EPISODIC ENCODING: SPECIFICITY INDUCTION AND GENERATION OF DETAILS IN YOUNG AND OLDER ADULTS

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Abstract

The effect of an episodic specificity induction on the amount and type of details recalled from unique events was examined. Forty young adults and thirty older adults were asked questions about a recent event. Either an episodic specificity or a gist mode of thinking was induced during this brief interview. Then participants were shown a series of videos, given a filler task, and asked to recall the content of the videos in as much detail as possible. These memories were scored for total detail generation to determine whether older or younger adults recalled more episodic details. It was predicted that an episodic specificity induction would increase encoding and recall of episodic details relative to a gist-based induction, and there would be a greater increase in detail generation in the older adults relative to younger adults. It was found that young adults who received an episodic specificity induction generated more details than young adults who received a gist-based induction. In regard to episodic detail content, the episodic specificity induction selectively benefited the encoding of perceptual details. There was not a significant difference in memory between the older adult groups, indicating the episodic specificity induction did not alter encoding among older adults.

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The brain continues to learn as we age, regardless of how old we become. However, there are normal changes that occur with age, and one of these is less efficient memory. Glisky and Glisky (2002) state that in normal aging, declines can be seen in episodic memory (memory of autobiographical events), as well as source memory (contextual information like from whom one heard a story), working memory (short-term memory currently being stored), and prospective memory (remembering to perform a planned action). However, there are not evident declines in semantic memory (common knowledge and general facts), implicit memory (memory that does not require conscious thought), or procedural memory (memory for motor skills). Although older adults who are aging normally typically have difficulty with resource-demanding memory tasks that require self-initiation of both encoding and retrieval processes and retrieval of episodic details, gist information is still retained fairly well. Alzheimer's disease is a neurodegenerative disorder that causes even faster declines in the memory system, especially episodic memory, although semantic memory is affected as well (Glisky & Glisky, 2008).

Additionally, there is also a difference in our autobiographical memories. Specifically, there is a difference between autobiographical episodes and autobiographical personal semantic memories (Conway, 2005; Grilli & Verfaellie, 2014). Autobiographical episodes are the re-experiencing of specific personal information that is full of phenomenological details that may be closely related to unique events that are located in a specific time and place (Tulving, 1983; 1985). Autobiographical personal semantic memories do not involve re-experiencing, but instead contain information that includes general knowledge about one's personal life (i.e. one's name or age) (Cermak & O'Connor, 1983). Some theories have proposed that our autobiographical memories are organized hierarchically, with life-time periods (long periods of life), general events (repeated events), and event-specific knowledge (specific events) forming different levels

of memory organization (Conway, 2005; Grilli, 2018). According to this viewpoint, when we recall events from the past, we first access more general descriptions, allowing them to prompt us to help access more event-specific details (Melendez, Agusti, Satorres, & Pitarque, 2018).

Normal aging can affect the nature of autobiographical memory, and the quality of older adults' autobiographical recollections can differ from those of younger adults. For instance, older adults are less likely to retrieve unique events, instead generating general events or other more abstract content from higher levels of the autobiographical memory hierarchy (Ford et al., 2014) Also, Levine et al. (2002) found that when unique events are retrieved, there are differences between autobiographical recollections of older and younger adults. Older adults often have more difficulty in retrieving episodic contextual details, but this effect is seemingly nonexistent for semantic autobiographical knowledge.

With the decline of episodic memory that typically occurs with normal aging and the inevitable decline in abnormal aging, there are three main methods that can help slow the downward trajectory. These are encoding strategies, non-mnemonic methods, and retrieval processes. One of these encoding strategies is visual imagery, which encourages formation of distinct visual images of the material that needs to be remembered with an easily retrievable cue (such as a keyword or a feature of a face) that is often meaningful for the participant. Another encoding strategy is integrative encoding, which has the participant integrate both the item and its source at the time of encoding. This was seen in an experiment that demonstrated that older adults can answer an encoding question such as "How well does this particular chair fit in this room?" when the item and the location were integrated at the encoding stage, utilizing the idea of integrative encoding (Glisky et al., 2001). It has been suggested that older adults have the ability for good memory performance, but when they are not given appropriate task instructions, they

may not do so. Using integrative encoding may allow them to do so. Another encoding strategy is semantic elaboration, which has participants receive deep processing instructions, focusing on their well-retained verbal skills, rather than more simple learning instructions. Finally, some who want to attempt on their own find success in self-generated strategies such as mnemonic strategies to remember a set of numbers (Glisky & Glisky, 2008).

