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Children's Multilingual Text Comprehension

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Comprehension of a text is conceptualized as the construction of a mental representation of that text. The question whether the construction will end with the preservation of the current mental representation at the end of the input leads to issues concerning the maintenance of the representation and potential changes by and after retrieval. If text input is followed by recall the mental representation may be retrieved as stored and then reproduced but it may also undergo changes before and during the retrieval process. The current study examines the role of text language and recall language in the construction of a mental representation of a story assessed by free recall and off-line inference questions.

Numerous studies report that text comprehension suffers when the text is presented in a non-native language (L2) (see Schönpflug, 2023) compared to a presentation in the native language (L1). A common interpretation is that lower-order cognitive processes such as decoding of the non-native linguistic surface structures use up mental resources necessary for higher-order processes such as the construction of a coherent mental representation of the text compared to native language processing. Hence, it is assumed that deficits in vocabulary and/or grammar and the lack of automaticity in L2 processing pose a challenge for higher-order construction processes that are needed for comprehension (e.g., Melby-Lervåg & Lervåg, 2014; Schleicher & Schwartz, 2022).

The current study

Any evaluation of the results concerning young multilingual speakers' text comprehension in each of their languages must consider their degree of bilingualism or their language dominance hierarchy. Further critical factors are the cognitive developmental status, age of acquisition of each language, and the length and intensity of exposure to each language.

The current study reaches beyond a simple comparison of L2 with L2 performance. It focusses on changes in bilingual children's comprehension processing when the original text or recall is in L2 compared to L1. Comparisons between the monolingual text language/recall language conditions L1/L1 and L2/L2 and the crosslingual conditions L1/L2 and L2/L1 allow to examine in which stage of text processing - whether during input or during recall – the use of a non-native language affects comprehension performance relative to a native language.

Inferences support the construction of both, local and global coherence. However, a text can be locally coherent without being globally coherent (Graesser et al., 1994). Thus, a valid

research question is to ask whether these two consequences of inference making are distinguishable and how the construction of both features functions in a native and non-native language. In this context, the finding that younger children tend to construct local coherence and do gradually proceed to global coherence has to be taken into consideration (LARRC & Muijselaar, 2018). Hence, younger children will emphasize local coherence no matter which language they use.

Poor comprehenders show greater impairment in global coherence than in local coherence when compared to their typically developing peers (Cain & Oakhill, 1999). In addition, working memory is more strongly related to global than to local coherence inference making for both written (Chrysochoou, Bablekou, & Tsigilis, 2011) and spoken (Currie & Cain, 2015) texts. LARRC and Muijselaar (2018) report, however, that both are necessary for comprehension of the same text. Therefore, when assessed for the same text, they are likely to be highly related.

Some basic questions concerning the role of language in text processing remain to be answered:

- Are L1 texts generally better understood than L2 texts?
- Does a potential benefit of one language originate during text input or during free recall or both?
- Do inferences for constructing text coherence contribute differently to comprehension when the text is monolingual in L1 or L2 or when text/recall are crosslingual (L1/L2 or L2/L1)?
- Does text comprehension in L2 rely more on local coherence opposed to global coherence construction than text comprehension in L1?

Method

Participants

The 95 participants (49 female) were randomly assigned to the four language conditions but controlling for gender and degree of bilingualism in each study condition. Surplus sampling ensured a balanced distribution of these features across conditions. The bilingually schooled fourth graders were native speakers of German (L1). The majority began their L2 English at the age of three years when they entered a bilingual pre-kindergarten affiliated with a public bilingual elementary school.

Materials and measures

Story

An age-appropriate L1 story and its translation into L2 had 129 words and 33 propositions in L1 and 133 words and 35 propositions in the L2 version.

Degree of bilingualism

Children's degree of bilingualism was assessed by comparing L1 and L2 reaction time (RT) in an experimenter-designed picture-naming test based on standardized pictures and picture naming (Schönpflug, 2023).

Degree of bilingualism was scored by subtracting L1 RT from L2 RT. The scores were dichotomized to yield two groups of bilingual children: balanced and L1-dominant bilingual.

Comprehension

Local coherence: propositions. The recall protocol of the story was transformed into propositions using the common format of predicate [argument 1, argument 2]. A child's individual score of correctly recalled propositions were compared to the standard propositions of the original text.

Local coherence: macropropositions were identified when more than one idea unit (proposition) was integrated to yield a macroproposition.

Global coherence: situation model construction was assessed by analysis of the participants' protocols. When the situation model was made explicit during recall, and the correct multiple choice response alternative was chosen in a critical question specifically targeting the correct situation model in a questionnaire presented after recall, a score of 2 was assigned. A score of 1 indicated that one of the two indicators was correctly responded to, and a score of 0 when no indicator revealed a correct score.

