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The effect of bilingualism and dyslexia on working memory, reading comprehension and oral language proficiency

O efeito do bilinguismo e da dislexia na memória de trabalho, na compreensão leitora e na proficiência da linguagem oral

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Abstract: The relationship between bilingualism and monolingualism in the context of working memory, oral language proficiency and reading comprehension is complex and requires further investigation. The aim of the present study was to investigate if there is an advantage of bilingualism. We investigated whether bilingual and monolingual individuals perform differently in tasks of working memory capacity, reading comprehension and oral language proficiency. Our total sample of N=54 comprised 20 typical bilinguals, 15 typical monolinguals, 13 monolinguals with dyslexia and 6 bilinguals with dyslexia. We administered the Operation-word Span Test, the Woodcock-Johnson Test of Achievement, the Oral narrative task and the reading practice tests of the TOEFL (Test of English as a Foreign Language). Performance across groups was compared, controlling for age, sex and education. Our study showed no advantage of bilingualism for working memory capacity and comparable second language reading and language abilities between monolinguals and bilinguals. Poorer working memory capacity performance for individuals with dyslexia was only seen in the monolingual group. No other group differences were significant. This study contributes to the sparse literature and provides insight into cognitive and language abilities of monolingual and bilingual individuals, and whether knowing a second language may show any benefit for those with reading difficulties. Our findings strengthen the idea that, while there is no advantage of bilingualism per se, there might be a beneficial effect of bilingualism in dyslexia at the linguistic and cognitive level.

Keywords: Monolingualism. Bilingualism. Dyslexia. Working memory capacity. Reading comprehension. Oral language proficiency.

Resumo: A relação entre bilinguismo e monolinguismo no contexto da memória de trabalho, proficiência em linguagem oral e compreensão de leitura é complexa e requer mais investigação. O objetivo do presente estudo foi investigar se há uma vantagem do bilinguismo. Nós investigamos se indivíduos bilíngues e monolíngues têm desempenho diferente em tarefas de capacidade

de memória de trabalho, compreensão de leitura e proficiência em linguagem oral. A amostra total de N = 54 compreendeu 20 bilíngues típicos, 15 monolíngues típicos, 13 monolíngues com dislexia e 6 bilíngues com dislexia. Os testes administrados incluiram o Operation-word Span Test, o Woodcock-Johnson Test of Achievement, a tarefa de narrativa oral e os testes de prática de leitura do TOEFL (Test of English as a Foreign Language). O desempenho entre os grupos foi comparado, controlando por idade, sexo e educação. O presente estudo não mostrou nenhuma vantagem do bilinguismo para a capacidade de memória de trabalho e habilidades de leitura e linguagem de segunda língua comparáveis entre monolíngues e bilíngues. O desempenho de capacidade de memória de trabalho mais baixo para indivíduos com dislexia foi visto apenas no grupo monolíngue. Nenhuma outra diferença entre os grupos foi significativa. Este estudo contribui para a literatura esparsa e fornece insights sobre as habilidades cognitivas e de linguagem de indivíduos monolíngues e bilíngues, e se saber uma segunda língua pode mostrar algum benefício para aqueles com dificuldades de leitura. Os resultados reforçam a ideia de que, embora não haja vantagem do bilinguismo per se, pode haver um efeito benéfico do bilinguismo na dislexia no nível linguístico e cognitivo.

Palavras-chave: Monolinguismo. Bilinguismo. Dislexia. Capacidade de memória de trabalho. Compreensão leitora. Proficiência em linguagem oral.

1 Introduction

Around 50% of the world's population are bilingual or multilingual (Fabbro et al., 1999; Oren & Breznitz, 2005). According to neuro-linguistic researchers, a bilingual individual is someone who understands and speaks, either two languages, two dialects or a language and dialect (Oren & Breznitz, 2005). Even within the context of the bilingualism definition, the ability and understanding of a second language varies and is most complex. Researchers in the past have looked at whether cognitive abilities and processing speed in the first language (L1) can be advantageous for the second language (L2) (Cook, 1997; Oren & Breznitz, 2005). The most consistent finding in the literature shows that cognitive processes in L2 are fractionally slower compared to that in the L1 within-groups. However, studies have also found that bilingualism could be a cognitive protective factor. For instance, a study by Bialystok, Craik and Freedman (2007) showed that dementia onset occurred 4 years later in bilingual individuals compared to monolingual individuals and may be due to domain general processes benefiting from learning the additional language and might result in greater grey matter volume. This finding has been replicated in other populations (Gold, 2015; Grundy et al., 2017; Guzmán-Vélez & Tranel, 2015).

Bilingualism has also been found to be associated with enhanced performance on tasks measuring several aspects of executive functioning including cognitive flexibility (Adi-Japha et al., 2010), efficiency (Blumenfeld & Marian, 2014), task-switching (Gold et al., 2013; Prior & MacWhinney, 2010) and conflict resolution (Donnelly et al., 2015) as a result of a lifelong experience of managing multiple languages (Grundy & Timmer, 2017). A recent selective review of bilingualism by Waldie and colleagues (2020) focused on two functional MRI studies where task performance and brain activation from late proficient bilinguals when using their L1 and L2 were compared to matched monolinguals. One study showed that monolinguals produced greater overall activation during Stroop performance, more posterior brain activation during inference, and greater activation in the anterior cingulate and prefrontal regions during response conflict compared to bilinguals. The second study observed that bilinguals recruited more extensive networks when processing L2 than L1 and showed weaker lateralisation, particularly in the temporal lobe, during both L1 and L2 lexical decisions. The findings demonstrate a benefit of bilingualism to executive functioning but at the expense of decreased cortical efficiency (Waldie et al., 2020).

1.1 Bilingualism and working memory

Given that language processing is largely dependent on working memory and that there is a strong positive relationship between higher-order executive functions and working memory capacity (WMC) (Engle, 2002), bilinguals may have greater WMC than monolinguals. Working memory is a complex, dynamic system which has processing as well as storage functions (e.g., Baddeley, 2017; Just & Carpenter, 1992; Tomitch, 2003). Reading a text requires storage of pragmatic, semantic and syntactic information in order to compute relationships between words, sentences and paragraphs, and, at the same time, processing demands involving decoding the input, lexical access, syntactic parsing, drawing inferences, and integrating the input with knowledge stored in memory (Daneman & Carpenter, 1980).

Research has shown that working memory is an important source of individual differences, being related to reading in both L1 (Bohn-Gettler & Kendeou, 2014; King & Just, 1991; MacDonald et al., 1992; Pérez et al., 2014; Tomitch, 2003) and L2 (Alptekin & Erçetin, 2011; Keijzer, 2013; Linck et al., 2014; Woelfer & Tomitch, 2019). While some research supports the prediction of greater WMC in bilinguals (e.g. Morales et al., 2013; Soliman, 2014) other studies have found no effect (e.g. Namazi & Thordardottir, 2010; Ratiu & Azuma, 2015). A more recent study by Andreou et al. (2021), with 8-12 year old children, 35 monolinguals of Greek and 35 bilinguals of Albanian-Greek speakers, did not find support for the bilingual advantage hypothesis, with monolinguals performing better than bilinguals in two working memory tasks: visuospatial and updating, results which have been corroborated (Engel de Abreu, 2011).

