, participants completed the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), the Generalized Anxiety Disorder Assessment (GAD7; Spitzer et al., 2006), and the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) to control for potential group differences that could explain our pattern of

results in memory recall. Then, participants were instructed to list personal chapters from their life (see section on "Life Chapter Listing and Selection" for more information). Older adults were then contacted to complete a screening for global cognition (ACE-III test) and a neuropsychological assessment for specific domains on a video call on Microsoft Teams with the experimenter. Young adults completed the neuropsychological assessment for specific domains at the end of the autobiographical and semantic interviews. The choice of adding a session for older adults was to avoid fatigue due to the long testing sessions and to increase the time available in case of technical issues. One week after completing the online questionnaires, participants were invited to a video call on Microsoft Teams to complete the original AI and the personal semantic section of the Semantic Autobiographical Interview (P-SAI), administered in a counterbalanced order, followed by the general semantic section of the Semantic Autobiographical Interview (G-SAI), which was always administered last to avoid shifting between personal (episodic and semantic) content and general semantic content. At the beginning of the session, participants selected two chapters (a recent and a remote one) from those previously listed to be used as personalized temporal cues for memories in the different sections of the interview.

Details Scoring

All recorded interviews were automatically transcribed offline, using Word Online, and then manually edited by two researchers (G.M. and F.L.). Memories were scored following an adapted method described in the original AI study (Levine et al., 2002) and in a more recently described taxonomy of semantic details (Renoult et al., 2020). Transcripts of memories were segmented into details and classified as Episodic, Autobiographical Facts, Self-knowledge, Repeated Events, General Semantic, Repetitions or Other. Episodic details refer to unique events, including spatial-temporal, perceptual and emotional information. Autobiographical Facts include basic objective information about the personal past, objective elements of our past, resembling a skeletal autobiography. Self-knowledge reflects personality traits and character, including also personal opinions and beliefs. Repeated events represent common elements of repeated episodes. General semantic includes culturally shared knowledge. Finally, repetitions are considered as a separate category, while metacognitive statements are details that do not belong to a

specific category and are scored as “other”. A description of the scoring rules with examples is presented in **Table 2**.

Memories were scored by two independent raters (G.M. and F.L.), after completing a training on the AI scoring methodology and the new scoring scheme for semantic details, using the material provided by B.L. (the main developer of the AI). As an additional practice, eight memories from AI, eight from the P-SAI, and four from the G-SAI were scored by both researchers (G.M. and F.L.). The remaining AI, P-SAI and G-SAI memories were allocated to one of the scorers (G.M. or F.L.) in a pseudo random order ensuring equal representation of time periods and age groups among the assigned memories. Scorers were only given the list of memories with an ID, without indication of the age group. We used keyboard shortcuts to label the types of details and an automated approach to count the labelled details (to facilitate scoring and reduce human error, as suggested by Wardel et al., 2021). A script developed in MATLAB (Mathworks, Inc) for this purpose is available at https://osf.io/srw2c/.

Reliability of Scoring Protocol

To assess reliability, 16 memories for the original AI (16.33% of the total AI), 16 of the P-SAI (16.33%) and 8 of the G-SAI (16.33%) were randomly selected to be scored by both scorers, who were blind to which memories were used to calculate reliability. Inter-rater reliability was calculated separately for each interview using the Intraclass correlation coefficient (ICC; two-way, random effects model). Considering each details category separately, inter-rater reliability was very good to excellent across interviews (all ICCs for the AI > 0.86, all ICCs for the P-SAI > 0.85; all ICCs for the G-SAI > 0.83).

Data Processing and Statistical Analysis

Prior to the analysis, due to a positive skewness that is typical of narratives, we applied a winsorization procedure to all memories to rescale detail counts exceeding +/- 2.5 SD from the mean to be 2.5 SD from the mean (McKinnon et al., 2008; McKinnon et al., 2015). Following this procedure, 53 data points were winsorized, accounting for 3.1% of the scores (for older adults, 2.19%, 2.33%, and 1.6% of AI, P-SAI, and G-SAI scores, respectively; for young adults, 0.43%, 0.58%, and 0.58% of AI, P-SAI, and G-SAI scores, respectively). Detail counts were averaged across recent and remote memories, as the effect of time period was not significant.

The analyses reported in the main text focus on the cumulative recall scores (free recall, general probe, plus specific probe) to attain more robust estimates of group differences through increased observations and reduced error variance. In our study, the inclusion of specific probe questions ensured equivalence between episodic and semantic interviews concerning participants' comprehension of the instructional manipulation. As previous studies mainly focused on the AI's free recall and general probing sections, we also report analyses of spontaneous recall (including only the free recall and general probing sections) in the Supplementary Materials for cross-studies comparisons.