There are several non-specific and non-mnemonic methods of memory improvement that can be used to help with the downward trajectory of memory in aging. Intensive practice and studying can show improvement in memory performance in older adults, but the age difference typically is not eliminated. Additionally, many studies suggest that a lifestyle that is more socially, physically, and cognitively active may be associated with better cognitive outcomes (Glisky & Glisky, 2008). The time of day may also play a role in the memory difference between young and old adults. Older people tend to hit their peak of the day at an early part of the day, whereas younger adults will hit their peak later in the afternoon. Older adults tend to perform with significantly more accuracy when tested at their peak time of the day, the early morning (May et al., 1993). Furthermore, if given caffeine in the afternoon, which is not the peak time for older adults, then their memory performance substantially improves, relative to the non-caffeinated controls (Ryan et al., 2002). With the help of these methods to ameliorate the decrease in memory with aging, it could lead to a reduction in the symptoms of Alzheimer's disease.

The main method in the retrieval process is recollection, which is the process of remembering something or a specific memory. Recollection methods benefit those with largely preserved executive abilities (Glisky & Glisky, 2008). There is not an abundance of studies that focus on retrieval processes, but Madore et al. (2014) focused on allowing one to enter a sort of

retrieval mode mindset. This study tested twenty-four young adults and twenty-four older adults over two sessions. In the first session, the participants watched videos, completed a filler task, and then discussed the videos they watched. In this discussion, they were given either a cognitive interview induction, also known as an episodic specificity induction, where participants were told they were the expert and were asked to report the surroundings, people, and actions, or they were given a gist induction, where participants were asked to focus on their impressions, thoughts, and feelings regarding the videos. The participants then viewed eighteen pictures and either recalled a personal memory from the past few years that related to the picture, imagined a personal event within the next few years, or simply described what was in the picture. This happened again when they came back for their second session, where they were again asked about the eighteen pictures. They also watched a new video and were given whichever induction that was not done in the first session. This study found that older adults produced fewer internal (episodic) details and more external (gist) details than young adults across all three conditions: remembering, imagining, and picture describing. However, episodic details for remembering and imagining increased in both young and old adults with the episodic specificity induction. Thus, the hypothesis was supported that specificity induction targets the episodic mechanisms related to memory and imagination, while non-episodic mechanisms are related to picture description (Madore et al., 2014). This study addressed the idea that we can induce specificity after the videos are shown, which allows the participant to enter an episodic retrieval mode. However, there are two limitations to that study. First, we do not know if the details from past events that are recalled are accurate, or if the episodic specificity induction leads to embellishment of memories. Second, inducing episodic specificity at retrieval can only strengthen an existing

memory trace. If participants are given the induction before the videos, then it might be possible to encode and consolidate a very strong, detailed memory trace.

The purpose of the present study is to examine whether an episodic specificity induction enhances encoding and recall of specific details and events. The hypothesis is that an episodic cognitive induction will increase encoding and recall of episodic details relative to a gist-based cognitive induction, and the magnitude of this increase may be greater in older adults. Although both older and younger adults will show an increase in episodic details, older adults will have a greater recall of details when given the episodic specificity induction, due to the fact that younger adults may naturally use an episodic encoding mode, but older adults may need more encouragement to engage in this same frame of thinking because it requires more cognitive resources. This study was formatted similarly to the Madore et al. (2014) study, however rather than working on the retrieval of details, the goal was to work on the encoding of details.