In a comprehensive meta-analysis on the effects of bilingualism on WMC, Grundy and Timmer (2017), observed that bilingual individuals exhibited a larger working memory span than monolinguals, explained by bilinguals' experience in having to switch between two competing languages, which is confirmed by other studies (e.g., Linck et al., 2014). The authors suggest that the experience managing two languages that compete for selection results in greater WMC over time (Grundy & Timmer, 2017). In a review by Liu and Liu (2021), the authors concluded that there is enough evidence from previous studies reviewed for a clear bilingual advantage in relation to the spatial component of working memory. However, results concerning the verbal component of working memory are still not conclusive, although they do not show a disadvantage for bilinguals (Liu & Liu, 2021).

1.2 Bilingualism, reading and oral language proficiency

Reading comprehension is a complex process that involves the integration and coordination of various cognitive abilities, including word decoding (recognizing single printed words) and listening comprehension (the ability to understand what is decoded in spoken form) (Gough & Tunmer, 1986). Children with reading comprehension difficulties are typically first identified in the first years at school through a primary weakness in decoding and phonological awareness (Snowling, 2001). It is less typical to have an individual with reading comprehension difficulties along with intact and age-appropriate decoding ability. In these cases, literacy difficulties emerge later, when decoding becomes automatized and more variance in reading comprehension is accounted for by oral language skills (Catts et al., 2012). Reading comprehension difficulties can thus be masked and overlooked by both good decoding skills and good oral language ability. There has been a dearth of research on bilingual reading comprehension. Relatively little is known regarding whether reading comprehension difficulties manifest in a similar manner in L1 and L2 for bilingual individuals.

Cummins (1984) suggested that L1 and L2 reading skills are interdependent, and that language and reading skills acquired in one language facilitate literacy development in the L2. As such, it is likely that the same cognitive and linguistic skills needed for successful reading comprehension in L1 contribute to reading development in L2 (Gottardo et al., 2006; Mancilla-Martinez & Lesaux, 2011). Research suggests that children at risk for L2 difficulties can be

identified based on their performance on L1 reading tasks (Da Fontoura & Siegel, 1995; Geva & Clifton, 1994). For individuals learning English as a second language, it can be difficult to determine whether weaknesses in L2 reading comprehension reflect limited language learning experiences or are indicative of a language or reading impairment (D'Angelo & Chen, 2017; Li & Kirby, 2014; Paradis et al., 2011). In a study by Tong et al. (2018) with children with lower reading comprehension (defined as those at or below the 25th percentile on reading comprehension tasks) in Chinese L1 and English L2, most children with lower reading comprehension in Chinese L1 also experienced lower reading comprehension in English L2.

In summary, findings regarding a bilingual advantage for cognitive abilities are still mixed and the relationships between bilingualism, reading ability and cognitive performance are complex. The main aim of the present study was to investigate whether bilingual and monolingual individuals perform differently in working memory, reading comprehension and oral language proficiency tasks. We also examined if differences can also be found in monolingual/bilingual individuals with and without dyslexia, respectively. Since our sample sizes were too small (particularly bilinguals with dyslexia) to make any strong inferences, this aspect of the research should be considered exploratory. Regardless, we predicted that bilingualism provides an advantage for the dyslexic individuals in at least one domain compared to being monolingual. This hypothesis comes from a resurgence of interest regarding whether having the additional language provides a neurocognitive benefit or not. Research in these domains remain under-investigated and can provide insight into better learning strategies for individuals with reading problems or dyslexia.

The role of phonological awareness and competency is particularly important. A study by Vender and Melloni (2021) found that both monolingual and bilingual dyslexic groups performed lower than non-dyslexic control groups across all tasks. Bilingualism in dyslexia did not provide an advantage but also did not provide a disadvantage per se, rather the phonological loop required for memory processes appeared to be problematic for individuals with dyslexia (Vender & Melloni, 2021). Regarding morphological processing, Vender et al (2021) investigated in monolingual and bilingual controls and individuals with dyslexia. Individuals with dyslexia, irrespective of a L2, performed worse compared to controls, consistent with previous research (Vender et al., 2018). In contrast, bilingual controls were able to generate more plural nouns from non-words compared to monolinguals. Whilst it was a not a significant effect, this was also seen in bilingual individuals with dyslexia, particularly for vowels ending with *e*, suggesting that bilingualism can improve one's morphological and metalinguistic abilities because bilinguals need to 'activate' information in both L1 and L2 constantly (Vender et al., 2021).

When it comes to the research on working memory and bilinguals with dyslexia, studies are still very scarce. As observed by Jalali-Moghadam and Kormi-Nouri (2015), most studies on reading difficulties have focused on reading processing skills in the second language. Executive functioning task performance from 88 bilingual children (Swedish and Farsi) and 102 monolinguals (Swedish), both with and without reading difficulties, showed a bilingual advantage for typical bilinguals but not for bilinguals with reading difficulties. In fact, the authors found a deterioration in speed performance of bilinguals with reading difficulties when compared to monolinguals with reading difficulties, showing a disadvantage for bilinguals. Moreover, a working memory deficit has been connected to the reading difficulties found in dyslexia for both monolingual and bilingual individuals, with some studies showing a bilingual advantage. In a study with 11- and 15-year-old monolingual children with dyslexia, Nicolson, Fawcett and Baddeley (1995) investigated the hypothesis that "cognitive deficits in children are attributable to a deficit in working memory which is itself attributable to motor deficit in articulation speed" (p. 4). The results did not fully support their hypothesis but indicated that younger children showed a deficit in phonological processing for unfamiliar words, which the older 15-year-olds seemed to have already overcome. However, both age groups showed articulation problems, which was explained by the

authors as a potentially due to a decreased working memory span. A decreased working memory span for those with dyslexia was also found by Varvara et al. (2014). Taken together, more studies are needed to investigate whether differences can be seen in working memory between typical bilingual individuals and bilingual individuals with dyslexia.

2 Methods

2.1 Participants

A total of 54 individuals participated in the study, comprising 4 groups: Typical monolingual (n=15); typical bilingual (n=20); monolingual with dyslexia (n=13); and bilingual with dyslexia (n=6). The monolingual speakers were all native speaker of English. Of the six bilingual participants with dyslexia, three were speakers of English as a second language, having learned English after the age of 6, and three individuals were raised as bilinguals, having learned English before the age of 6. The typical bilingual participants were all speakers of English as a second language, having learned English after the age of 6. All participants had normal or corrected to normal vision. All participants in the dyslexia group had been given a clinical diagnosis of dyslexia during childhood. Diagnoses were made by a clinical psychologist or paediatrician. Exclusion criteria for typical participants included personal or family history of neurological or psychiatric disorders, hearing deficits, and pharmacological treatment. Further exclusion criteria for participants with dyslexia were a co-morbid Axis 1 disorder, relevant Axis 3 diagnosis and hearing deficits.

