



Recollection but not familiarity differentiates memory for text in students with and without learning difficulties

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ABSTRACT

The present research was aimed at investigating recognition memory and recollective experience for a text in adolescents with and without learning difficulties. Adolescents (age 15 to 19) with learning difficulties were selected based on their performance on a standardized test for text comprehension and on the teachers' evaluations of their school achievement. In a recognition memory paradigm for text, "poor learners", compared to a control group, were less able to recognize whether target sentences appeared in a previously heard narrative, thus producing fewer hits and more false alarms. Further, "poor learners" were less likely to associate Remember judgments to the target sentences, whereas both groups associated a similar level of Familiar responses to the old items. These results show that students with learning difficulties have a less subjectively compelling memory experience related to a complex text.

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1. Introduction

Recognition memory – the ability to distinguish an event that has been previously encountered from others not previously experienced – is thought to largely depend on two distinct memory processes, namely recollection and familiarity (e.g., Brainerd, Reyna & Mojardin, 1999; Jacoby, 1991; Yonelinas, 1994, 2002). Recollection is the process that allows for the retrieval of qualitative features about an event and is associated with a vivid subjective experience of "remembering". In contrast, familiarity is the process that allows one to experience memories of varying degrees of strength without retrieving any contextual or qualitative information about the event; it is associated with a subjective experience of "knowing" that an event occurred (for a review, Yonelinas, 2002). Although familiarity is sufficient to distinguish an old item from a new one, recollection is necessary to remember the qualitative and contextual features associated with the item.

Semantic processing enhances item recollection more than it enhances item familiarity (e.g., Gardiner, Ramponi & Richardson-Klavehn, 1999; Rajaram, 1993). The effect of semantic encoding on recollection has been observed not only at the item level but also at the text level. For example, Long and Prat (2002) found that experts experience greater recollection for text details (i.e., they give a higher proportion of Remember answers) than novices, likely resulting from experts' more complex discourse models integrated with previous knowledge (Long & Prat, 2002). Furthermore, research suggests that

semantic processing gains increasing importance for recollection as conceptual knowledge and semantic elaboration abilities develop (e.g., Billingsley, Smith & McAndrews, 2002; Brainerd, Holliday & Reyna, 2004; Dewhurst & Robinson, 2004; Ghetti & Angelini, 2008). Overall, this research leads to the concern that conditions hindering semantic processing may be particularly detrimental for recollection during development. If semantic elaboration promotes recollection, then it should be possible to detect decrements in recollection when poor ability to process semantic information is suspected, both in adults and children.

To date, no study has examined the potential deficits in recollection for text ideas in students with learning difficulties. However, this point appears critical for the understanding of learning difficulties. Indeed, subjective recollection for text ideas may have powerful implications for learning in that, when recollected, a text may be better contextualized and associated with other relevant information.

In the present study we have examined the extent to which subjective recollection for text ideas is impaired in a group of adolescents with learning difficulties (from here called 'poor learners') compared to a control group. A text story was presented to the students, and their memory for it was subsequently tested with a recognition task. The text was presented orally and in a classroom context in order to simulate a typical lesson situation. In addition to being asked to recognize old sentences (targets) from new sentences (distracters), participants were asked to provide Remember–Familiar judgements (Remember–Know paradigm, Tulving, 1985) on recognized sentences thereby providing measures of subjective recollection and familiarity.

Participants' recognition memory was tested using three types of distracters: Novel details (i.e., sentences that combined different

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details of the text), Inferences (i.e., sentences that represented ideas that were not included in the text, but that could be inferred from the text), and Paraphrases (i.e., sentences that represented, but with different wording, ideas that were included in the text). We included distinct classes of distracters because we hypothesized that group differences in recollection for sentences may result in differences in the nature of errors exhibited by the groups. Specifically, stronger recollection of the semantic content of the text in control participants may lead them to increased errors for distracters that reflect the meaning of the text compared to novel distracters. In contrast false alarms in poor learners were expected to differentiate less among classes of distracters.

2. Method

2.1. Participants

Ninety three adolescents, ninth- and tenth-graders (mean age = 16 years, $SD = .94$), attending a public Professional High-School (this school is *mainly attended by low achievement students*), in a small town in Northern-Eastern Italy, participated in the study. They were divided into two groups, a group of 47 students (mean age = 16, $SD = .95$) with learning difficulties and a control group of 46 peers (mean age = 16.17, $SD = .93$) without learning difficulties.