To account for the longer narratives consistently provided by older adults than young adults in the AI (M = 110 vs. 78.7 for older vs. young number of details, SD = 34.8 vs. 32.3; t(46.95) = 3.26, p = 0.003, d = 0.93, 95% CI [11.98, 50.53]) and P-SAI (M = 179 vs. 114 for older vs. young number of details, SD = 53.9 vs. 36.7; t(42.41) = 4.46, p < 0.001, d = 1.41, 95% CI [32.1, 85.1]), but not in the G-SAI (M = 66.3 vs. 55.6 for older vs. young number of details, SD = 29.4 vs. 23; t(45.18) = 1.42, p = 0.16, 95% CI [-4.47, 25.8]) we considered the proportion of details (i.e., details count divided by the total number of details) as our main measure of interest (see Supplementary Materials for analysis on details counts for cumulative and spontaneous recall, and proportions for spontaneous recall). "Target" detail scores for each interview were calculated for each participant by dividing the elicited detail category (i.e., episodic for the AI, personal semantic [autobiographical facts, self-knowledge, and repeated events] for the P-SAI, and general semantic for the G-SAI) by the total number of details. We assessed the production of target details across the three interviews, followed by differences in the elaboration of specific detail types (episodic, personal semantic general semantic, repetition, and other) within each interview. Rank-order correlations of the proportion of target details recalled across interviews were used to assess the consistency of individual differences in recall given the different instructional manipulations. Scores were analyzed in mixed (Score Type X Group) ANOVAs. In addition to counterbalancing the administration of the AI and the P-SAI, we checked for order effects including order as a factor in the analysis and found no significant effect (p = 0.12). Post-hoc comparisons involving detail type and group were run with paired-samples t-test and corrected for false discovery rate of multiple comparisons (Benjamini & Hochberg, 1995).

We also conducted a power analysis to compare the statistical power of our study with the original AI study (Levine et al., 2002) that also utilized the proportion of details as a measure of autobiographical recall. According to a G*Power analysis (Version 3.1.9.4; Faul et al., 2007), the statistical power for the proportion of internal details was high at 0.99 with 15 participants per group in Levine et al. (2002) study. Our study, with 25 older and 24 young adults, yielded a statistical power of 0.72, still indicating a moderate statistical power. Additionally, we calculated the statistical power for the proportion of semantic-on-total details from the re-analysis of external details conducted by Renoult et al. (2020). We focused on the spontaneous recall (free recall and general probe) as one of the studies included did not collect specific probe information (St. Jacques & Levine, 2007). The statistical power for the proportion of semantic details was 0.99 with 30 participants per group (from Renoult et al., 2020). Our study achieved a similar high statistical power of 0.96.

Results

Age Differences in the Production of Target Recall Across Interviews

As seen in **Figure 1**, participants generally oriented their narrative production to produce target details in alignment with instructions. There was a larger proportion of target detail production across groups for the AI and P-SAI, with the target detail production on the G-SAI being lower than for the other two AI versions. These observations were supported by a main effect of interview ($F(2,141) = 101.1$, $p < 0.001$, $\eta p2 = 0.59$, 95% CI [0.51, 1.00]) such that the P-SAI had a higher proportion of target details ($M = 0.78$, $SD = 0.05$) than the G-SAI ($M = 0.52$, $SD = 0.14$; $t(79) = 3.26$, $p < 0.001$, $d = 2.47$, 95% CI [0.12, 0.22]) and the standard AI ($M = 0.69$, $SD = 0.09$; $t(75.15) = 6.69$, $p < 0.001$, $d = 1.24$, 95% CI [-0.31, -0.22]). Young adults generally produced a higher proportion of target details ($M = 0.70$, $SD = 0.13$) than older adults ($M = 0.63$, $SD = 0.16$, $F(1,141) = 18.9$, $p < 0.001$, $\eta p2 = 0.12$, 95% CI [0.05, 1.00]), and this effect was qualified by an interaction between group and interview ($F(2,141) = 3.71$, $p = 0.03$, $\eta p2 = 0.05$, 95% CI [0.00, 1.00]), whereby older adults' target detail production was selectively lower for the G-SAI ($M = 0.46$, $SD = 0.12$) than young adults ($M = 0.58$, $SD = 0.13$; $t(46.24) = -3.37$, $p = 0.004$, $d = 1.24$, 95% CI [-0.20, -0.05]); there were no significant age difference for the AI and P-SAI (all *p-values* > 0.06), only a trend for older adults to include fewer target details ($M = 0.77$, $SD = 0.04$) than younger adults ($M = 0.80$, $SD = 0.05$) for the P-SAI