Participants were recruited through advertisements posted around the University of Auckland, as well as via Facebook and the courier advertising. The study was approved by the University of Auckland's Human Participants Ethics Committee (UAHPEC; Ref: 021103). Written informed consent was obtained from all participants.

2.2 Measures

All measures and test procedures were administered in English language. The participants answered a demographic questionnaire and individuals with dyslexia completed a dyslexia test, a reading comprehension test and a measure of WMC. The six bilingual participants with dyslexia, besides taking the tests just described, were also administered an oral proficiency test in English. Typical bilingual individuals took the oral proficiency test in English, the reading comprehension test and the measure of WMC. Typical monolingual participants were administered the WMC test. Data for each test was collected individually with each participant and the order of test application was randomized across participants. A self-developed demographic questionnaire focused on (1) highest education, (2) age of dyslexia diagnosis, (3) therapy received for dyslexia, (4) reading difficulties faced when diagnosed, (5) reading difficulties faced at the time of data collection, (6) impact of dyslexia on school and academic reading, (7) impact of dyslexia on reading habits, (8) comorbidities, (9) psychoactive medication, (10) mother tongue, and (11) additional languages spoken.

2.2.1 Word identification. The Letter-Word Identification (LWI) and the Word Attack skills (WAS) subtests from the Woodcock-Johnson Test of Achievement (Woodcock et al., 2001) were applied to monolingual and bilingual participants with dyslexia, following other studies in the area, for example Varvara et al. (2014). Following Woodcock and colleagues' (2001) recommendations for test application, in the LWI subtest, participants were asked to read aloud a list of real words, which were presented to them, in written format, one by one by the test administrator. Participants had to read each word within 5 seconds after presentation and the test was terminated after six consecutive incorrect responses. The same procedure was used for the WAS test except that, this time, a list of nonwords was presented to participants and they were asked to try to read each one of them aloud. The number of correct words and nonwords respectively were recorded and summed to a total score.

2.2.2 Measure of WMC. Aiming at verifying the extent of the involvement of working memory, due to the non automatisation of decoding and literal comprehension processes in dyslexia, as well as in bilingualism, a WMC test – the Operation-word Span

Test (OSPAN) (Turner & Engle, 1989) was used in this study. There is ample evidence in the literature showing that the OSPAN is a reliable and valid measure of WMC, accounting for its functions of storing and processing information, whereas the simple digit or word span measures only account for storage functions (Bailer et al., 2013; Conway et al., 2005). The test requires that participants solve math operations as they try to retain a series of unrelated words in working memory in order to perform a subsequent recall task. The procedure for the OSPAN consisted of a series of simple math operations being presented on the computer screen and participants had to read each operation out loud and then solve it mentally. After each operation an interrogation mark (?) appeared on the screen and they had to judge whether the result shown was correct or not. Right after that, a word popped up on the screen, they had to read it out loud and try to memorize it. Then a new math operation and a new word appeared and the procedure was repeated. Each time a blank screen popped up with interrogation marks, they were asked to search their memory for the words in that set and to say them out loud, exactly in the order they were shown to them. There were 42 math operations, each one followed by a disyllabic English word to be recalled (e.g. (10 ÷ 2) - 3 = 2 ? Socket; (10 ÷ 10) - 1 = 2 ? Island; (8 x 4) - 2 = 32 ? Weapon). The test was divided into three blocks, with randomized sets of two, three, four and five sequences of math operations followed by words to be recalled. Randomization of sets is a usual procedure in this area, for example (Bailer, 2016; Prebianca, 2009; Turner & Engle, 1989), in order to prevent participants from knowing in advance how many words will be part of the set at hand. There was an initial practice test so that participants could be familiarized with the procedure and solve any possible doubts. Performance in the test depended on the correct judgment of the math results (at least 50%) and the number of words recalled correctly in the presented sequence. Each participant received a strict and lenient score. The strict score resulted from counting the total number of words correctly recalled in the exact same order they were presented, whereas the lenient score considered all correctly recalled words, regardless of the order participants mentioned them.

2.2.3 Reading comprehension test. Although literal and inferential comprehension depend on being able to decode individual words, as in the subtests above (LWI and WAS), reading aloud separate individual words or nonwords is not the same as reading a text silently for its global and local meaning, where the context of the sentence and even the paragraph can help readers to make sense of the text as a whole. In this regard, one of the practice tests of the reading section of the Test of English as Foreign Language (TOEFL) was used in order to measure the reading comprehension skills in L2 for typical bilinguals and bilinguals with dyslexia. The TOEFL test aims at assessing skills of English use in terms of reading, writing, listening and speaking. However, for the purposes of this study, only the section on reading comprehension was used which portrays the ability to comprehend academic texts in English (ETS TOEFL, 2021). In the present study, participants were asked to read one passage with 609 words, titled “Meteorite Impact and Dinosaur Extinction”, and to answer questions on the basis of what was stated or implied in the text. Participants were given 35 minutes for the whole task of reading and answering the questions proposed. The actual TOEFL test would give participants about half this time for one passage. It is important to clarify that, although the test was originally devised for English as a second/foreign language students, in this study we used it for both bilingual participants and monolingual participants with dyslexia. This decision was made as there is nothing in the test (text and accompanying questions) that would make it inappropriate for monolingual English speakers. Moreover, we considered the importance to have a standardised measure to compare the performance of both groups.

In order to analyse the level of comprehension demanded from readers, the 10 questions included in the reading comprehension test were categorized according to the taxonomy for comprehension questions devised by Pearson and Johnson (1978) and largely used in the field of reading. The taxonomy includes three types of questions: textually-explicit;

textually-implicit and scriptally-implicit. Textually-explicit questions are those whose answers can be found explicitly stated in the text. To make a connection with the reading comprehension framework by Gagné et al (1993), textually-explicit questions probe for information at the literal comprehension level, which includes lexical access and parsing. Answers to textually-implicit questions, on the other hand, cannot be found on the surface of the text and depend on the reader being able to make connections between different pieces of textual information. In Gagné et al.'s (1993) model, this would be the inferential level of comprehension, which requires inferences in order to integrate, to summarize, and to elaborate on textual information, providing links between clauses and sentences and also across paragraphs. The third type of question in Pearson and Johnson's (1978) taxonomy is scriptally-implicit questions, which, as the name implies, is dependent upon the reader's 'script' or prior knowledge in relation to the topic of the text. Although some degree of prior knowledge is also necessary to answer textually-implicit questions, scriptally-implicit questions are totally dependent upon reader's knowledge and require them to use information outside the text. In sum, textually-explicit questions require the reader to 'read the lines', whereas textually-implicit questions require 'reading between the lines' and scriptally-implicit questions entail 'reading beyond the lines'. The test was submitted to a group of four independent judges who were asked to categorize each one of the ten questions in the TOEFL test, in accordance with the taxonomy described above. Four questions were considered textually-explicit, five were considered textually-implicit, and one was considered scriptally-implicit.

