

Impact of Encoding Strategy on Stimulus Type on Autobiographical and Semantic Memory

Pranavi Gokavaram¹

Priya Dsouza²

Sethu Lakshmi C V³

Swagini Nakashe⁴

Accepted: 20 May 2026

© The Author(s) 2026

Abstract

The self-reference effect (SRE) and the picture superiority effect (PSE) are two well-established memory phenomena, yet their interplay and developmental expression in adolescence remain underexplored. The present study examined the independent effects of elaboration type (autobiographical vs. semantic) and stimulus type (picture vs. word) on recall and recognition memory in a sample of 151 adolescents aged 13 to 16 years. A within-subjects design was employed in which participants encoded items under all four combinations of elaboration and material type. Due to the structure of the available data, which provided only marginal totals, a series of planned paired-samples t-tests with Holm–Bonferroni correction was conducted to evaluate five directional hypotheses. Results revealed that autobiographical elaboration produced significantly higher recall ($d = 0.32$) and recognition ($d = 0.33$) than semantic elaboration. Pictures were recalled significantly better than words ($d = 1.05$), but recognition of pictures and words did not differ ($d = 0.05$). Overall recognition performance substantially exceeded recall ($d = 2.69$). This is consistent with contemporary studies that these two forms of memory utilise overlapping neural networks while also existing along a continuum of specificity and context (Irish & Piquet, 2013; Sheldon et al., 2019; Tanguay et al., 2023; Rubin, 2021), autobiographical elaboration has a modest but reliable mnemonic advantage across both retrieval types. These findings further support the distinctiveness account of the PSE and dual-process theories of retrieval, demonstrating that the PSE is robust in recall but not in recognition, whereas the SRE confers a modest advantage across both retrieval modes. The study contributes data on these phenomena in an adolescent sample and highlights the need for future research examining the interaction between self-referential elaboration and stimulus distinctiveness.

Keywords: Autobiographical memory · Semantic memory · Self-reference effect · Picture superiority effect · Recall · Recognition · Adolescence

The study of human memory has long since captivated the minds of psychologists, particularly the question of why certain types of information are more easily remembered, or in more technical terms, encoded and retrieved than others. Two important and extensively researched phenomena in this domain are the Self-Reference Effect (SRE) and the Picture Superiority Effect (PSE).

However, before examining the SRE and PSE, it is necessary to establish the difference between two basic forms of memory that underlie the elaboration tasks in this study, namely, autobiographical (episodic) memory and semantic memory. The difference between the two was most influentially proposed by Tulving (1972) who stated that episodic memory refers to the recollection of personally experienced events in a particular time and place, while semantic memory encompasses general knowledge of the world, facts and concepts that are separate from the context in which they were initially learned. Tulving (1985) later introduced the concept of autonoetic consciousness which is the subjective sense of mentally re-experiencing a past event, as a main hallmark of

episodic retrieval, as compared to the noetic consciousness which is associated with semantic knowing. As Tulving (2002) put it, “Episodic memory is about happenings in particular places at particular times, or about ‘what’, ‘where,’ and ‘when,’” (p.3). He further explains that autonoetic consciousness, “...”, was used to describe the experiential “flavor” of remembering, or recollection; the latter was used to describe the conscious state that accompanies thinking about (knowing) the world,” (Tulving, 2002, p.4)

Although treated as distinct systems, contemporary research indicates significant neurological and functional overlaps between the two systems (Irish & Piquet, 2013; Tanguay et al., 2023). Neuroimaging studies reveal that both forms of memory engage a common bilateral network, however autobiographical recollection elicits a stronger and more widespread activation within this network, especially in regions associated with self-referential processing and spatial reconstruction (Tanguay et al., 2023; Sheldon et al., 2019). Tanguay et al. (2023) identified the regions encompassing this common network, which comprises of the frontal pole,