that did not survive correction (t(44.39) = -2.15, p = 0.06, 95% CI [-0.05, -0.002]; see **Figure 1**). Taken together, these results indicate that older adults modulated their narratives about personal past event (AI) and life chapters (P-SAI) according to instructions to a similar degree as younger adults, as shown by a similar production of target content in the AI and P-SAI. However, when prompted with general semantic cues, older adults had more difficulties in elaborating narratives rich in target general knowledge. Given the typical preservation of semantic memory in aging, and the ability to follow the instructions of the AI and P-SAI observed in the present study, the reduced target content in the G-SAI might be due to the less strict instruction given to participants in this section of the interview (see discussion section). As seen below, examination of specific categories of details revealed more nuanced age group differences.

We next explored whether young and older adults retained their rank in the proportion of target content across interviews. The within-group rank order correlations between the AI and the P-SAI were significant for the young (τ = 0.30, p = 0.04) and older adults (τ = 0.32, p = 0.03), whereas the within-group correlations between the AI and the P-SAI with the G-SAI were not significant (both *p-values* > 0.08). These findings revealed a moderate intra-individual consistency for both young and older adults for interviews evoking episodic or personal semantic content, suggesting a trait level in the production of target details and in how people tend to access their past (e.g., Palombo et al., 2018). These similarities in the production of target details may also be related to the particular narrative style and communicative goal consistently adopted across interviews targeting personal content (e.g., James et al., 1988).

Age Differences in Details Elaboration in Each Interview

Figure 2 and **Table 3** provide a finer-grain level of analysis concerning the categories of detail production across the three interviews. Episodic details were clearly modulated downward in the P-SAI and G-SAI relative to the standard AI. In both forms of the SAI, the production of semantic details broadly corresponded to the instructions, with elevated autobiographical facts and self-knowledge in the P-SAI, and elevated general semantic facts in the G-SAI.

Autobiographical Interview

Considering the proportion of the different sub-type of details in young and older adults episodic narratives, the ANOVA revealed a main effect of detail type (F(6,329) = 1593.7, p < 0.001, ηp2 = 0.97, 95%

CI [0.96, 1.00]), and a significant detail type x group interaction (F(6,329) = 5.55, p < 0.001, ηp2 = 0.09, 95% CI [0.04, 1.00]), but no main effect of group (p > 0.98). Older adults' episodic narratives included a marginally significant lower proportion of episodic details than young adults (M = 0.66 vs. 0.72, SD = 0.09 vs. 0.08 for young vs. older; t(44.5) = -2.23, p = 0.05, d = 0.70, 95% CI [-0.10, -0.05], a significant higher proportion of autobiographical facts (AF, M = 0.09 vs. 0.05, SD = 0.05 vs. 0.03 for young vs. older; t(40.02) = 3.71, p = 0.004, d = 0.97, 95% CI [0.02, 0.06]) and self-knowledge than young adults (SK, M = 0.02 vs. 0.01, SD = 0.01 vs. 0.01 for young vs. older; t(37.98) = 2.94, p = 0.02, d = 1.0, 95% CI [0.003, 0.02]), together with a marginally significant higher proportion of general semantic details than young adults (GS, M = 0.03 vs. 0.01, SD = 0.03 vs. 0.02 for young vs. older; t(41.67) = 2.35, p = 0.05, d = 0.45, 95% CI [0.002, 0.03]; see **Figure 2** and **Table 3**). Our findings are consistent with previous research that showed a tendency among older adults to recall past events with a lower proportion of target episodic details (as noted in Levine et al., 2002) and a higher proportion of off-task recall, particularly personal semantics, than young adults (as found in Renoult et al., 2020).