Method

Participants

Forty undergraduate students between the ages of 18 and 25 attending the University of Arizona were recruited to participate. In addition, thirty older adults who are 65 years old or older were recruited as participants from a pool of Tucson community-dwelling healthy adults. Informed consent was obtained from the participants. Undergraduate students were compensated with credit for one of their classes, and older adults received financial compensation for their participation.

Design

This study is considered to be a 2 (age group) X 2 (induction) X 2 (detail type: episodic or gist) mixed design. There are two between-subjects variables: age (young (undergraduate) or

older (at least 65 years of age)), and the induction (control induction (gist induction) or experimental induction (episodic specificity)). The within-subject variable is detail type (episodic vs. gist). The dependent measure is the amount of details that the participant recalls.

Materials

The same short video clips were used for every condition. Participants were shown these clips and asked to recall twelve of them in detail. The same materials were used in each condition, however the induction given to the participant prior to watching the clips was different based on the condition they were assigned. No other materials were used.

Procedure

Twenty undergraduates were randomly assigned to either the control induction (gist specificity) or the experimental induction (episodic specificity). To begin, all participants were asked about an event from their life. It could be any event, but they had to be personally involved in the event and they had to have recollection of being personally involved. The event had to involve one other person, had to be at a specific time and place and the event had to have happened between one week and one year ago. Once the participant had thought of an event, they were given one of the two inductions.

For the episodic specificity induction, participants were asked to think about what types of things were in the environment and how they were arranged, as well as what they looked like. They were asked about where things were in relation to each other, what the scene/room/environment looked like, etc. Participants were also asked about people, including what the participant was wearing, what the other person was wearing, and the people's face/ physical features. Finally, they were asked about actions, what they were actually doing in the event and how they did these things. If a sequence of events was not given by the participant,

they were prompted with questions such as ‘What happened after that?’ or “What was the last thing that happened?’

For the control participants, they were asked about their general impressions of the event. They were asked questions such as ‘If you had to use one or two words to describe the event, what would they be?’, ‘Did you like the event?’, ‘Does this event remind you of anything from another period of time in your life?’, or ‘Would you describe the event as brief or long in duration?’, etc. in order to get a general idea for the event that they were picturing.

Next, both control and experimental participants moved to a computer screen and watched a series of videos. Each video had a title that appeared both before and after the video. The participant was then given a filler task and then was guided through a memory test. The researcher told them that they were testing their memory for the videos that they just watched. The researcher said, “Earlier you watched a video called ‘xxxx.’ Replay this video in your mind and describe to me all the details you are remembering.” This was completed for all of the videos shown to the participant until the task was complete. Participants were then asked about each video once more, being prompted with two questions. The first of these questions was specific to the surroundings of the video and where things were in relation to each other. The second question was in regard to the perceptual details, such as colors and other features of objects or people. This was completed for all of the videos shown to the participant until the task was complete.

The same procedure was copied for the older adults. While there was still an equal number of gist-inductions and episodic-inductions, the researchers double checked that each group matched in both age and education level.

Results

Figure 1 and Figure 2 show the mean number of episodic and other details generated per video pre- and post-prompting for young (Figure 1) and older (Figure 2) participants. Young and older adult participant data were analyzed separately with 2 (Induction group) x 2 (Detail type) ANOVAs. Although we predicted that older adults might benefit more from the episodic specificity induction relative to young adults, as shown below, there was no need to directly compare young and older adults.

Pre-prompting Findings

Young Adults

Young adults in the episodic specificity induction group generated more details than young adults in the gist-based induction group (main effect of group), $F\,(1, 38) = 6.76, p = .013$. Also, not surprisingly, episodic details were generated more than other details (main effect of detail type), $F\,(1, 38) = 339.63, p < .001$. There also was a significant interaction between group and detail type, $F\,(1, 38) = 6.33, p = .016$. However, young adults in the episodic specificity group generated more episodic and other details relative to young adults in the gist-based induction group, t's ≥ 2.03, p's $\leq .049$.