paracingulate and medial frontal cortex, middle and superior temporal gyrus, precuneus, posterior cingulate cortex, angular gyrus, and medial temporal lobe. In this study, the activity in these regions increased as memories became more personal and episodic, with autobiographical recall having the most pronounced effect. Additionally, Sheldon et al. (2019) highlighted the role of the hippocampus in reconstructing both the conceptual and perceptual details of one's personal memories, which further supports the role of spatial reconstruction in autobiographical memory. This pattern suggests that autobiographical and semantic memory are not entirely distinct but rather exist along a continuum of specificity and context (Rubin, 2021). This understanding informs the present study's comparison of an autobiographical elaboration, which requires participants to retrieve a specific personal incident related to the target stimulus, with semantic elaboration which involves using the stimulus in a sentence without referring to oneself. By directly contrasting the two elaboration tasks, the study provides a behavioral test of whether the additional self-referential and contextually specific processing inherent to autobiographical recall shows a mnemonic advantage beyond that provided by deep semantic processing by itself.

SRE postulates that information processed in regards to oneself, or referring to oneself, is better recalled than information processed by other methods (Symons & Johnson, 1997; Liu et al., 2023). PSE on the other hand, states that memory for pictorial depictions supersedes memory for verbal material, that is, a picture will be more easily recalled than words (Paivio & Csapo, 1973). While these effects are important in understanding memory, the precise cognitive mechanisms that underlie them remains a subject of debate and the relationship between these two has received little empirical attention. This review views the current literature on autobiographical elaboration and the picture-word memory distinction and examines their impact on recall and recognition.

The SRE is a mnemonic strategy that utilizes the unique organizational properties of the self-schema. A meta-analysis by Symons and Johnson (1997) confirmed the robustness of the SRE across studies and demonstrated that SRE encoding produces a consistent advantage in memory, over both semantic and other-referent encoding tasks. This study, however conceptualizes the self as a relatively stagnant and static cognitive structure with typical manipulations requiring the participants to judge adjectives in relation to themselves (e.g., "Does this word describe you?"). These initial studies establish the basic effect, however, they open the question of how narrative-based forms of self-reference such as the recall of a personal incident, may compare to other encoding strategies.

Further research has studied the neural substrates of this effect with an fMRI study by Wilbers and colleagues (2012), investigating whether autobiographical memory recall is social in nature. The study found that recall of autobiographical memories, as compared to non-autobiographical memories, were associated with the activation of the medial prefrontal cortex (mPFC), as was recall in the social condition as compared to the non-social

condition, however, interestingly both of these contrasts involved different regions within the mPFC which did not overlap with each other. The mPFC regions activated during autobiographical recall did not overlap with those engaged during social interaction, which suggest that autobiographical memory contains a unique self-referential process which is separate from social cognition. These findings highlight that the SRE is more nuanced than previously conceptualized.

Recently, developmental research has further highlighted the ontogenetic origins of the SRE. Wiesmann and colleagues (2025) studied the development of the self-reference effect in 18-month-old infants using ownership manipulation. The infants were presented with objects assigned either to themselves or to another, after which they were rested on their memory for these objects with mirror self-recognition serving as an index of self-concept emergence. Infants who recognized themselves in the mirror remembered objects assigned to themselves better than those assigned to the other. However, interestingly, another phenomenon emerged as well; in contrast, non-self-recognizers remembered the objects assigned to the other, displaying an 'other-reference effect'. This reversal of the classic self-reference effect suggests that early in development, when infants are reliant on others for information, they may lean towards encoding the world in relation to others rather than themselves (Wiesmann et al., 2025). This study demonstrates how self-reference processing develops, though Grossmann (2026), in a commentary, notes that this more likely represents a reorganization of pre-existing capacity rather than a true onset.

The main strength of SRE lies in its consistency across works. Meta analytic evidence supports the mnemonic benefits of self-reference across a variety of tasks and populations across time (Symons & Johnson, 1997; Liu et al., 2023). Furthermore, the integration of neuroimaging techniques and the developmental approach has provided a more mechanistic understanding of SRE. However, an important limitation continues to persist. Most of the SRE literature, especially in educational and cognitive psychology, relies on simple 'self' versus 'other' contrasts. This binary approach fails to capture the potential gradation within self-referential processing itself. For example, the cognitive and neural demands of making a simple trait judgement may differ from the more elaborative and emotionally salient process of retrieving a specific autobiographical memory. The current study attempts to address this gap by utilizing an autobiographical elaboration task which requires participants to connect new information presented with an episodic memory, therefore providing a more ecologically valid form of self-reference.