2.2.4 Oral language proficiency test. Both typical bilingual individuals and bilingual individuals with dyslexia took an oral proficiency test in their second language (English). An oral narrative task (Robinson, 1995) was used which enables participants to speak more freely in terms of lexical, grammatical and syntactic choices, as well as those related to text organisation – cohesion and coherence. It required that participants constructed a narrative based on a stimulus containing pictures that denoted a sequence of events in a story. Following a number of authors in the area of second language acquisition, a type of task named "there-and-then' picture cued narratives" (Robinson, 1995; Tavares, 2008) was used. Following previous research in the area, participants had 3 minutes to look at a sequence of pictures, trying to formulate a story in their mind and then asked to verbalize a narrative based on what they had seen. It is called 'there-and-then' since participants are not allowed to look back at the pictures once they have initiated verbalization. The oral narrative produced was evaluated in terms of its fluency, complexity and accuracy (D'Ely, 2006; Foster & Skehan, 1996; Tavares, 2008). Two measures of fluency used by D'Ely (2006) were used in this study: speech rate unpruned and speech rate pruned. Speech rate unpruned is a lenient measure of fluency which is obtained by "dividing the total number of semantic units (complete and partial words), including repetitions, produced by the total amount of time (in seconds) participants took to perform orally. The result is then multiplied by 60 so as to determine the number of words learners produced per minute" (p.104). Speech rate pruned is a more strict measure of fluency which is obtained in the same way as the former one but this time all repeated semantic units are eliminated from the calculation. In both cases all contractions (e.g don't; aren't) were counted as one word. Following D'Ely (2006) the index of complexity was obtained "by the number of independent and dependent clauses divided by the number of c-units produced, resulting in a figure that expresses the total number of clauses per c-unit. The higher the index the more complex the speech is" (p.109). Finally, complying with D'Ely (2006), the index of accuracy was calculated as the percentage of clauses which were free of errors in relation to syntax, morphology and lexical choices. Errors in relation to pronunciation, stress and intonation which did not hinder communication were not computed and neither were those that were corrected by participants themselves during the course of oral production.

2.3 Data analysis

To determine how the different variables were associated, we performed correlation analyses across all outcome measures. To test for mean difference between groups regarding performance in the outcome measures, we conducted two-independent-sample *t*-tests. For reading comprehension and oral English language proficiency, we compared the mean TOEFL performance and Oral Narrative Task and of typical bilingual participants and bilingual participants with dyslexia. For the test of dyslexia, we compared the mean LWI and WAS scores of monolingual and bilingual participants with dyslexia. For WMC, we compared the mean OSPAN lenient and strict scores between all four groups in our study. Following this procedure, we conducted multivariate covariance analysis (MANCOVA) for the identified measures showing significant group differences by controlling for age, sex and education. As this study is part of larger project involving EEG assessment, we also controlled for intake of SSRI medication that would affect EEG signal in order to be able to compare the findings across analyses. *Bonferroni* post-hoc tests were performed to compare the groups one by one at a significance level of 0.05.

3 Results

Sociodemographic characteristics of the total study sample and the participants of each group are presented in Table 1.

Table 1 – Sociodemographic characteristics of the sample

	Total sample N=54	Typical monolingual N=15	Typical bilingual N=20	Monolingual w dyslexia N=13	Bilingual w dyslexia N=6
Age [M (SD)]	28.94 (7.4)	26.2 (6.4)	30.3 (6.1)	31.5 (10.1)	25.8 (4.6)
Sex [n, (%)]					
Male	18 (33.3)	6 (40)	7 (35)	2 (15.4)	3 (50)
Female	36 (66.7)	9 (60)	13 (65)	11 (84.6)	3 (50)
Education [n, (%)]					
Secondary	19 (35.2)	8 (53.3)	6 (30)	3 (23.1)	2 (33.3)
Tertiary (university-level)	35 (64.8)	7 (46.7)	14 (70)	10 (76.9)	4 (66.7)

Note. No statistical differences between groups. ANOVA was conducted for continuous variable, Chi^2 test for categorical variables. Sociodemographic data is also presented at Tomitch et al. (2025).

Intercorrelation of outcomes measures revealed a moderate significant correlation between the TOEFL score and the Oral Narrative Accuracy score. All other associations were not significant (Table 2).

The results of the testing for mean difference between groups are presented in Table 3. We found that typical participants showed higher OSPAN scores and thus better WMC than participants with dyslexia. Typical monolinguals had a significantly higher OSPAN score than monolinguals with dyslexia. All other group mean comparisons were not significant.

The MANCOVA, for the OSPAN strict scores, controlling for age, sex and education revealed a significant group effect (p=0.03) The *Bonferroni* pairwise comparisons of all groups showed that there was a significant group difference between monolingual participants with dyslexia and typical monolingual participants, with typical monolingual participants performing better in the OSPAN test (mean difference=6.0, 95% CI [0.63, 11.38]; p=0.02). No other group differences were significant.

Table 2 – Intercorrelations of behavioural measures

Measure	OSPAN strict	LWI	WAS	TOEFL	Oral Narrative Fluency SRP	Oral Narrative Accuracy	Oral Narrative Complexity
OSPAN strict	1	.262	.019	.314	-.040	.221	-.203
Woodcock Johnson WI		1	.452	.252	.445	-.037	-.007
Woodcock Johnson WA			1	-.036	.497	.140	.128
TOEFL				1	.283	**.470***	.165
Oral Narrative Fluency SRP					1	.349	.357
Oral Narrative Accuracy						1	.352
Oral Narrative Complexity							1

Note. *p>.05. level. OSPAN = The Operation-Word Span Test; TOEFL = Test of English as Foreign Language; LWI=Letter Word Identification; WAS=Word Attack Skills; SRU=Speech rate pruned.

