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Abstract

Adding cues such as connectives and word overlap to text increases cohesion, and in turn, text ease. In this study, Russian students (ages 11-12; $n = 65$) read either a low cohesion (i.e., original version) or high cohesion (i.e., modified) informational text. Replicating prior studies conducted in English, the students who read the high cohesion form of the Russian text recalled more propositions from the text than those who had read the low cohesion form.

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Text complexity emerges not only from the difficulty of the specific words in a text, but the relations between words and ideas. *Cohesion* refers to linguistic elements (i.e., words, features, cues, signals, constituents) in a text that help the reader to relate information from sentence to sentence and across a text. Texts that are more cohesive are, in general, easier to process and comprehend, particularly for younger readers (e.g., Graesser et al., 2004; McNamara, Ozuru, & Floyd, 2011; O'Reilly & McNamara, 2007).

Despite the importance of cohesion on comprehension, previous research indicates that many expository materials written for schoolchildren have low levels of cohesion (Beck, McKeown, & Gromoll, 1989). Notably, the research in text cohesion has largely focused on the English language and English text materials. Scholars have noted marked differences in the academic (informational) writing across English and Russian (Khoutyz, 2013). While English language (American) textbooks have been criticized for their lack of cohesion, a criticism of Russian textbooks is that the language in these books is often overly simplistic (Pinskaya, 2009).

Thus, the purpose of this study was to examine if the effects of increasing text cohesion could be generalized to Russian school textbook materials. In the present study, we modified an authentic textbook excerpt to increase its cohesion. Students read either the original (low cohesion) text or the modified (high cohesion) text. We then examined how this manipulation impacted students' recall of key and detail information.

Method

Participants

These data are part of a larger study in which fifth grade students ($n = 177$) were recruited from three middle schools in a Russian metropolitan area. Given that world knowledge

is a strong predictor in comprehension and can interact with text cohesion (McNamara & Kintsch, 1996; O'Reilly & McNamara, 2009), students were screened using the world knowledge subtest from the Weschler Intelligence Scale for Children (WISC). Students whose WISC knowledge scores were in the average range (13-16), were asked to complete the reading and recall task. Thus, the present study included 65 participants (low cohesion = 34; high cohesion = 31).

Materials & Procedure

Participants were randomly assigned to read either the original low cohesion or modified high cohesion version of the text. The text was selected from the textbook Social Science 5 (Bogolyubov, 2013). The original low cohesion form of the text was 211 words. The high cohesion version of the text was created by adding a topic sentence, splitting sentences, adding temporal markers (e.g. "it was at this time that"), and demonstrative pronouns (e.g., "*this* church"). These modifications resulted in a slightly longer text of 224 words (Texts appear in Table 1). After reading the text, each participant recalled the text aloud.

Table 1.

Original (Low Cohesion) and Modified (High Cohesion) Text (Presented in Russian; translated to English for demonstration)