Parallel to the SRE, the PSE has been a cornerstone of memory theory. The traditional explanation for the phenomena, the Dual-Coding Theory (DCT) posited by Pavio (1969), which states that pictures are more memorable because they are spontaneously labelled, resulting in the creation of both an image and a verbal code, as compared to words which typically generate only a single verbal code (Pavio & Csapo, 1973). This dual representation, however, provides redundant retrieval routes, which further increases the probability of successful recall or recognition of an item. Paivio and Csapo (1973) suggested that the superiority of pictures in free recall

is best explained by dual encoding or a combination of image superiority and dual encoding.

However, a compelling challenge emerges in the form of the Distinctiveness Account. This perspective postulates that the memory advantage that images provide occurs not due to dual coding, but comes from their physical and conceptual distinctiveness as compared to words. Words, which are presented in a uniform and distinct font may be confused for one another, whereas comparatively, pictures have a wider range of shapes that make them unique, which furthermore makes them stand apart in memory. A series of experiments by Ensor, Surprenant, and Neath (2019) provided strong support for this account. They showed that by increasing the physical distinctiveness of words (e.g. presenting in varied fonts, sizes, colors, etc.) and decreasing the distinctiveness of pictures (e.g. presenting them in black and white) the PSE could be eliminated in recognition memory. They concluded that if the physical variability of images as compared to words is the factor responsible for their mnemonic benefit, then increasing the distinctiveness of words and/or reducing the physical variance of pictures should reduce the PSE. This hypothesis was supported by their findings (Ensor et al., 2019).

Another study by Higdon et al. (2024) extended these findings to both associative recognition and free recall, concluding that, “dual-coding theory is no longer a viable explanation of the picture-superiority effect”. They suggest that the physical distinctiveness of stimuli is the primary factor that influences memorability. This suggests that PSE is not merely a special property of pictures but rather a manifestation of a more general principle of memory, that distinctive items are better recalled. This furthermore opens new avenues for investigation, particularly whether different forms of elaboration may enhance the distinctiveness of verbal material in a way that can compare to the natural advantage of pictures.

The Distinctiveness Account offers a powerful framework, yet an important gap remains that the majority of the studies in this area have been conducted with adult populations, and the developmental trajectory of PSE during adolescence, which is a period of cognitive and neurological maturation, remains largely unexplored. A study by Almog et al. (2023) attempted to breach this gap, however they found that memorability scores for images were strongly correlated between adult and adolescent samples. However, this finding does not eliminate the possibility that the magnitude of the PSE, or its interaction with other cognitive factors such as elaboration can differ across developmental periods. The present study, by focusing on an adolescent sample may contribute vital data to this underexplored subdomain.

Although SRE and PSE are often studied in isolation, they are not completely independent phenomena, with both affecting and enhancing memory by increasing the distinctiveness of a memory trace, though they use different routes. Autobiographical elaboration, on one hand, increases the distinctiveness of materials by linking new information with a rich, pre-existing network of episodic details relevant to oneself, which furthermore creates a unique and elaborative memory representation. While on the other hand, the picture

superiority effect, according to the distinctiveness account, improves memory by providing stimuli that is more physically and perceptually distinct than words. In both cases, the memory benefit is due to the encoded information standing out from other items in memory, further reducing failures and interference in retrieval. However, an important distinction exists within the very nature of distinctiveness between the two, that is, autobiographical elaboration functions at a conceptual and schema-driven level by embedding information within a narrative, contrastingly PSE operates at a perceptual level, utilizing the unique visual features of the image itself. This difference raises the intriguing possibility that these two forms of distinctiveness may interact.