Table 3 – Testing for mean differences between groups in working memory, word identification, oral language proficiency and reading comprehension

	Group comparison			
Outcomes M (SD), p-value	Typical monolingual (n=15) vs. Typical bilingual (n=20)	Monolingual w dyslexia (n=13) vs bilingual w dyslexia (n=6)	Typical monolingual (n=15) vs. monolingual w dyslexia (n=13)	Typical bilingual (n=20) vs. bilingual w dyslexia (n=6)
OSPAN strict	Typical monolingual: 30.4 (4.4) Typical bilingual: 28.3 (4.7) *p*=.19	Monolingual with dyslexia: 23.7 (5.6) Bilingual w dyslexia: 27.2 (3.6) *p*=.19	Typical monolingual: 30.4 (4.4) Monolingual w dyslexia: 23.7 (5.6) ***p*=.001**	Typical bilingual: 28.3 (4.7) Bilingual w dyslexia: 27.2 (3.6) *p*=.46
OSPAN lenient	Typical monolingual: 32.4 (4.4) Typical bilingual: 30.9 (4.4) *p*=.31	Monolingual with dyslexia: 28.1 (5.1) Bilingual w dyslexia: 29.8 (4.1) *p*=.47	Typical monolingual: 32.4 (4.4) Monolingual w dyslexia: 28.1 (5.1) ***p*=.02**	Typical monolingual: 30.9 (4.4) Bilingual w dyslexia: 29.8 (4.1) *p*=.72
LWI		Monolingual with dyslexia: 30.2 (8.3) Bilingual w dyslexia: 30.2 (5.3) *p*=.99		
WAS		Monolingual w dyslexia: 33.7 (7.5) Bilingual w dyslexia: 35.7 (3.2) *p*=.55		
Oral Narrative Fluency SRU				Typical bilingual: 129.1 (37.6) Bilingual w dyslexia:

		155.6 (36.7) *p*=.14
Oral Narrative Fluency SRP		Typical bilingual: 124.1 (37.7) Bilingual w dyslexia: 151.6 (35.8) *p*=.13
Oral Narrative Accuracy		Typical bilingual: 72.2 (23.4) Bilingual w dyslexia: 88.4 (14.6) *p*=.13
Oral Narrative Complexity		Typical bilingual: 2.2 (0.5) Bilingual w dyslexia: 2.6 (0.3) *p*=.26
TOEFL	Monolingual w dyslexia: 8.6 (2.1) Bilingual w dyslexia: 8.2 (3.0) *p*=.70	Typical bilingual: 7.9 (2.5) Bilingual w dyslexia: 8.2 (3.0) *p*=.83

Note. OSPAN = The Operation-Word Span Test; TOEFL = Test of English as Foreign Language; LWI=Letter Word Identification; WAS=Word Attack Skills. This data is also presented as minor analysis at Tomitch et al. (2025).

4 Discussion

Our study showed that typical monolinguals demonstrated a better working memory performance than monolinguals with dyslexia while no differences were found between typical bilinguals and bilinguals with dyslexia. No differences were also found when comparing monolinguals with bilinguals with and without dyslexia, respectively.

The advantage of bilingualism on executive functioning is still discussed controversially in the literature. Our findings support previous work that there is no direct bilingual advantage for WMC (Namazi & Thordardottir, 2010; Ratiu & Azuma, 2015). While impairments in working memory have been well documented in dyslexia (McLoughlin et al., 1994; Smith-Spark & Fisk, 2007), we found this effect only when comparing typical monolinguals and monolinguals with dyslexia. While we did not find an advantage of bilingualism per se, we also did not observe a disadvantage for dyslexia in bilinguals, suggesting that WMC might presumably not be affected in a similar way by dyslexia in bilingual adults. In this regard, our findings extend previous studies with child participants showing that, even though bilingualism may not provide an advantage, it also did not disadvantage children with dyslexia in phonological awareness and morphological and metalinguistic abilities (Vender et al., 2021; Vender & Melloni, 2021). This finding has also been noted in a previous study by Abu-Rabia and Siegel (2002) with children and adolescents. They observed 56 bilingual Arab-Canadian children aged between 9–14 years, where both bilingual and monolingual children with reading problems performed equally in terms of a working memory test. Similarly, Fontoura and Siegel (1995) found that at age 9-12 years, bilingual children (English, Portuguese) with reading difficulties had similar scores to the monolingual children (English) on working memory tasks.

The word recognition test demonstrated that there was no difference between monolingual and

bilingual individuals with dyslexia. While most studies indicate brain activation, cognitive abilities and behavioural manifestation differs from typical bilinguals and monolinguals, individuals with dyslexia and without dyslexia (Lallier et al., 2018; Vender et al., 2021; Waldie et al., 2020), our results demonstrated monolingual and bilingual adults with dyslexia performed similarly in the word recognition tasks. This is in line with findings stated by Vender et al. (2018), that a negative effect of bilingualism on clitic production disappears when controlling for vocabulary and thus, evidencing the importance of lexical competence in the target language for a native-like performance. Our findings suggest that the effect can potentially be extended for monolingual and bilingual individuals with dyslexia. Moreover, previous studies highlight the similarity in learning to read in L1 and L2 (August & Shanahan, 2006) and that L1 abilities are a significant predictor of reading and writing skills in L2 (Pae, 2018). Thus, in our study it might be that bilingual participants' performances on writing and reading abilities in L1 also affected their abilities in their L2. Furthermore, a review of studies has shown that there are no differences between bilingual children and their monolingual peers in decoding skill after the first or second year of schooling (August & Shanahan, 2006). Accordingly, exposure to the linguistic environment and experience and use of language has increased their performance in reading and oral language to the level of monolinguals at the time of assessment.

Furthermore, the results of the present study showed that there is no significant difference in reading comprehension and oral language proficiency in L2 (English) between typical bilingual individuals and bilingual individuals with dyslexia, suggesting there was no disadvantage of bilingualism for individuals with dyslexia in our study with respect to these tasks. We also found that there was no significant difference in reading comprehension between monolingual participants with dyslexia and bilingual participants with dyslexia, which confirms a similar ability in L2 for bilinguals with dyslexia comparable to the level of monolinguals with dyslexia. Contrarily, Vender et al. (2018) have found that children with dyslexia both monolingual and bilingual, performed worse than controls both in clitic production, suggesting that this is more challenging with dyslexia. However, reading comprehension and oral language ability are both complex processes relying upon several abilities which can be influenced by language exposure and using language in bilinguals. De Cat (2020) reported the strongest predictor of language proficiency in children is school language exposure. Thus, the opportunity of using English as a second language for our bilingual participants in the public and particularly academic circumstances might be a possible factor for finding these results in our adult sample. Earlier research on adults with dyslexia shows that individuals who had difficulty reading or were diagnosed with dyslexia as children do not receive full diagnostic criteria in adulthood by receiving effective interventions (Pinheiro & Scliar-Cabral, 2017). This indicates that people who have had reading difficulties as children might have been able to find compensatory strategies to deal with their reading problems during development or by therapeutic practices circumvented their reading problems effectively. Earlier qualitative work with the same sample of this study supports this, finding that even though reading difficulties may be persistent they can be circumvented with effective coping strategies. Furthermore, individuals with dyslexia can succeed academically although this often requires them having to work harder compared to typical individuals (Tomitch et al., 2023). Another factor might be that the frequent use and practice of L2 increases the performance of bilinguals as well as those who have reading difficulties. Therefore, it is possible that our participants' reading difficulties resolved over the years, and their performance at the time of the assessment was similar to that of people without history of reading problems.