Para.	Sent.	ORIGINAL TEXT	Para.	Sent.	MANIPULATED TEXT	
P1	S1	You would probably agree with the statement that art necessarily requires an ability to create, produce beautiful works, which appear novel and original.	P1	S1	This text focuses on monuments of art and culture.	
			P2	S2	Art requires an ability to create beautiful works.	
				S3	These works amaze us because they are different from all the others, they are novel and original.	
P2	S2	The legend says that once upon a time there lived Master Nestor , who built an amazingly beautiful wooden church of the Transfiguration on Kizhi island in Onega lake without any nail at all.	P3	S4	There is such a legend.	
	S3	In the early 18th century, when Russia was settling in the Baltic sea and becoming a sea power, the Master built a 22-domed festive, cheerful church , which was different from any other.		S5	Once upon a time there lived Master Nestor , who built an amazingly beautiful wooden church of the Transfiguration on Kizhi island in Onega lake without any nail at all.	
				S6	This happened in the early 18th century, when Russia was becoming a sea power.	
				S7	It was at this time that Master Nestor built a festive, cheerful church .	
				S8	This 22-domed church was different from any other.	
				S9	The church naturally matched the environment.	
				S10	It seemed that the church was hovering over the water, its domes touched the blue sky, it sang thus manifesting the talent of Russian builders.	
	S5	The church looked pleasing and exquisite.		S11	The church looked pleasing and exquisite.	
	S6	It sounded as a solemn anthem to the Russian people.		S12	The church bells rang a solemn hymn to the Russian people.	
	S7	So, having finished the work, the Master threw his axe into the lake and said: 'There haven't been, there is no and will not be one like this!'		P4	S13	So, having finished the work, the Master threw his axe into the lake and said: 'There is no and will not be one like this!'
	S8	But he refused to carve his name for history and did not sign his creation.			S14	But he refused to carve his name for history and his signature on his creation.
P3	S9	Remember this legend every time when you see somewhere the words carved or scratched by ignorant people: 'Here was Tolya' or 'Here was Sasha from 5B form'.		P5	S15	Remember this legend every time you see the words carved or scratched by ignorant people.
	S10	To put your name on a monument of history or culture, as well as a painted wall or a living tree, means that you are an ill-mannered savage person ignorant of principles of beauty.	S16		E.g., 'Here was Tolya' or 'Here was Sasha from 5B form'.	
			P6	S17	To put your name a monument of history or culture, as well as a painted wall or a living tree, means that you are an ill-mannered savage ignorant of principles of beauty.	
				S18	To spoil a cultural monument means to offend the master who created it, put not only his effort, but health, intelligence and feelings.	
S11	To spoil a cultural monument means to offend the master who created it, put not only his effort, but health, intelligence and feelings.					

Results

Participants recalls were audio-recorded and transcribed. The transcriptions were parsed into main and sub-propositions. The two text versions had varying lengths and numbers of possible propositions. The low cohesion form comprised 39 main propositions, and 104 sub-propositions. In contrast, the high cohesion form comprised 43 main propositions and 114 sub-propositions. Thus, we calculated proportions scores for comparison (Table 2). A preliminary 2(text form: high cohesion, low cohesion) x 2(proposition type: main, sub) mixed analysis of variance (ANOVA) revealed only a marginal effect of proposition type, $F(1, 63) = 3.39, p = .07$, Cohen's $d = 0.29$, indicative that students tended to recall a higher proportion of main propositions ($M = .37; SD = .18$) than sub-propositions ($M = .32; SD = .16$). Most importantly, there was a main effect of text form, such that participants who read the high cohesion form ($M = .38; SD = .16$) recalled significantly more propositions than those who read the low cohesion version ($M = .31; SD = .17$), $F(1, 63) = 18.91, p < .001$, Cohen's $d = 0.42$. The text form by proposition type interaction was not significant, $F < 1.00, p = .49$; thus, the benefits of added cohesion was equivalent for both key ideas and details in the text.

Table 2.

Proportion of propositions recalled as a function of proposition type and text cohesion form

Text Form	Main Propositions		Sub-Propositions	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
High Cohesion	.40	.17	.34	.19
Low Cohesion	.36	.16	.28	.15

Conclusions and Implications

This study provides an important replication of the benefits of text cohesion. Prior research has demonstrated that adding cohesive cues to texts produces large benefits for text

comprehension, particularly for elementary grade children (e.g., Beck et al., 1989; McNamara et al., 2011; for a review see McNamara, Louwrese, McCarthy, & Graesser, 2010). This study extends those findings to Russian school texts, ones that have been assumed to be too simplistic. As such, this study raises serious concerns regarding measures of text simplicity and the need to consider text cohesion as an important factor in estimating text difficulty.

One limitation in this study is that we focused on participants of average general knowledge. This decision was largely driven by a limitation of resources, and the need to limit the number of children who were surveyed. We are currently pursuing more fine-grained analyses to explore how more subtle differences in world knowledge might impact the effect of cohesion. In future work, we intend to replicate these findings with larger samples and additional texts to examine how features of text (e.g., cohesion) interact with aspects of the reader (e.g., reading skill, prior knowledge; O'Reilly & McNamara, 2007).

Despite the limitations of this study, the results reported here provide strong preliminary evidence that the effects of cohesion on comprehension extend to the Russian language. Despite the fact that Russian textbooks are criticized for their simplicity (e.g., Pinks kaya, 2009), this study demonstrates that Russian students may still benefit from increased text cohesion in their school reading materials.

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