An understanding of these memory processes further requires understanding the differences between recall and recognition in the retrieval process. The Dual-process theories of memory, especially the model suggested by Yonelinas (2002) suggests that recognition is supported by two processes, namely, recollection, which involves the conscious retrieval of qualitative details about a past event, and familiarity, which is the sense of knowing that an item was previously encountered without recalling any contextual information specifying as to when it was encountered. Free recall, in contrast, is seen as a more demanding process relying solely on recall (Yonelinas, 2002; Uner & Roediger, 2022). This distinction is important in interpreting the different patterns of the SRE and PSE across these two memory tasks. If pictures are more distinctive, their features may serve as strong retrieval cues for recollection further resulting in a larger PSE during recall. Comparatively, in recognition where familiarity drives performance, the advantage of pictures may be reduced as the gist of a word may be enough to provide a strong feeling of familiarity, enough to identify the relevant stimuli. Similarly, autobiographical elaboration, which creates rich and detailed episodic traces would improve recollection-based-retrieval, which further provides an advantage in favor of recall than recognition. The direct comparison of effects across recall and recognition in the present study provides an indirect but important test of these ideas.

Conducting this research with an adolescent sample is a theoretically motivated choice with adolescence being a period of development for the prefrontal cortex, a region central to self-referential processing and controlled elaborative encoding. Research by Andrade and Raposo (2021) directly demonstrated that adolescent's recollection abilities, especially after semantic encoding are underdeveloped as compared to adults, which further suggests that the complete benefits of deep and more elaborative encoding may not be realized in this age group. This hints at several critical gaps in the literature. Few studies have directly compared an autobiographical elaboration task to a matched semantic elaboration task within this population. Furthermore, research on PSE in adolescence is lacking. No study, to our knowledge, has examined how this PSE might be moderated by different types of elaborative encoding in this age group, nor has distinctiveness account been studied with adolescents. The current study is designed to address these gaps. By manipulating the elaboration type (autobiographical vs. Semantic) and material type (picture vs word) and assessing both recall and recognition. This study will provide a needed

examination of the boundary conditions and developmental nuances of these phenomena. Furthermore, it will test whether the mnemonic advantage of the self and the image are additive and if the frameworks developed primarily in adult populations holds true for a population whose cognition is still developing.

The present study was designed to address these gaps by examining the independent and joint effects of elaboration type (autobiographical v. semantic) and stimulus type (picture v. word) on recall and recognition memory in an adolescent sample. Based on the theoretical frameworks and empirical findings reviewed above, the following directional hypotheses were formulated:

1. Autobiographical elaboration will produce significantly higher recall than semantic elaboration.
2. Pictures will produce significantly higher recall than words.
3. Autobiographical elaboration will produce significantly higher recognition than semantic elaboration.
4. Pictures will produce significantly higher recognition than words.
5. Overall recognition performance will be significantly higher than overall recall performance.

Method

Participants

The sample consisted of 151 adolescent students recruited from English-medium schools in an urban Indian setting between the age ranges of 13 to 16 years. All participants were required to have normal or corrected-to-normal visual and auditory acuity, free of any cognitive impairments or psychiatric conditions and proficiency in English. Participation was voluntary and informed consent was obtained from both, the participant's parents/legal guardians and the participant, prior to data collection.

Design

This study employed a 2 x 2 within-subjects factorial design.

Materials

A set of 30 common concrete nouns were selected as the target stimulus (e.g., bridge, candle, etc.). Each noun was prepared in two formats: as black-and-white line drawings (picture condition) and as a printed word in lowercase Arial font (word condition). A computer with Microsoft PowerPoint was used to present the stimuli.

For the recognition phase, a printed test sheet was prepared containing the names of the 30 target items interspersed with 21 distractor items. Distractor items were also common concrete nouns that were not present in the encoding phase (e.g., tunnel, matchstick, lake, whale, stone, etc.). The recognition sheet listed a total of 51 items in a fixed random order.

Procedure

The experiment was conducted individually for each participant in a quiet, well-lit room. The entire session lasted approximately 30-45 minutes and consisted of three phases: encoding, recall, and recognition.