Another aspect that potentially contributes to the lack of differences between groups is the role of socioeconomic status (SES). Many studies have shown the role of SES in linguistic skills (Calvo & Bialystok, 2014; Gathercole et al., 2016; Meir & Armon-Lotem, 2017) and cognitive domains such as decoding skills (Noble et al., 2006) which can provide a rich environment for children. One of the indicators of SES is the education of parents, with parents with higher

education typically having more access to support and resources available to provide learning environments and support for children. It is noteworthy that while SES was controlled for in the multivariate analysis, we generally had a high proportion of participants with tertiary education in our sample.

Together, we found no advantage nor disadvantage of bilingualism on any of the working memory or language tasks, which supports that bilingualism does not appear to have negative consequences for the development of reading skills and even shows that L2 performance is comparable to monolinguals' abilities in our groups with dyslexia. Furthermore, no negative effect of dyslexia on working memory was found in our bilingual sample. This further strengthens the important implication that bilingualism does not negatively affect dyslexia (Vender & Melloni, 2021). On the opposite, our study supports the suggestion that bilingualism might be beneficial in dyslexia at the linguistic and cognitive level (Antoniou et al., 2016; Vender & Melloni, 2021). This is of course in addition to the numerous advantages of bilingualism and multilingualism that have been documented, including enhanced communication skills, social connectivity, cultural identity, enhanced creativity and academic success (Gunnerud et al., 2020; Oakhill et al., 2003; Zelasko & Antunez, 2000). The benefit of bilingualism on dyslexia in the cognitive and linguistic domains may be due to the complexity of the interaction of bilingualism and dyslexia in adulthood and various influencing factors throughout development. Further studies are needed to investigate the interplay of these effects (do Amaral & de Azevedo, 2021).

A strength of this study is that it provides an insight into working memory, oral language proficiency and reading comprehension abilities of monolingual and bilingual individuals and in addition for those with and without dyslexia, and whether knowing a second language provides any benefit. The results do not show differences between monolingual and bilingual individuals overall, providing evidence that language and reading ability in L1 supports that of the L2, especially given that no differences were found between the monolingual and bilingual individuals with dyslexia. Our findings further support earlier work demonstrating that there is no bilingual benefit for WMC per se.

A primary limitation of the study was the small sample size of the bilingual individuals with dyslexia relative to typical controls. Therefore, this was mainly an initial exploratory analysis. For the working memory task, the results demonstrate that WMC is better in typical monolinguals compared to monolinguals with dyslexia, consistent with literature on working memory. However, the results did not show a difference in WMC or reading comprehension abilities between the groups with dyslexia suggesting that L2 does not affect working memory load and reading comprehension. The outcome could also be a result of sampling bias as several of our adverts were placed in a tertiary (university) setting, attracting participants who are more socio-economically advantaged and a majority of our sample had pursued tertiary education. This was especially apparent for bilingual individuals, as this group generally tended to progress to higher study compared to monolingual individuals in our sample. It is recommended that future studies recruit across a larger sample representative of the wider population with respect to educational and socio-economic backgrounds for a more accurate reflection of reading comprehension and working memory abilities between monolingual and bilingual individuals with and without dyslexia. For future studies it will be beneficial to explore the reciprocal and interactive relationship between bilingualism, dyslexia, WM and reading, as we were limited in conducting this level of analysis. Future studies with bigger sample sizes might also consider bilinguals with different L1 and L2 language pairs and orthography as a possible relevant factor. We would also like to acknowledge another limitation in our study which is the fact that not all the participants took the oral narrative test, and the reason was that it is a test designed for testing oral language competence (fluency, accuracy, and complexity) in bilinguals. Also, in relation to the reading comprehension test, the interest was more on bilinguals and on those with dyslexia, so only these groups took the test. We acknowledge that administering all tests, including WM, in English, and

thus in L2 for bilingual individuals, might have also partially affected the outcomes rather than monolingualism/bilingualism per se. Other factors such as language proficiency, age of language acquisition, frequency of use of L1 and L2, immersion, participation is specific linguistic contexts, among others, have been noted as potentially affecting a bilingual advantage (Durand Lopez, 2021; Kroll et al., 2018).

5 Conclusion

The present study investigated whether bilingual and monolingual individuals with and without dyslexia respectively perform differently in working memory, reading comprehension and oral language proficiency. Results showed that typical monolinguals performed better in working memory compared to monolinguals with dyslexia, while all other group differences were not significant. Hence, a negative effect of dyslexia on working memory was only seen in the monolingual group and reading and language performance were comparable across groups. We conclude that while there seems to be no bilingual advantage per se, there might be a tendency towards a beneficial effect of bilingualism in dyslexia at the linguistic and cognitive level.

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References

Abu-Rabia, S., & Siegel, L. S. (2002). Reading, syntactic, orthographic, and working memory skills of bilingual Arabic-English speaking Canadian children. *Journal of Psycholinguistic Research*, *31*(6), 661-678.

Adi-Japha, E., Berberich-Artzi, J., & Libnawi, A. (2010). Cognitive flexibility in drawings of bilingual children. *Child Development*, *81*(5), 1356-1366.

Alptekin, C., & Erçetin, G. (2011). Effects of working memory capacity and content familiarity on literal and inferential comprehension in L2 reading. *Tesol Quarterly*, *45*(2), 235-266.

Andreou, M., Tsimpli, I. M., Masoura, E., & Agathopoulou, E. (2021). Cognitive Mechanisms of Monolingual and Bilingual Children in Monoliterate Educational Settings: Evidence From Sentence Repetition. *Frontiers in Psychology*, *11*, 3875.

Antoniou, K., Grohmann, K. K., Kambanaros, M., & Katsos, N. (2016). The effect of childhood bilectalism and multilingualism on executive control. *Cognition*, *149*, 18-30.

August, D., & Shanahan, T. (2006). *Developing literacy in second-language learners: Report of the National Literacy Panel on Language-Minority Children and Youth*. Lawrence Erlbaum Associates Publishers.

Baddeley, A. D. (2017). Modularity, working memory and language acquisition. *Second Language Research*, *33*(3), 299-311.

Bailer, C. (2016). The neural processing of sentences in bilinguals and monolinguals: an fMRI study of portugues-english bilinguals and portuguese monolinguals reading comprehension effects on brain activation.

Bailer, C., Tomitch, L. M. B., & D'Ely, R. C. S. F. (2013). Capacidade de memória de trabalho e atenção à forma e significado em leitura de inglês como língua estrangeira. *Letras de Hoje*, *48*(1), 139-147.

Bialystok, E., Craik, F. I., & Freedman, M. (2007). Bilingualism as a protection against the onset of symptoms of dementia. *Neuropsychologia*, *45*(2), 459-464.

Blumenfeld, H. K., & Marian, V. (2014). Cognitive control in bilinguals: Advantages in Stimulus–Stimulus inhibition. *Bilingualism: Language and Cognition*, *17*(3), 610-629.