Global coherence: story structure. A conventional story structure with three sections: introduction, action/conflict, and resolution was chosen as standard. Children delivering propositions categorized as belonging to one, two or all three categories received a score of 1, 2, or 3, respectively.

Inference making

Inference making was assessed by an offline multiple-choice comprehension questionnaire. The correct answer to four questions required text inferences, the correct answer to a fifth question required the child to have constructed the situation model with the support of background knowledge. The scores varied from 0 = no correct inference to 5 = all correct inferences.

Procedure

The children were tested individually. Each session started with the test of degree of bilingualism by applying the Picture Naming Test with support of a Power Point presentation and recordings of naming and naming time by means of the Audacity software (https://www.audacityteam.org). The participants were informed by written instructions appearing on a screen. In all conditions the language of instructions matched the language of the text. The post-recall inference questions were in the language of recall in order to avoid any verbatim memory effects of text input.

After the Picture Naming Test, the participants listened to the video presentation of a story read by a female native speaker. The instruction "tell everything you remember about the story in German (English)" appeared on the screen immediately after the presentation. The oral recall was recorded. Thereafter, the children responded to the questions of the comprehension test. Finally, they completed a questionnaire asking for their language learning history, language use and self-ratings of their language competencies.

Results

Timing of comprehension process

The design of this study allows to separate the effects of language of text and of recall on comprehension performance. Corresponding analyses repeated the known language effects (Schönpflug, 2023): L1 texts were better understood than L2 texts irrespective of language of recall. However, L1 recall irrespective of language of text yielded no beneficial effect. Hence, the benefit of L1 is restricted to text input. Degree of bilingualism did not significantly affect comprehension in this context.

Inferences and L2 text comprehension

Inferences are considered useful but dispensable for text comprehension (Perfetti & Stafura, 2015). A model of multilingual text comprehension (Figure 1) developed and tested by Schönpflug (2023) describes potential effects of text input/output language on comprehension, mediated by inference making and moderated by bilingual group. In the model comprehension is specified as consisting of macronarrative skills assessed by situation model construction and structure-building.

The empirical test of the model revealed that in this context and being an L1-dominant bilingual confronted with a crosslingual text/recall condition played a crucial role in text comprehension: For the L1-dominant bilingual group, inference making mediated between crosslingual conditions and comprehension performance. The significant negative mediation coefficients suggest that in the crosslingual tasks the mediation effect of inference making is negative. The mediation model was not significant for balanced bilingual children.

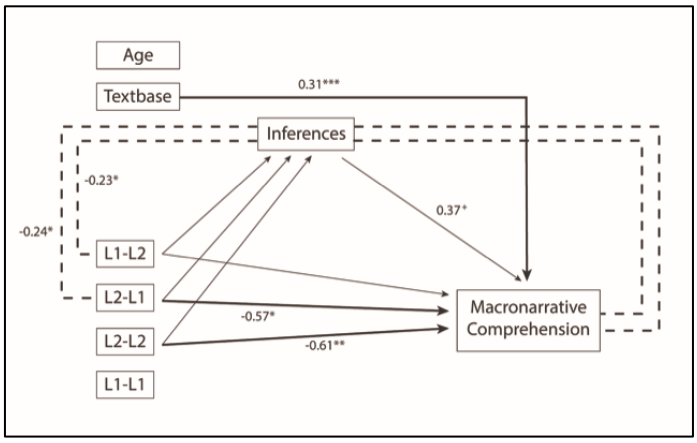

Figure 1. Results of the multilingual text comprehension model testing the impact of text and recall language on macronarrative comprehension when mediated by inference making and moderated by bilingual group (L1-dominant bilingual children) (Schönpflug, 2023).

Local and global coherence

New analyses included three indicators of local and of global coherence: correct propositions and macropropositions indicating local coherence and acceptable situation model construction representing global coherence. The indicators correlated moderately when controlling for age (in months), degree of bilingualism, and length of free recall protocol (number of words).

The question of whether text processing in L2 is based more on local coherence than in L1 was examined by applying a repeated measures MANCOVA featuring language of text (L1. L2) as the between-group factor and coherence as within-subject factor defined by propositions, macropropositions, and situation model construction. The dependent variable was comprehension performance. The covariates were the same as those previously stated for the correlations. The results revealed a significant interaction of Coherence x Language of Text ($F(1,90) = 11.83$***, $Eta^2 = 0.12$). Figure 2 shows the means of the interaction. The average number of correct propositions and the situation model score showed opposite mean trends in the two language conditions: In the L1 text the mean number of correct propositions was low and associated with significantly higher scores in situation model construction. When the text was presented in L2 the opposite trend emerged: They increasingly processed at text base level and reduced situation model construction.