In the encoding phase, participants were seated comfortably in front of a computer screen. The experimenter provided standardized verbal instructions explaining the nature of the two elaboration tasks. Participants were informed that before each slide appeared, they would be told whether they were to "recollect an incident in your life related to this word or picture" (autobiographical elaboration) or to "form a sentence using the word or picture on the slide" (semantic elaboration). A brief demonstration was provided using the word classroom and a picture depicting anger to illustrate the autobiographical task, and additional examples were given for the semantic task.

Participants were then instructed to write down their response either a brief description of the recalled personal incident or a coherent sentence on a provided sheet of paper within a one-minute interval. Each stimulus slide was displayed for two seconds, during which time participants were to begin generating their response.

Following the presentation of the slide, participants were given the full one-minute period to complete their written elaboration. The experimenter provided a verbal "ready" signal prior to each new trial. The 30 target stimuli were presented one at a time, with elaboration type and material type varying across trials according to a predetermined sequence.

The recall phase immediately followed the encoding phase. Participants were given a blank sheet of paper and instructed to write down, in any order, as many of the words and pictures they could remember from the preceding task. They were informed that they could write the names of the pictures or the words they had seen. A five-minute time limit was given. Participants were asked to list their responses vertically, and were told that the order of recall was not important.

Upon completion of the recall task, the recall sheet was collected and the recognition test sheet was distributed. Participants were instructed to read through the list of 51 items and place a tick mark next to any item that they recognized as having been presented during the encoding phase. They were explicitly informed that the list contained both previously presented items and new items. A five-minute time limit was provided for this task. After five minutes, the recognition sheets were collected, and participants were debriefed and thanked for their participation.

Data Analysis

All statistical analyses were conducted using R (Version 4.5.2; R Core Team, 2024). Descriptive statistics including means and standard deviations for each dependent measure were computed across all conditions.

Due to the format of the available dataset which provided marginal totals collapsed across the second factor (e.g., autobiographical recall summed across both picture and word trials), a full 2×2 repeated measures analysis of variance could not be performed. Consequently, a series of planned paired-samples t-tests was employed to evaluate each directional hypothesis. For within-subjects factors with two levels, the paired-samples t-test is mathematically equivalent to a one-way repeated measures analysis of variance ($F = t^2$).

with identical p-values) and is an appropriate test of the main effects of elaboration type and material type.

The paired-samples t-test is considered robust to moderate violations of normality given the large sample size ($N = 151$; degrees of freedom = 146 for all comparisons after accounting for one missing case). No extreme outliers were identified that would unduly influence the results.

To control the familywise Type I error rate across the five hypothesis tests, the Holm-Bonferroni sequential correction was applied to the raw p-values. This method provides greater statistical power than the traditional Bonferroni correction while maintaining strong control of the familywise error rate. All reported p-values are one-tailed, consistent with the directional nature of the hypotheses.

Effect sizes for paired comparisons were calculated using Cohen's d for repeated measures, defined as the mean difference between conditions divided by the standard deviation of the difference scores.

The analyses were conducted separately for recall and recognition scores. For Hypotheses 1 through 4, the marginal totals provided in the dataset were used directly. For Hypothesis 5, average recall and average recognition scores were computed for each participant by taking the mean of the four respective marginal scores (autobiographical recall, semantic recall, picture recall, word recall for the recall average; analogous for recognition). A paired-samples t-test was then conducted comparing these two composite scores.

Results

Due to the format of the available data a full 2x2 repeated measures ANOVA could not be conducted. However, a series of planned paired-samples t-test was conducted to evaluate the directional hypotheses. A Holm-Bonferroni correction was applied to control the familywise error rate across the 5 tests. All reported p-values are one-tailed, consistent with the directional nature of the hypotheses. Effect sizes are reported as Cohen's d for paired samples.

Recall Performance

Hypothesis 1: Autobiographical elaboration will produce significantly higher recall than semantic elaboration.

Participants recalled significantly more items following autobiographical elaboration ($M=8.20$, $SD= 2.52$) than semantic elaboration ($M=7.22$, $SD=2.83$), $t(146)$, $p<.001$ (Holm-adjusted $p=.0002$), Cohen's $d=0.32$. The effect size was small to medium in magnitude, however, the finding supports Hypothesis 1.