Personal Semantic Interview

We next analyzed the proportion of the different sub-type of details in young and older adults' narratives of life chapters in the P-SAI. The ANOVA on group differences revealed a main effect of detail type (F(6,329) = 565.13, p < 0.001, ηp2 = 0.91, 95% CI [0.90, 1.00]), and a detail by age group interaction (F(6,329) = 17.52, p < 0.001, ηp2 = 0.24, 95% CI [0.17, 1.00]), but no main effect of group (p > 0.98). Older adults produced a higher proportion of autobiographical facts (AF, M = 0.46 vs. 0.37, SD = 0.06 vs. 0.05 for young vs. older; t(46.29) = 5.78, p < 0.001, d = 1.63, 95% CI [0.06, 0.12]), general semantic (GS, M = 0.04 vs. 0.02, SD = 0.02 vs. 0.02 for young vs. older; t(42.64) = 3.12, p = 0.01, d = 1.0, 95% CI [0.01, 0.03]), and episodic details (M = 0.02 vs. 0.003, SD = 0.01 vs. 0.02 for young vs. older; t(29.69) = 3.31, p = 0.01, d = 1.07, 95% CI [0.005, 0.02]), but a lower proportion of self-knowledge details (SK, M = 0.19 vs. 0.26, SD = 0.04 vs. 0.05 for young vs. older; t(42.07) = -5.12, p < 0.001, d = 1.55, 95% CI [-0.10, -0.04]) and "other" details compared to young adults (M = 0.08 vs. 0.10, SD = 0.03 vs. 0.04 for young vs. older; t(40.68) = -2.26, p = 0.04, d = 0.56, 95% CI [-0.04, -0.002]; see **Figure 2** and **Table 3**). The finding that older adults' narratives were richer in autobiographical facts compared to those from young adults indicates a preserved recall of

abstracted forms of autobiographical memories in aging (Acevedo-Molina et al., 2020; Grilli & Sheldon, 2023) and a prevalence of autobiographical facts not only when describing past unique events (in the AI) but also when relating how past life chapters were for them in the P-SAI. The presence of more off-target content in older adults' narratives, like episodic details and general knowledge, despite their low numbers, aligns with previous findings of more story-asides and variety in narrative content in aging (e.g., Acevedo-Molina et al., 2020; Bluck et al., 2016; Sheldon et al., 2023).

General Semantic Interview

The analysis on the proportion of the different details types in the G-SAI revealed a main effect of detail type ($F(6,329) = 275.17$, $p < 0.001$, $\eta p2 = 0.83$, 95% CI [0.81, 1.00]), and significant interaction between age group and detail type ($F(6,329) = 13.31$, $p < 0.001$, $\eta p2 = 0.20$, 95% CI [0.13, 1.00]), but no main effect of group ($p > 0.98$). In particular, older adults' narratives included a lower proportion of general semantic (GS, $M = 0.46$ vs. 0.58, $SD = 0.12$ vs. 0.13 for young vs. older; $t(46.24) = -3.37$, $p = 0.005$, $d = 0.96$, 95% CI [-0.20, -0.05]), a higher proportion of self-knowledge (SK, $M = 0.24$ vs. 0.11, $SD = 0.13$ vs. 0.08 for young vs. older; $t(40.95) = 4.31$, $p < 0.001$, $d = 1.20$, 95% CI [0.07, 0.19]), as well as a lower proportion of "other" type of details ($M = 0.13$ vs. 0.20, $SD = 0.06$ vs. 0.09 for young vs. older; $t(41.08) = 4.31$, $p = 0.02$, $d = 0.91$, 95% CI [-0.11, -0.02]; see **Figure 2** and **Table 3**), as compared to young adults.

Given the commonly observed preservation of semantic memory in aging, the presence of additional content related to non-target information may reflect a tendency of older adults to enrich the recall of semantic knowledge with subjective elements like opinions and beliefs (Bluck et al., 2016; Sheldon et al., 2023), rather than a compensatory strategy. This presence of subjective content in older adults' narratives may also be attributed to adopting a different communicative goal than young adults (e.g., James et al., 1988).

Discussion

The analysis of narrative recall is a fruitful technique for probing naturalistic memory, especially in aging and age-related conditions. People normally embed heterogeneous non-episodic content – such as personal or general semantic information – when asked to recall specific events from their past. This incidental non-episodic recall tends to be more prominent in older adults. We controlled the nature of

intentional-versus incidentally-cued narrative content by manipulating the instructions of the Autobiographical Interview (AI; Levine et al., 2002) to elicit personal and general semantic content as opposed to episodic content, as is usually the case. Overall, participants modulated the content of their narratives depending on the instructions, such that episodic details were greatest on the standard AI, personal semantic details were greatest on the personal semantic section of the interview (P-SAI), and general semantic details were greatest on the general semantic section of the interview (G-SAI). We found a consistency in the proportion of target details between the AI and the P-SAI, reflecting a trait level in generating on-task details when people recall their past (e.g., Palombo et al., 2018) that could also be related to a consistent narrative style and communicative goal adopted across interviews targeting personal content (e.g., James et al., 1988). Proportion of details produced in the G-SAI did not track with the other AI versions, possibly due to methodological factors (see below).