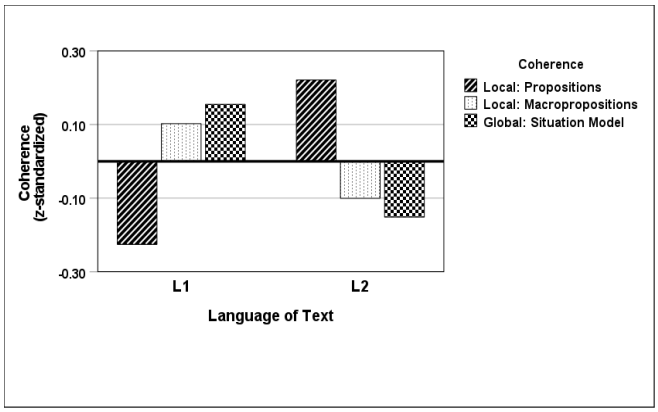

Figure 2. Local and global coherence scores dependent on language of text irrespective of language of recall.

Discussion

The current selection of results illuminates some consequences of multiple language use in text processing. The involvement of other than the overlearned native language in text comprehension affects the quantity and quality of comprehension. Comprehension performance was superior when the text was presented in the native language L1 and decreased significantly when the text was presented in L2 irrespective of language of recall. The use of L1 in recall did not

result in superior comprehension. This finding suggests that by the end of processing text input, the construction of the mental representation has reached a temporarily stable state. Once the current situation model and the text structure are constructed at the end of input, a language switch to L1 use for free recall did not significantly enforce construction processes. Hence, taking a general perspective on text comprehension these findings suggest that crucial comprehension processes take place during the input stage of the text.

The results gained by testing the multilingual model show that crosslingual switches from text to recall diminish the support of inferences in construction processes involved in comprehension. One explanation is that the switch of the language involves activating the conceptual mental representation dissociated from text language and then encoding the mental representation into language other than that of the original text. The switch demands redirecting attention from the mental representation of the text to the linguistic surface level required for use of the language of recall which constrains the resources necessary for inference making and leads to weaker performance.

As language dominance and cognitive abilities oscillate during childhood, changes in language input and use and cognitive development will lead to considerable individual differences in the course of development. As L1-dominant bilingual children experience more impairments in comprehension of L2 texts than balanced bilingual children, enforcing L2 competence will improve comprehension of L2 texts. Furthermore, younger children tend to emphasize local coherence and only later in childhood the construction efforts advance to global coherence. Further instruction of strategies of how to progress from local to global coherence construction with the support of inference making will advance children's L2 text comprehension.

References

Cain, K., & Oakhill, J. V. (1999). Inference making ability and its relation to comprehension failure in young children. *Reading & Writing*, *11*(5-6), 489-503. doi:10.1023/A:1008084120205

Chrysochoou, E., Bablekou, Z., & Tsigilis, N. S. (2011). Working memory contributions to reading comprehension components in middle childhood children. The American *Journal of Psychology*, *96*(1), 31-42. https:/jstor.org/stable/10.5406/amerjpsyc.124.3.0275.

Currie, N. K. & Cain, K. (2015) Children's inference generation: The role of vocabulary and working memory. *Journal of Experimental Child Psychology*, *137*, 57-75. https://doi.org/10.1016/j.jecp.2015.03.005

Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review*, *101*(3), p. 371-395.

LARRC (Language and Reading Research Consortium) & Muijeselaar, M. M. L. (2018). The dimensionality of inference making: Are local and global inferences distinguishable? *Scientific Studies of Reading, 22*(2), 117–136. doi.org/10.1080/10888438.2017.1371179

Melby-Lervåg, M. & Lervåg, A. (2014). Reading comprehension and its underlying components in second-language learners: A meta-analysis of studies comparing first- and second-language learners. *Psychological Bulletin*, *140*(2), 409–433. doi.org: 10.1037/a0033890.supp

Perfetti, C. A., & Stafura, J. Z. (2015). Comprehending implicit meanings in text without making inferences. In E. J. O'Brien, A. E. Cook, & R. F. Lorch (Eds.), *Inferences during reading* (pp. 1-18). Cambridge University Press.

Schleicher, K. M. & Schwartz, A. I. (2022) Bilingual discourse comprehension: The role of language overlap in updating the discourse representation. *Discourse Processes*, *59*(3), 184-208. doi: 10.1080/0163853X.2021.1994299

Schönpflug, U. (2023). *Multilingual text comprehension*. Series Bilingual Mind and Brain. Springer.