Hypothesis 2: Pictures will produce significantly higher recall than words.

A substantial picture superiority effect was observed for recall with participants recalling significantly more pictorial items ($M = 9.02$, $SD = 2.37$) than as words ($M = 6.44$, $SD = 2.59$), $t(146) = 12.71$, $p < .001$ (Holm-adjusted $p < .001$), Cohen's $d = 1.05$. This effect was large in magnitude and strongly supports Hypothesis 2.

Recognition Performance

Hypothesis 3: Autobiographical elaboration will produce significantly higher recognition than semantic elaboration.

A significant advantage for autobiographical elaboration was also seen in recognition performance. Participants correctly recognized more items encoded with autobiographical elaboration ($M = 14.30$, $SD = 2.23$) than semantic elaboration ($M = 13.30$, $SD = 2.27$), $t(146) = 4.05$, $p < .001$ (Holm-adjusted $p = .0001$), Cohen's $d = 0.33$. The effect size was small-to-medium. Hypothesis 3 was supported.

Hypothesis 4: Pictures will produce significantly higher recognition than words.

In contrast to recall, no significant difference emerged between recognition of pictures ($M = 13.80$, $SD = 1.59$) and words ($M = 13.70$, $SD = 2.21$), $t(146) = 0.64$, $p = .262$ (Holm-adjusted $p = .262$), Cohen's $d = 0.05$. The effect size was negligible. Hypothesis 4 was not supported.

Recall vs Recognition

Hypothesis 5: Overall recognition performance will be significantly higher than overall recall performance

Collapsing across all elaboration and material conditions, recognition performance ($M = 13.80$, $SD = 1.68$) was substantially and significantly higher than recall performance ($M = 7.72$, $SD = 2.14$), $t(146) = 32.60$, $p < .001$ (Holm-adjusted $p < .001$), Cohen's $d = 2.69$. The effect size was extremely large, providing unequivocal support for Hypothesis 5.

Table 1

Summary of Hypothesis Testing Results

Hypothesis	$t(146)$	Raw p	Holm-adj. p	Cohen's d
H1: ABM Recall > SM Recall	3.89	0.001	0.002	0.32
H2: Picture Recall > Word Recall	12.71	0.001	0.001	1.05
H3: ABM Recognition > SM Recognition	4.05	0.001	0.0001	0.33
H4: Picture Recognition > Word Recognition	0.94	0.262	0.262	0.05
H5: Recognition > Recall	32.60	0.001	0.001	2.69

Note: *ABM- Autobiographical Memory, SM- Semantic Memory

Discussion

The current study investigated the mnemonic effects of autobiographical elaboration and stimulus type on recall and recognition performance in an adolescent sample. Five directional hypotheses were tested; that autobiographical elaboration would yield superior recollection relative to semantic elaboration for both recall (H1) and recognition (H3); that pictures would be better remembered than words for both recall (H2) and recognition (H4); and that overall recognition performance would exceed overall recall performance (H5). The above results provided support for four

out of the five hypotheses, while also revealing a difference between recall and recognition in regards to the picture superiority effect. These findings contribute to a growing body of literature in regards to the self-reference effect (SRE) and the picture superiority effect (PSE) and they highlight the importance of attending to the retrieval mode and developmental stage of the participants in memory research.

The advantage of autobiographical elaboration aligns with the self-reference effect (Symons & Johnson, 1997). By requiring participants to link the target stimuli to a specific personal incident, the task engaged with the self-relevant network which characterizes episodic memory (Tulving, 1985; Conway & Pleydell-Pearce, 2000). The resulting memory traces were more distinct and better integrated into existing schemas which produced a modest but reliable benefit. The fact that this effect emerged in an adolescent sample is important given the evidence that recollection continues to mature during this period (Andrade & Raposo, 2021), suggesting that the self-schema is sufficiently developed.