Compared to younger adults, older adults' retrieval was biased towards personal semantic content (particularly autobiographical facts and self-knowledge), regardless of task instructions, reflecting a shift in narrative style rather than merely an episodic memory deficit. Additionally, there was evidence of age-related off-task content across all three interviews. Compared to young adults, older adults produced a lower proportion of internal episodic details, and a higher proportion of semantic details – particularly autobiographical facts – when remembering past events, which is consistent with previous work on autobiographical memory recall in aging (Renoult et al., 2020; Simpson et al., 2023). For the semantic autobiographical interview (SAI), age differences in the personal semantic narratives (P-SAI) mainly consisted of a higher production of autobiographical facts in older adults, but a lower proportion of self-knowledge details. In addition, older adults included a higher proportion of off-task recall, particularly general semantic and episodic details, compared to young participants. The elaboration of general semantic narratives (G-SAI) was characterized by older adults producing a lower proportion of general semantic details, but an elevated production of self-knowledge information, as compared to young adults.

Age effects in autobiographical recall are often interpreted from the perspective of reduced episodic memory. For instance, a compensatory account holds that older adults produce more non-episodic details to compensate for a reduced capacity to retrieve episodic details (e.g., Devitt et al., 2017). Such an

account is not easily accommodated by our findings. Indeed, off-task recall in aging was not only observed when asked to retrieve episodic memories, but was also evident in the P-SAI, where older adults produced more episodic details than younger adults (although both groups suppressed episodic details relative to other details, as shown by the fact that the majority of detail produced were personal semantics) and in the G-SAI, where they produced more self-knowledge content.

Rather than focusing on cognitive deficits, other accounts consider the possibility of older adults adopting different narrative styles and communicative goals, such as sharing an interesting story, including personal opinions and values (e.g., Hasher & Zacks, 1998; James et al., 1998). Accordingly, older adults' recall in our study was reminiscent of some of the observed age differences in the elaboration of narratives with more "story-asides" and off-topic speech (Bluck et al., 2016; Trunk & Abrams, 2009), which were also shown to vary more in their content as compared to young adults (Sheldon et al., 2023). What remains unclear and would deserve further study is the respective roles of a difficulty to inhibit irrelevant information (Amer et al., 2022), which would require the inclusion of an extensive test battery targeting executive functions and cognitive control processes, and a deliberate choice to include additional details to tell a good story and give more context to the listener (Mair et al., 2023).

Results of the finer-grained analysis of off-task detail categories are compatible with the proposal of a different narrative style in aging. Autobiographical facts and self-knowledge information were not only preferred by young and older adults to describe personal life chapters in the P-SAI, but they also attracted the most off-task utterances in response to instructions to elaborate unique events (AI) and general knowledge (G-SAI) in older adults. Autobiographical facts have been conceptualized as knowledge about objective elements of our past, resembling a schematic autobiography (Grilli & Verfaellie, 2014; Renoult et al., 2012; Renoult et al., 2020). On the other hand, self-knowledge refers to a summary of personality traits and character and thus is a more subjective form of personal semantic memory (Renoult et al., 2012). These findings suggest that older adults' off-task recall is not simply content excluded by instructions (i.e., general semantic details when given episodic instructions) nor a more general increase in repetitions or metacognitive statements. Rather, older adults appear to be biased towards the production of personal semantic information that is adaptive and meaningful to them (Grilli & Sheldon, 2022).

Given the typical preservation of semantic memory in aging (e.g., Allen et al., 2002; Spaniol et al., 2006), one might expect that, when asked to elaborate semantic knowledge in the G-SAI, the performance of older adults would not differ from that of young adults, especially with regard to the amount of target semantic details. Yet, older adults included a lower proportion of general semantic knowledge in the G-SAI compared to young adults. This result may be attributable to restricting time periods to the last year in the G-SAI, an experimental design choice governed by the fact that younger adults would have been disadvantaged for the production of general semantic information during the remote period, which occurred during their childhood. It is also the case that – unlike the P-SAI and the AI – the G-SAI instructions did not explicitly prohibit personal semantic or episodic details. Given these less strict instructions, older adults may have focused on their personal opinions and beliefs while talking about general knowledge, as they were not explicitly instructed not to do so. This tendency of older adults in interpreting their semantic knowledge with personal opinions and beliefs, whereas young adults preferentially focused on the objective aspects of general semantic knowledge was observed in previous studies (Hasher & Zacks, 1988; James et al., 1998), and could be explained as a reinterpretation of general semantics from the lens of the self (Rathbone et al., 2008). Of note, young and older adults did not differ in the amount of general semantic information as measured by detail counts (see Supplementary Materials). Rather, older adults included more personal semantic information, particularly self-knowledge. Finally, the G-SAI was always administered after the AI and P-SAI, both of which induced recall of personal information. It is thus possible that older adults may have had more difficulties in adapting to the new task demands that required them to describe general semantic knowledge (Strikwerda-Brown et al., 2021).