Bohn-Gettler, C. M., & Kendeou, P. (2014). The interplay of reader goals, working memory, and text structure during reading. *Contemporary Educational Psychology*, *39*(3), 206-219.

Calvo, A., & Bialystok, E. (2014). Independent effects of bilingualism and socioeconomic status on language ability and executive functioning. *Cognition*, *130*(3), 278-288.

Catts, H., Compton, D., Tomblin, J., & Bridges, M. (2012). Prevalence and nature of late emerging reading disabilities. *Journal of Educational Psychology*, *104*(1), 166-181.

Conway, A. R., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., Engle, R. W., & review. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic bulletin*, *12*(5), 769-786.

Cook, V. (1997). The consequences of bilingualism for cognitive processing. *Tutorials in bilingualism: Psycholinguistic perspectives*, 279-299.

Cummins, J. (1984). *Bilingualism and Special Education: Issues in Assessment and Pedagogy*. Multilingual Matters.

D'Angelo, N., & Chen, X. (2017). Language profiles of poor comprehenders in English and French. *Journal of Research in Reading*, *40*(2), 153-168.

D'Ely, R. C. S. F. (2006). *A focus on learners' metacognitive processes: The impact of strategic planning, repetition, strategic planning plus repetition, and strategic planning for repetition on L2 oral performance* [Doctoral thesis, Universidade Federal de Santa Catarina].

Da Fontoura, H. A., & Siegel, L. S. (1995). Reading, syntactic, and working memory skills of bilingual Portuguese-English Canadian children. *Reading Writing*, *7*(1), 139-153.

Daneman, M., & Carpenter, P. A. (1980). Individual differences in working memory and reading. *Journal of verbal learning verbal behavior*, *19*(4), 450-466.

De Cat, C. (2020). Predicting language proficiency in bilingual children. *Studies in Second Language Acquisition*, *42*(2), 279-325.

do Amaral, J., & de Azevedo, B. (2021). What research can tell us about the interaction between dyslexia and bilingualism. *Letrônica*, *14*(2), e38695-e38695.

Donnelly, S., Brooks, P. J., & Homer, B. D. (2015). Examining the Bilingual Advantage on Conflict Resolution Tasks: A Meta-Analysis. CogSci.

Durand Lopez, E. M. (2021). A bilingual advantage in memory capacity: Assessing the roles of proficiency, number of languages acquired and age of acquisition. *International Journal of Bilingualism*, *25*(3), 606-621.

Engel de Abreu, P. M. (2011). Working memory in multilingual children: Is there a bilingual effect? *Memory*, *19*(5), 529-537.

Engle, R. W. (2002). Working memory capacity as executive attention. *Current Directions in Psychological Science*, *11*(1), 19-23.

ETS TOEFL. (2021). Retrieved 05.11.2021 from www.toeflgoanywhere.org

Fabbro, F., Naatanen, R., & Kujala, T. (1999). The neurolinguistics of bilingualism. *Nature*, *398*(6728), 577-577.

Foster, P., & Skehan, P. (1996). The influence of planning and task type on second language performance. *Studies in Second Language Acquisition*, *18*(3), 299-323.

Gagné, E. D., Yekovich, C. W., & Yekovich, F. R. (1993). *The cognitive psychology of school learning new york.* . Harper Collins.

Gathercole, V. C. M., Kennedy, I., & Thomas, E. M. (2016). Socioeconomic level and bilinguals' performance on language and cognitive measures. *Bilingualism: Language Cognition*, *19*(5), 1057-1078.

Geva, E., & Clifton, S. (1994). The development of first and second language reading skills in early

French immersion. *Canadian modern language review*, *50*(4), 646-667.

Gold, B. T. (2015). Lifelong bilingualism and neural reserve against Alzheimer's disease: A review of findings and potential mechanisms. *Behavioural Brain Research*, *281*, 9-15.

Gold, B. T., Kim, C., Johnson, N. F., Kryscio, R. J., & Smith, C. D. (2013). Lifelong bilingualism maintains neural efficiency for cognitive control in aging. *Journal of Neuroscience*, *33*(2), 387-396.

Gottardo, A., Chiappe, P., Yan, B., Siegel, L., & Gu, Y. (2006). Relationships between first and second language phonological processing skills and reading in Chinese-English speakers living in English-speaking contexts. *Educational Psychology*, *26*(3), 367-393.

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial special education*, *7*(1), 6-10.

Grundy, J. G., Anderson, J. A., & Bialystok, E. (2017). Neural correlates of cognitive processing in monolinguals and bilinguals. *Annals of the New York Academy of Sciences*, *1396*(1), 183.

Grundy, J. G., & Timmer, K. (2017). Bilingualism and working memory capacity: A comprehensive meta-analysis. *Second Language Research*, *33*(3), 325-340.

Gunnerud, H. L., Ten Braak, D., Reikerås, E. K. L., Donolato, E., & Melby-Lervåg, M. (2020). Is bilingualism related to a cognitive advantage in children? A systematic review and meta-analysis. *Psychological Bulletin*, *146*(12), 1059.

Guzmán-Vélez, E., & Tranel, D. (2015). Does bilingualism contribute to cognitive reserve? Cognitive and neural perspectives. *Neuropsychology*, *29*(1), 139.

Jalali-Moghadam, N., & Kormi-Nouri, R. (2015). The role of executive functions in bilingual children with reading difficulties. *Scandinavian Journal of Psychology*, *56*(3), 297-305.

Just, M. A., & Carpenter, P. A. (1992). A capacity theory of comprehension: individual differences in working memory. *Psychological Review*, *99*(1), 122.

Keijzer, M. (2013). Working memory capacity, inhibitory control and the role of L2 proficiency in aging L1 Dutch speakers of near-native L2 English. *Brain Sciences*, *3*(3), 1261-1281.

King, J., & Just, M. A. (1991). Individual differences in syntactic processing: The role of working memory. *Journal of memory language*, *30*(5), 580-602.

Kroll, J. F., Dussias, P. E., & Bajo, M. T. (2018). Language use across international contexts: Shaping the minds of L2 speakers. *Annual Review of Applied Linguistics*, *38*, 60-79.

Lallier, M., Thierry, G., Barr, P., Carreiras, M., & Tainturier, M.-J. (2018). Learning to read bilingually modulates the manifestations of dyslexia in adults. *Scientific Studies of Reading*, *22*(4), 335-349.

Li, M., & Kirby, J. R. (2014). Unexpected poor comprehenders among adolescent ESL students. *Scientific Studies of Reading*, *18*(2), 75-93.

Linck, J. A., Osthus, P., Koeth, J. T., & Bunting, M. F. (2014). Working memory and second language comprehension and production: A meta-analysis. *Psychonomic bulletin review*, *21*(4), 861-883.

Liu, Q., & Liu, Z. (2021). A Review on the Relationship between Bilingualism and Working Memory. *Open Journal of Modern Linguistics*, *11*(2), 121-134.