The difference between recall and recognition in the PSE strongly supports the distinctiveness account (Ensor et al., 2019; Higdon et al., 2024). In recall, which relies on recollection, the unique visual features of pictures serve as a powerful retrieval cue, providing a large effect (Cohen's $d=1.05$). In recognition, however, familiarity alone can drive performance, indicating that the conceptual gist of a word is enough to produce a sense of prior occurrence, thereby removing the advantage of pictures. Thus, with the absence of a picture superiority effect in recognition is consistent with the distinctiveness account, which suggests that familiarity-based recognition is less sensitive to perceptual details that provides an advantage for pictures during recall. Therefore, the high scores in both picture and word conditions raise the possibility of ceiling effects. The ceiling, therefore, may have compressed any latent differences, suggesting that the null finding for H4 more likely reflects a methodological constraint and should thus be interpreted with caution.

The overwhelming superiority of recognition over recall in H5 (Cohen's $d=2.69$) highlights the vital difference between the two retrieval modes. Recognition draws on both recollection and familiarity while recall demands the more effortful process of recollection (Yonelinas, 2002). This difference was expected and replicates prior research.

However, several limitations of this study must be acknowledged. First, the data were available only as marginal totals, disallowing the examination of the elaboration and material interaction. The question of whether autobiographical elaboration and picture superiority interact remains unanswered and should be addressed in future research. Secondly, ceiling effects in recognition likely obscured more subtle effects and limit the interpretability of H4. Future research could remedy this issue by utilising more sensitive recognition measures, such as delayed recognition tasks, larger stimulus sets or the remember/know paradigm Yonelinas (2002). Thirdly, the fixed order of stimulus presentation and the specific demographic characteristics of the sample may constrain generalizability.

Despite these limitations, the study contributes needed data on the SRE and PSE in adolescence in a relatively neglected developmental period. The findings confirm that autobiographical elaboration enhances memory, that the PSE is retrieval specific and that the theoretical frameworks developed primarily with adult samples largely generalize to an adolescent population. Future research should test the critical interaction between elaboration and material type and should use more challenging recognition tasks to avoid ceiling effects. In particular, the inclusion of confidence ratings or remember/know judgements which could help reveal whether recognition scores are comparable across the picture and word conditions as the two conditions differ in regards to the subjective vividness of memory. Additionally, using delayed recognition tasks, increasing the stimulus set size or source memory tests could lower overall performance and instill the sensitivity required to detect subtle differences, thereby allowing for a deeper understanding of these memory systems.

Conclusion

In summary, the present study provides clear empirical evidence that autobiographical elaboration enhances both recall and recognition in adolescents. Pictures are recalled better than words but recognized equivalently and that overall recognition performance is superior to recall performance. These findings are consistent with previous theoretical frameworks and empirical research, including the distinctiveness account of the PSE, dual-process theories of retrieval and the SRE literature. They further highlight the values of examining memory phenomena across developmental stages and retrieval modes. While limitations related to data structure and ceiling effects limit some interpretations, the study contributes to an underexplored area and directs future research to explore similar effects in more detail.

Author Information

For any correspondence related to the paper, contact office@ijngp.com

¹ Pranavi Gokavaram
Psychologist
Hyderabad, India

² Priya Dsouza
Special Educator
Mumbai, India

³ Sethu Lakshmi C V
Assistant professor
De Paul Institute of Science & Technology
Angamaly, Ernakulam

⁴ Swagini Nakashe
Psychologist
Mumbai, India

Declarations

Conflicts of interest: The authors have no conflicts of interest.