In this study, older adults consistently provided more details when recalling memories across all interviews (see analysis of details counts in Supplementary Materials). Older adults included more episodic details than young participants in the AI, which may appear to contrast with the well-established reduction in episodic details count in aging (Levine et al., 2002; Simpson et al., 2023). However, our pattern of results is not inconsistent with the age-related reduction in internal/episodic details when considering proportions of details (e.g., Levine et al., 2002; Miloyan et al., 2019), both in the spontaneous (free recall and general probe; see Supplementary Materials) and cumulative recall (including also specific probe). Older adults may

also have selectively benefited from the fact that this study was conducted online, at home. A recent paper (Badham et al., 2022) described a similar pattern of results and interpreted the absence of age difference in the amount of episodic details as related to the home environmental support, although the absence of age-related differences could be related to the different design of the task (written instead of verbal narratives; Pearson et al., 2023). Future work is needed to better understand the impact of the familiarity of the testing environment on participants' ability to recall episodic and semantic memories. More generally, it is important to take into account different measures for the elaboration of autobiographical memory when analyzing participants' narratives. Indeed, utilizing proportions or ratio scores may provide a more accurate reflection of autobiographical recall, particularly when variations in the overall length of narratives are evident (Lockrow et al., 2023). At the same time, considering the count of details together with the proportion of details produced is important while interpreting the results, as these measures should not be considered fully interchangeable (Lockrow et al., 2023).

Limitations

In exploring sub-categories of non-target details, those not directly probed by instructions, we had to work with relatively small number of details. Although this phenomenon was also observed in prior research (Renoult et al., 2020; Strikwerda-Brown et al., 2019; Strikwerda-Brown et al., 2021), a cautious interpretation of group differences is necessary. Nevertheless, this approach of scoring non-target details captures the mixture of information that participants include in autobiographical narratives and provides important insight into memory retrieval and narrative production.

The instructions given to participants in the general semantic interview may have been less restrictive than in the personal episodic and semantic interviews. Participants were explicitly and extensively instructed not to recall semantic information in the AI and episodic details in the P-SAI. In the G-SAI the instructions were less strict about not recalling personal information, as it was briefly mentioned to participants but not reiterated. In addition, the G-SAI was always conducted at the end of the experimental session. These methodological aspects could explain the lower production of target details in the G-SAI (general semantic information) in both young and older adults, compared to the other interviews. Future

studies could modify the instructions of the general semantic interview and randomize the presentations of the different sections (or conduct the different sections on different days) to overcome these limitations.

Future studies could also include a comprehensive battery of tests for assessing cognitive control and executive functions to better understand their role in the production of non-target content, not only in episodic but also in semantic narratives. As the present study did not include such comprehensive battery, we could not access an association between detail production, particularly off-task content, and executive control abilities.

Conclusion

We investigated the effects of aging on focused episodic and semantic detail production in narrative recall by manipulating instructions with a new measure, the Semantic Autobiographical Interview (SAI). Older adults' off-task recall was not confined to the overproduction of semantic details when prompted with episodic cues; relative to younger adults, they produced more episodic details when prompted with personal semantic cues, and more personal semantic details when prompted with general semantic cues. Overall, older adults demonstrated a consistent bias towards the production of autobiographical facts. These findings suggest that older adults' production of non-target semantic details under standard AI instructions are not solely due to compensatory strategies or to a general cognitive control deficit, but rather that they are biased towards the production of personal semantic information that is both adaptive and meaningful to them. Finally, this new version of the AI could be adapted to investigate different populations and time periods, including clinical samples with episodic and semantic impairments.

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Field Code Changed

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Table 1

Participants Demographic and Neuropsychological Assessment

	Older		Young	
	M	SD	M	SD
Age in years	**70.04**	5.73	21.29*	2.14
Education in years	13.76	2.3	13.46	1.64
ACE	95.92	2.74	-	-
PHQ-9	1.4	2	2.88	2.89
GAD-7	1	1.71	2.96	3.47
PSQI	4	1.89	4.36	2.5
Trail making B-A time	18.45	15.57	13.2	21.7
Digit span backwards	5.72	1.59	5.35	1.26
Episodic memory tests				
Recognition (d')	0.76	0.16	0.75	0.21
Source Memory (Hits)	0.85	0.13	0.84	0.14

Note. In the episodic memory test, the scores refer to the mean percentage of responses. ACE = Addenbrooke's Cognitive Examination; PHQ9 = Patient Health Questionnaire; GAD7 = Generalized Anxiety Disorder Assessment; PSQI = Pittsburgh Sleep Quality Index; d-prime was calculated as the difference between the z-score of hits and z-score of false alarm. * The difference between groups is significant ($p < 0.001$).