Older Adults

In contrast to young adults, older adults in the episodic specificity induction group did not generate more details than older adults in the gist-based induction group (no main effect of group), $F < 1$. There was a main effect of detail type, $F\,(1, 28) = 278, p < .001$, but not a detail type by group interaction, $F < 1$.

Post-prompting Findings

Young Adults

Similar to the pre-prompting findings, young adults in the episodic specificity induction group generated more details than young adults in the gist-based induction group (main effect of group), $F\ (1, 38) = 5.15, p = .029$. Also, as before, episodic details were generated more than other details (main effect of detail type), $F\ (1, 38) = 211.62, p < .001$. In this case, there was not a significant interaction between group and detail type, $F\ (1, 38) = 2.83, p = .101$.

Older Adults

Consistent with the pre-prompting findings, older adults in the episodic specificity induction group did not generate more details than older adults in the gist-based induction group (no main effect of group), $F < 1$, there was a main effect of detail type, $F\ (1, 28) = 116.47, p < .001$, and there was not a detail type by group interaction, $F < 1$.

Discussion

The present study tested whether there was an effect of an episodic specificity induction on the amount and type of details recalled from specific, unique events. Forty young adults and thirty older adults were compared to see if there was a difference in amount of details recalled depending on age. Glisky and Glisky (2002) stated that declines in episodic memory, as well as other types of memory, occur with age. Because less efficient memory tends to occur as someone ages, it was presumed that older adults would recall less specific details before being prompted, but that they would benefit from the induction more than the young adults. This was believed because of Ford et al. (2014) and the viewpoint that older adults are less likely to be able to retrieve unique events. Instead, they generate general events or more abstract content. We believed an episodic cognitive induction would increase encoding and recall of episodic details relative to a gist-based cognitive induction. We also believed the magnitude of this increase would be greater in the older adults.

We found that an episodic specificity induction can evoke an effective "encoding mode" in young adults. Younger adults who were given an episodic specificity induction were found to generate more details than young adults who received a gist-based induction. While both gist and episodic-induction groups generated more details after prompting, those with the episodic specificity induction did produce significantly more details. This is the first study to demonstrate that an episodic encoding mode can be induced relatively easily, with a brief interview of questions that guide individuals to reflect on complex events in a more episodically specific way.

However, we also found that this episodic specificity encoding mode is easier to induce in young adults relative to older adults. Indeed, we found that the difference between the two groups for older adults was not significant. The older adults produced almost equal amounts of details regardless of which induction group they were placed in. This is disappointing, as older adults are in particular need for episodic memory encoding strategies. It is possible that the episodic specificity induction was simply too subtle for the older adults. Perhaps a more elaborative, repeated induction might have been effective. Future research could address this by having participants describe multiple autobiographical memories as part of the induction period.

Surprisingly, the older adults also generated more details than the younger adults. This was found for both pre- and post- prompting. It is possible that education is one factor for the unexpected memory advantage in the older adult group, given that the older adults were more educated than the young adults in the present study. That being said, it is difficult to assume that this alone would account for the group differences. In the future, it could be valuable to include a third group of participants who have matched education levels with those of older adults but are still younger. Graduate students would likely be the best group of participants for a third group.

By including this, one could possibly determine whether it is the younger age or the education level that has more influence in one's generation of details.

Another possibility is that there were age differences in motivation. Is it noteworthy that some of our young participants may have only chosen to participate for extrinsic motivation in credit. However, older adults often expressed their desire to learn more about their memory, often seeming more intrinsically motivated. It is possible that they were simply more interested in the study and working harder to memorize the videos and the corresponding details. Furthermore, when signing up for an experiment, young adults were told they would be watching videos (thus having no idea about a memory task), whereas older adults were asked if they wanted to participate in a study for the Human Memory Lab (likely assuming their memory would be tested). This could have allowed them to take better note of all the details, thus allowing them to perform better on the following memory task.