References

- Almog, G., Naeini, S. A., Hu, Y., Duerden, E. G., & Mohsenzadeh, Y. (2023). Memoir study: Investigating image memorability across developmental stages. *PLoS ONE*, 18(12), e0295940. <https://doi.org/10.1371/journal.pone.0295940>
- Andrade, M. Â., & Raposo, A. (2020). Underdeveloped recollection during adolescence: Semantic elaboration and inhibition as underlying mechanisms. *Journal of Experimental Child Psychology*, 203, 105044. <https://doi.org/10.1016/j.jecp.2020.105044>
- Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107(2), 261–288. <https://doi.org/10.1037/0033-295x.107.2.261>
- Ensor, T. M., Surprenant, A. M., & Neath, I. (2018). Increasing word distinctiveness eliminates the picture superiority effect in recognition: Evidence for the physical-distinctiveness account. *Memory & Cognition*, 47(1), 182–193. <https://doi.org/10.3758/s13421-018-0858-9>
- Higdon, K. F., Neath, I., Surprenant, A. M., & Ensor, T. M. (2024). Distinctiveness, not dual coding, explains the picture-superiority effect. *Quarterly Journal of Experimental Psychology*, 78(1), 180–191. <https://doi.org/10.1177/17470218241235520>
- Irish, M., & Piguet, O. (2013). The pivotal role of semantic memory in remembering the past and imagining the future. *Frontiers in Behavioral Neuroscience*, 7, 27. <https://doi.org/10.3389/fnbeh.2013.00027>
- Grossmann, T. (2026). Reconsidering the ontogeny of the Self-Reference effect. *Collabra Psychology*, 12(1). <https://doi.org/10.1525/collabra.155687>
- Liu, Z., Wen, J., Liu, Y., & Hu, C. (2023). The effectiveness of self: A meta-analysis of using self-referential encoding techniques in education. *British Journal of Educational Psychology*, 94(1), 112–137. <https://doi.org/10.1111/bjep.12636>
- Paivio, A. (1969). Mental imagery in associative learning and memory. *Psychological Review*, 76(3), 241–263. <https://doi.org/10.1037/h0027272>
- Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: Imagery or dual coding? *Cognitive Psychology*, 5(2), 176–206. [https://doi.org/10.1016/0010-0285\(73\)90032-7](https://doi.org/10.1016/0010-0285(73)90032-7)
- Rubin, D. C. (2021). A conceptual space for episodic and semantic memory. *Memory & Cognition*, 50(3), 464–477. <https://doi.org/10.3758/s13421-021-01148-3>
- Sheldon, S., Fenerci, C., & Gurguryan, L. (2019). A Neurocognitive perspective on the forms and functions of autobiographical memory retrieval. *Frontiers in Systems Neuroscience*, 13, 4. <https://doi.org/10.3389/fnsys.2019.00004>
- Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: A meta-analysis. *Psychological Bulletin*, 121(3), 371–394. <https://doi.org/10.1037/0033-2909.121.3.371>
- Tanguay, A. F., Palombo, D. J., Love, B., Glikstein, R., Davidson, P. S., & Renoult, L. (2023). The shared and unique neural correlates of personal semantic, general semantic, and episodic memory. *eLife*, 12. <https://doi.org/10.7554/elife.83645>
- Tulving E. (1972). Episodic and Semantic Memory. In E. Tulving, & W. Donaldson (Eds.), *Organization of Memory* (pp. 381-403). Cambridge, MA: Academic Press.
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychology/Psychologie Canadienne*, 26(1), 1–12. <https://doi.org/10.1037/h0080017>
- Tulving, E. (2002). Episodic memory: from mind to brain. *Annual Review of Psychology*, 53(1), 1–25. <https://doi.org/10.1146/annurev.psych.53.100901.135114>
- Uner, O., & Roediger, H. L. (2022). Do recall and recognition lead to different retrieval experiences? *The American Journal of Psychology*, 135(1), 33–43. <https://doi.org/10.5406/19398298.135.1.03>
- Wiesmann, C. G., Rothmaler, K., Hasan, E., Habdank, K., Yang, C., Yeung, E., & Southgate, V. (2025). The self-reference memory bias is preceded by an other-reference bias in infancy. *Nature Communications*, 16(1), 6311. <https://doi.org/10.1038/s41467-025-61642-z>
- Wilbers, L., Deuker, L., Fell, J., & Axmacher, N. (2012). Are Autobiographical Memories Inherently Social? Evidence from an fMRI Study. *PLoS ONE*, 7(9), e45089. <https://doi.org/10.1371/journal.pone.0045089>
- Yonelinas, A. P. (2002). The Nature of Recollection and Familiarity: A review of 30 years of research. *Journal of Memory and Language*, 46(3), 441–517. <https://doi.org/10.1006/jmla.2002.2864>