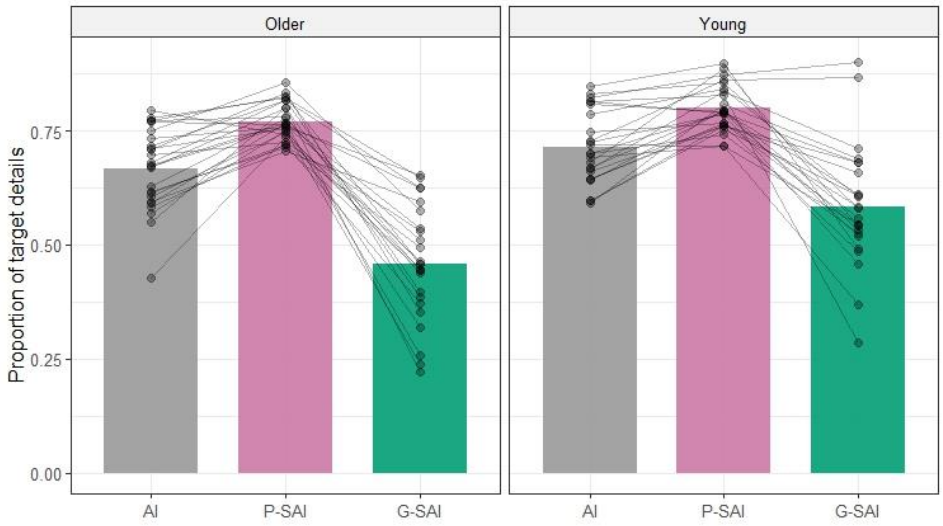
Table 2

Summary of Scoring Rules and Examples.

Detail Type	Definition	Examples
Episodic	Unfolding of the event, spatiotemporal, perceptual and emotional details	*Last week I went to the mountains; I was very happy; There was a blue table on the left.*
Autobiographical Fact	Basic (objective) information about personal life circumstances, factual element of unique episodes	*I live in Norwich; I have a younger sister.*
Self-Knowledge	Personality traits and character, opinions and beliefs	*I was very shy at that age; I am not fond of the weather in the UK*
Repeated Event	Common elements of repeated episodes	*I go climbing every Thursday; In the summer I cycle to the office every day*
General Semantic	Culturally shared knowledge (e.g., neighbor community, country, world)	*Last year Covid hit the world;*
Repetition	Information that has already been recalled	*As I said, Covid hit the world last year*
Other	Metacognitive statements and editorializing	*Let me think about it; I can try to guess, but no I don't remember anything else.*

Figure 1

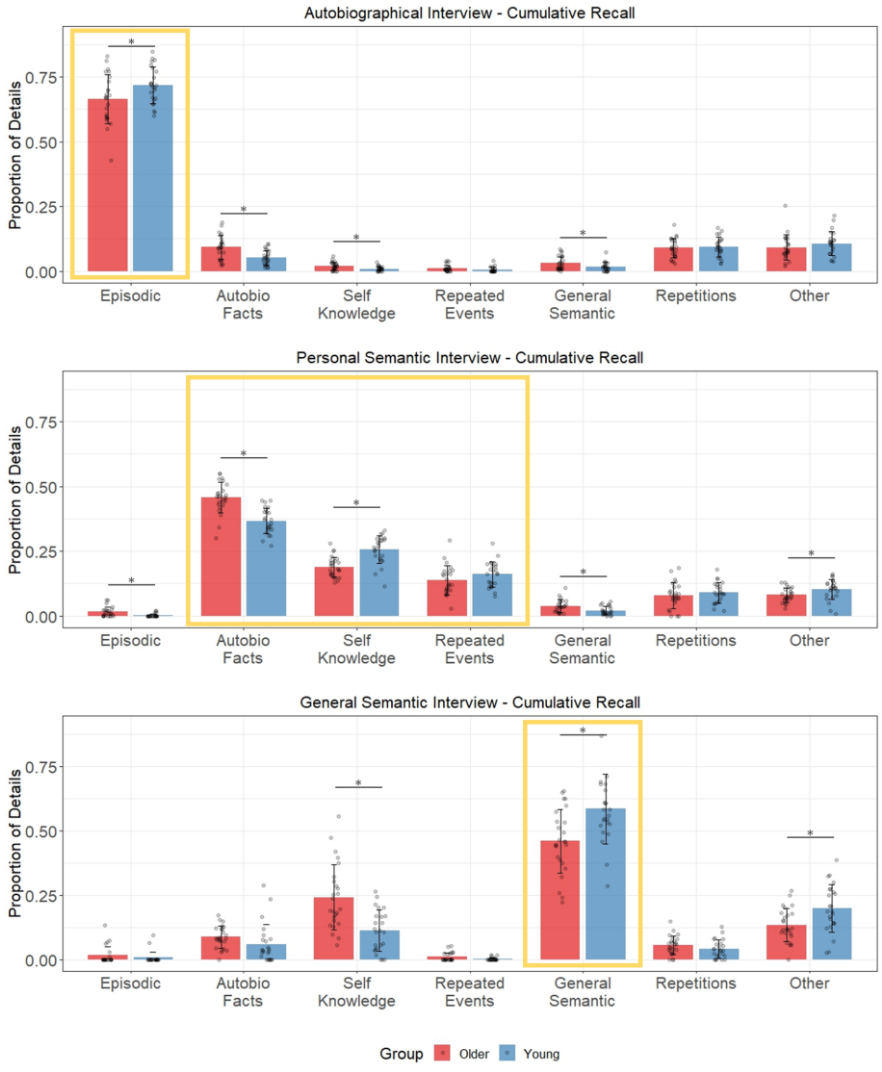
Proportion of target details during cumulative recall in young and older adults across interviews.