Groups were formed on the basis of three different indices: Performance on a standardised reading comprehension test, including two texts and 20 questions each (*MT Test*, Cornoldi, Friso & Pra Baldi, 2010), teachers' ratings of school achievement and recognition memory scores. Students who received a score on the comprehension test below the 10th percentile and received low school achievement ratings by their teachers were considered for inclusion in the group of students with learning difficulties, whereas the other students in their classrooms, who according to the norms were included in the category of the average comprehenders, were considered for the inclusion in the control group. Raw scores on the comprehension test were as follows: Students with learning difficulties, $M = 8.19$, $SD = 1.57$; controls, $M = 13.09$, $SD = 1.95$. Students were instead similar on their performance on a memory task requiring the recognition of isolated words and the recall of associated details (task adapted from Ciarumelli & Ghetti, 2007) both with respect to the memory performance and to the subjective experience. These both groups did not differ either in their objective (proportions of details – color of the word ink, red or green, and position of the word on the screen, left or right – correctly retrieved) or in their subjective (correctly retrieved details accompanied by Remember judgments) recollection, showing that they were similarly accurate in the use of the Remember/Know paradigm (Hit rates: poor learners, $M = .85$, $SD = .26$ and control participants, $M = .86$, $SD = .23$; False alarm rates: poor learners, $M = .04$, $SD = .08$ and control participants, $M = .03$, $SD = .04$; rates of recollection for hits: poor learners, $M = .55$, $SD = .28$ and control participants, $M = .56$, $SD = .24$).

2.2. Materials

Text. A text story including 1351 words (“The Art Thief”; Marsh, 2004) was translated and adapted to the Italian language. *Recognition test.* The test included 32 sentences (the average length of the sentences was 16 words): Sixteen target sentences, which were taken *verbatim* from the text, and 16 distracters. The distracters were created on the basis of the evaluation given by a group of 7 judges to a larger pool of sentences. Distracters included 8 sentences that were semantically related to the content of the story (i.e., 4 inferences and 4 paraphrases) and 8 “Novel” sentences that included a new combination of details of the text (i.e., they were created by combining different *verbatim* parts of propositions that did not result in a meaning consistent to the text plot). The test

required participants to answer whether they recognized each sentence, by writing “yes” if they thought the sentence was old (i.e., included in the story previously heard), or “no” if they thought it was a new one. For items that were recognized as old, the test further required participants to tell whether the sentence was “remembered” or “familiar.” We used the term “familiar” instead of “know”, because “familiar” is easier to understand, even for adults (e.g., Dobbins, Kroll & Liu, 1998). One randomised sequence was used for all participants. We ensured that the different distracter types referring to different parts of the texts were distributed evenly throughout the entire text.

2.3. Procedure

Participants were tested in groups (about 20 students per group), in their classroom. All of the participants were read the same story and sentences aloud by the experimenter at a slow pace. After listening to the text (the text was orally presented at a pace of about 193 words per minute), participants were informed that some of the sentences they would hear were part of the text, whereas other sentences were new. They were told that for each sentence, they had to circle “yes” on their answering sheet when they recognized the sentence as being taken directly from the text and “no” when they thought the sentence was not taken from the text and had not been heard before. The experimenter emphasized that participants had to recognize as old only those sentences that included exactly the same words as the sentences encountered in the text. They were also told that for each “yes” answer they would have to select the option “Remember” if they had a clear memory of their encounter with the sentence in mind, and they could further remember some qualitative and contextual information related to the memory itself (e.g., Who did the content of the sentence refer to?) or select the option “Familiar” if they had the feeling that the sentence was part of the text story but they could not recollect any qualitative detail about the encoding of the sentence. The recognition test started approximately 5 min after the end of the presentation of the passage and lasted approximately 7 to 8 min.

3. Results

3.1. Recognition performance

To examine whether students with learning difficulties and control participants differed in their overall performance on the recognition memory test we conducted a 2 (group: poor learners vs. controls) \times 2 (item type: old items vs. distracters) mixed ANOVA, with rates of old judgments as the dependent measure (“yes” responses to old items correspond to the hit rate, whereas “yes” responses to distracters correspond to the false-alarm rate). Results are reported in Table 1. A significant main effect of item type was found, $F(1, 91) = 151.47$,

Table 1

Mean proportions and standard deviations of “yes” responses to old items (i.e., hits) and “yes” responses to distracters (i.e., false alarms); the “yes” responses to distracters are further characterized as follows: “yes” responses to distracters that included plausible but not stated information (i.e., inferences), “yes” responses to distracters that included the same information of the text sentences, but with different words (i.e., paraphrases) and “yes” responses to distracters that included a new combination of text details (i.e., novel sentences). Asterisks are referred to significant differences between groups; * $p < .05$, ** $p < .01$.

	Group			
	Poor learners		Controls	
	M	SD	M	SD
Hits**	.70	.17	.77	.16
False alarms**	.52	.18	.41	.14
Inferences**	.53	.28	.32	.21
Paraphrases	.55	.27	.51	.26
Novel sentences	.50	.22	.42	.17

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