MacDonald, M. C., Just, M. A., & Carpenter, P. A. (1992). Working memory constraints on the processing of syntactic ambiguity. *Cognitive Psychology*, *24*(1), 56-98.

Mancilla-Martinez, J., & Lesaux, N. K. (2011). The gap between Spanish speakers' word reading and word knowledge: A longitudinal study. *Child Development*, *82*(5), 1544-1560.

McLoughlin, D., Fitzgibbon, G., & Young, V. (1994). *Adult Dyslexia: Assessment. Counselling and Training*. Whurr.

Meir, N., & Armon-Lotem, S. (2017). Independent and combined effects of socioeconomic status (SES) and bilingualism on children's vocabulary and verbal short-term memory. *Frontiers in Psychology*, *8*, 1442.

Morales, J., Calvo, A., & Bialystok, E. (2013). Working memory development in monolingual and bilingual children. *Journal of Experimental Child Psychology*, *114*(2), 187-202.

Namazi, M., & Thordardottir, E. (2010). A working memory, not bilingual advantage, in controlled attention. *International Journal of Bilingual Education and Bilingualism*, *13*(5), 597-616.

Nicolson, R. I., Fawcett, A. J., & Baddeley, A. D. (1995). *Working memory and dyslexia. Internal Report. Learning Research Group*. D. o. Psychology.

Noble, K. G., Farah, M. J., & McCandliss, B. D. (2006). Socioeconomic background modulates cognition–achievement relationships in reading. *Cognitive Development*, *21*(3), 349-368.

Oakhill, J. V., Cain, K., & Bryant, P. E. (2003). The dissociation of word reading and text comprehension: Evidence from component skills. *Language and Cognitive Processes*, *18*(4), 443-468.

Oren, R., & Breznitz, Z. (2005). Reading processes in L1 and L2 among dyslexic as compared to regular bilingual readers: Behavioral and electrophysiological evidence. *Journal of Neurolinguistics*, *18*(2), 127-151.

Pae, H. K. (2018). *Writing systems, reading processes, and cross-linguistic influences: Reflections from the Chinese, Japanese and Korean languages* (Vol. 7). John Benjamins Publishing Company.

Paradis, J., Genesee, F., & Crago, M. B. (2011). *Dual language development and disorders: A handbook on bilingualism and second language learning*. ERIC.

Pearson, P., & Johnson, D. (1978). 1978: Teaching reading comprehension. New York: Holt, Rinehart and Winston.

Pérez, A. I., Paolieri, D., Macizo, P., & Bajo, T. (2014). The role of working memory in inferential sentence comprehension. *Cognitive Processing*, *15*(3), 405-413.

Pinheiro, Â. M. V., & Scliar-Cabral, L. (2017). *DISLEXIA Causas e consequências*. Editora UFMG.

Prebianca, G. V. V. (2009). Communication strategies and proficiency levels in L2 speech production: A systematic relationship. *Revista de Estudos da Linguagem*, *17*(1), 7-50.

Prior, A., & MacWhinney, B. (2010). A bilingual advantage in task switching. *Bilingualism: Language and Cognition*, *13*(2), 253-262.

Ratiu, I., & Azuma, T. (2015). Working memory capacity: Is there a bilingual advantage? *Journal of Cognitive Psychology*, *27*(1), 1-11.

Robinson, P. (1995). Task complexity and second language narrative discourse. *Language learning*, *45*(1), 99-140.

Smith-Spark, J. H., & Fisk, J. E. (2007). Working memory functioning in developmental dyslexia. *Memory*, *15*(1), 34-56.

Snowling, M. J. (2001). *Dyslexia* (2 ed.). Blackwell.

Soliman, A. M. (2014). Bilingual advantages of working memory revisited: A latent variable examination. *Learning Individual Differences*, *32*, 168-177.

Tavares, M. d. G. G. (2008). Pre-task planning, working memory capacity, and L2 speech performance.

Tomitch, L. M. B. (2003). Reading: Text organization perception and working memory capacity. In *Advanced Research in English Series* (Vol. 7). Universidade Federal de Santa Catarina.

Tomitch, L. M. B., Lodhia, V., Neumann, D., Zamani Foroushani, N., & Waldie, K. (2025). Individual differences in main idea identification: An EEG study of monolinguals and bilinguals with dyslexia. *Bilingualism: Language and Cognition*, 1-13.

Tomitch, L. M. B., Neumann, D., Lodhia, V., Zamani Foroushani, N., & Waldie, K. (2023). Developmental dyslexia: An exploratory study using thematic analysis of the self-reported

reading difficulties of monolinguals and bilinguals. *International Journal for Research in Learning Disabilities*, *6*(1), 44-57.

Tong, X., McBride, C., Shu, H., & Ho, C. S. h. (2018). Reading comprehension difficulties in Chinese–English bilingual children. *Dyslexia*, *24*(1), 59-83.

Turner, M. L., & Engle, R. W. (1989). Is working memory capacity task dependent? *Journal of memory language*, *28*(2), 127-154.

Varvara, P., Varuzza, C., Padovano Sorentino, A. C., Vicari, S., & Menghini, D. (2014). Executive functions in developmental dyslexia. *Frontiers in Human Neuroscience*, *8*, 120.

Vender, M., Hu, S., Mantione, F., Delfitto, D., & Melloni, C. (2018). The production of clitic pronouns: a study on bilingual and monolingual dyslexic children. *Frontiers in Psychology*, *9*, 2301.

Vender, M., Hu, S., Mantione, F., Savazzi, S., Delfitto, D., & Melloni, C. (2021). Inflectional morphology: evidence for an advantage of bilingualism in dyslexia. *International Journal of Bilingual Education Bilingualism*, *24*(2), 155-172.

Vender, M., & Melloni, C. (2021). Phonological Awareness across Child Populations: How Bilingualism and Dyslexia Interact. *Languages*, *6*(1), 39.

Waldie, K. E., Badzakova-Trajkov, G., Park, H. R., Zheng, Y., Neumann, D., & Zamani Foroushani, N. (2020). The cognitive and neural correlates of written language: a selective review of bilingualism. *Journal of the Royal Society of New Zealand*, 1-16.

Woelfer, S. W., & Tomitch, L. M. B. (2019). WORKING MEMORY CAPACITY, READING PROFICIENCY, AND THE PROCESSING OF VERBAL AND PICTORIAL INFORMATION IN ENGLISH AS A FOREIGN LANGUAGE READING. *Alfa: Revista de Lingüística*, *63*(3), 637-663.

Woodcock, R. W., Mather, N., McGrew, K. S., & Wendling, B. J. (2001). *Woodcock-Johnson III tests of cognitive abilities*. Riverside Publishing Company Itasca, IL.

Zelasko, N., & Antunez, B. (2000). *If Your Child Learns in Two Languages: A Parent's Guide for Improving Educational Opportunities for Children Acquiring English as a Second Language*. National Clearinghouse for Bilingual Education.