Note. Individual lines and dots represent participants. Target details refer to the information that was directly probed by instructions: episodic details in the AI; personal semantic details (autobiographical facts, self-knowledge and repeated events) in the P-SAI; general semantic details in the G-SAI. AI: Autobiographical Interview. P-SAI: Personal Semantic Interview. G-SAI: General Semantic Interview.

Figure 2

Proportion of detail types during cumulative recall in young and older adults, separately for the Autobiographical Interview, Personal Semantic Interview, and General Semantic Interview.



*Note: Bar plots display mean proportion values for each category of details produced by young and older adults during the cumulative recall (free recall, general probe and specific probe) of the Autobiographical Interview (AI), Personal Semantic Interview (P-SAI), and General Semantic Interview (G-SAI). Individual subjects are represented by dots, and the target details are highlighted within the yellow box. * refers to significant group differences (α = 0.05).*

Table 3

Proportion of details in young and older adults for cumulative recall (free recall, general probe and specific probe) in the AI, P-SAI and G-SAI.

	AI			P-SAI			G-SAI		
	Older	Young	p-value	Older	Young	p-value	Older	Young	p-value
Episodic	0.66 (0.09)	0.72 (0.07)	**0.05^**	0.02 (0.02)	0.003 (0.01)	0.01*	0.01 (0.03)	0.01 (0.02)	0.31
AF	0.09 (0.05)	0.05 (0.03)	0.004*	**0.46 (0.06)**	**0.37 (0.05)**	**<0.001***	0.09 (0.04)	0.06 (0.08)	0.17
SK	0.02 (0.01)	0.01 (0.01)	0.02*	**0.19 (0.04)**	**0.26 (0.05)**	**<0.001***	0.24 (0.13)	0.11 (0.08)	<0.001*
RE	0.01 (0.01)	0.01 (0.01)	0.17	**0.14 (0.06)**	**0.16 (0.05)**	**0.18**	0.01 (0.02)	0.002 (0.005)	0.06
GS	0.03 (0.03)	0.02 (0.02)	0.05^	0.04 (0.02)	0.02 (0.02)	0.01*	0.46 (0.12)	0.58 (0.13)	**0.005***
Repetitions	0.09 (0.04)	0.09 (0.05)	0.77	0.08 (0.05)	0.09 (0.04)	0.46	0.06 (0.04)	0.04 (0.03)	0.19
Other	0.09 (0.05)	0.11 (0.05)	0.33	0.08 (0.03)	0.10 (0.04)	0.04*	0.13 (0.06)	0.20 (0.09)	0.02*

Notes. Mean values (and standard deviations) of proportions are reported for young and older adults together with the p-value corrected for multiple comparisons. The values in bold are the targets details in each interview. AI = Autobiographical Interview. P-SAI: Personal Semantic Interview. G-SAI: General Semantic Interview. AF = Autobiographical Facts. SK = Self-Knowledge. RE = Repeated Events. GS = General Semantic. * refers to significant group differences ($\alpha = 0.05$). ^ refers to marginally significant group differences ($\alpha = 0.05$).