In conclusion, the present study demonstrated that an episodic specificity encoding mode can be induced in young adults. Although we did not see a similar effect in older adults, future research can investigate whether changes in method improve the effectiveness.

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Figures

Figure 1. Mean number of details generated per memory by young adults in both pre- and post-prompting. Error bars depict standard error of the mean.

Figure 2. Mean number of details generated per memory by older adults in both pre- and post-prompting. Error bars depict standard error of the mean.

Figure 1

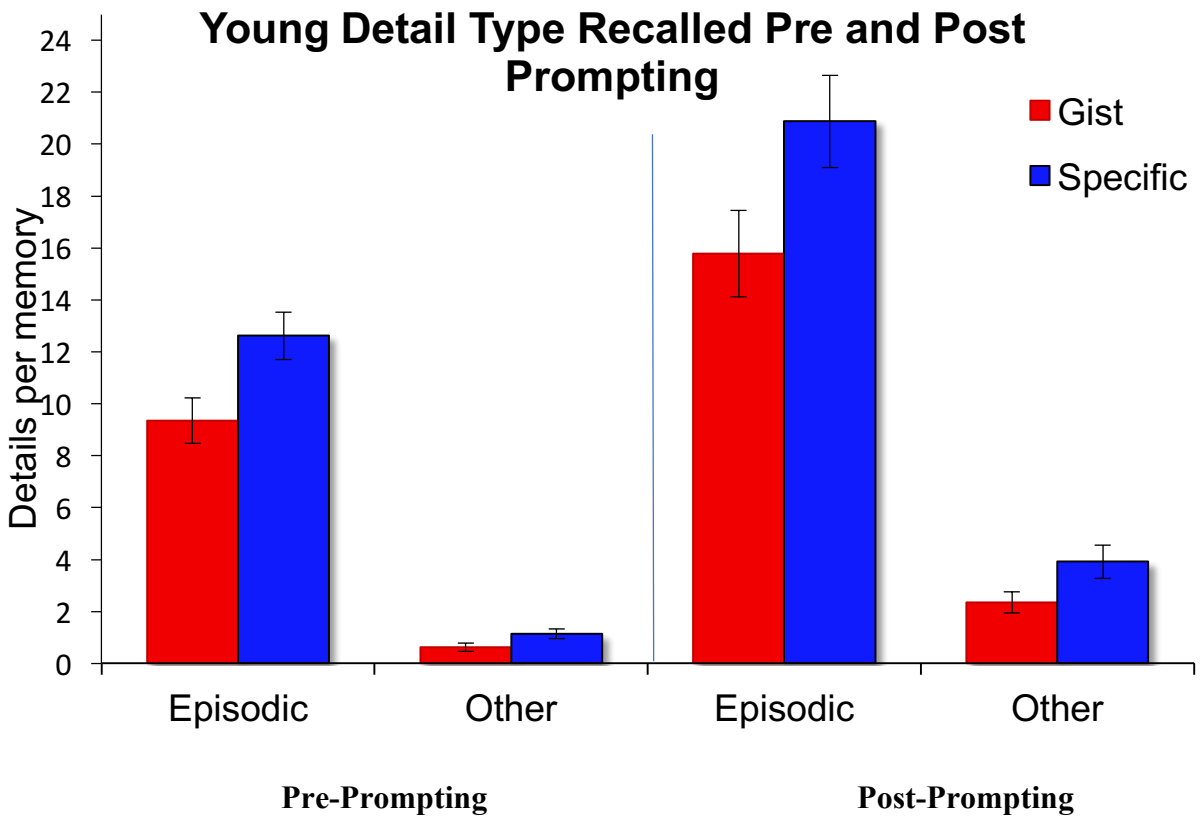
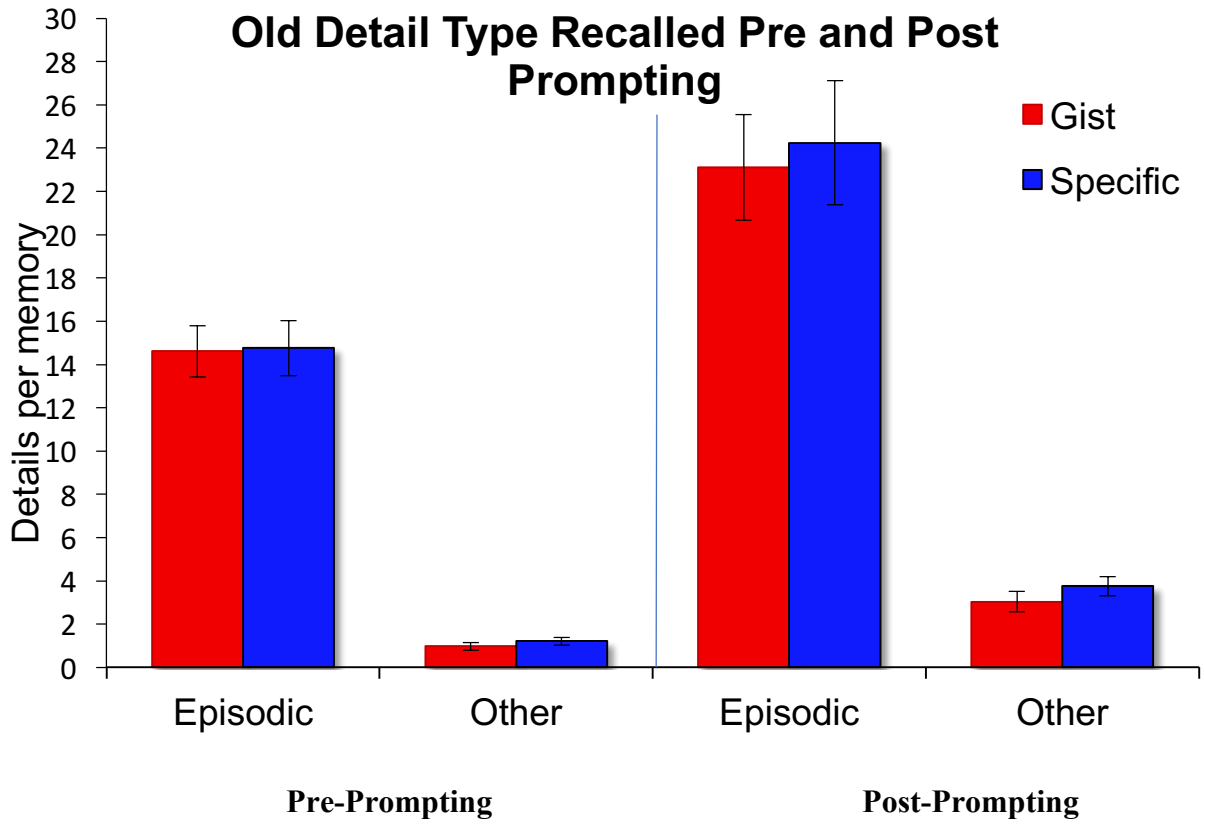

Young Detail Type Recalled Pre and Post Prompting
Gist
Specific
Details per memory
24
22
20
18
16
14
12
10
8
6
4
2
0
Episodic
Other
Episodic
Other
Pre-Prompting
Post-Prompting

Figure 2


Old Detail Type Recalled Pre and Post Prompting
Details per memory
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Gist
Specific
Episodic
Other
Episodic
Other
Pre-Prompting
Post-Prompting

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Statement of Roles and Responsibilities of All Group Members

I had the opportunity to work with Sedona Coste and Janet Landry on this thesis project. We all conducted the same research but had different areas of focus that our theses were centered around. This being said, all three of us divided the work up evenly throughout the testing time. We all tested participants, transcribed the recordings, and scored the transcriptions. We would take the total amount of work to do and divide it by three to assure fairness. Additionally, we all worked on the poster together, adding input and making charts while sitting together. Our actual thesis papers were all done individually, as our areas of focus did differ. Overall, the work to prepare for the actual write-up was a group effort.