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DYSLEXIA AND VOCABULARY DEPTH IN EFL TEXT COMPREHENSION

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Abstract – The study offers a retrospective analysis of data collected from reading comprehension activities of two groups of English foreign language (EFL) learners, one with and one without dyslexia. The aim of the investigation was to verify whether vocabulary depth corresponds to greater accuracy in answering factual and inferential questions in the two groups. The hypothesis was that depth would be associated with better comprehension even in dyslexic readers' performance, which was generally poorer than that of the control group. In fact, this was only confirmed for high-range focus words, that is, words that were more deeply known to the participants according to an adapted Word Associates Test. Variable outcomes were observed for mid- and low-range words. A qualitative analysis of the unexpected results was carried out which led to the identification of several factors hindering text comprehension by dyslexic readers. These include a difficulty in selecting the relevant sense of focus words in contexts in which competing elements coexist and a negative interaction between lexical and pragmatic-inferential processing.

Keywords: dyslexia; English as a Foreign Language; inferential reading; reading comprehension; vocabulary depth.

1. Introduction

It is now widely recognized that dyslexia can be seen as a multidimensional and multifactorial disorder. Although primarily hindering the acquisition of efficient reading and writing skills even when appropriate learning opportunities are provided, it manifests with a variety of difficulties that go beyond inefficient word-level decoding and reduced graphemic competence (Ramus *et al.* 2003). Dyslexia has been linked to impairment of different severity in working memory functioning, verbal short-term memory, rapid automatized naming, and executive functions (Araújo, Faísca 2019; Araújo *et al.* 2020; Lonergan *et al.* 2019; Meisinger *et al.* 2021; Smith-Spark *et al.* 2003, 2016; Smith-Spark, Fisk 2007) and, although, its effects differ both in

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quality and severity, they can be variously reflected in the linguistic behaviour of people with the disorder (Cappelli, Noccetti 2022).

There is no universal agreement as to whether reading comprehension is impaired by dyslexia or whether the difficulties observed in some individuals are to be considered secondary consequences (cf. Cappelli this volume). However, since in our world, much information and knowledge are passed via written texts, exploring the way in which dyslexia is associated with difficulties in understanding such texts (both in L1 and foreign language contexts) seems to be of paramount importance.

This article discusses the qualitative investigation of opportunistic data collected from reading comprehension activities presented to a group of learners of English (EFL) with and without dyslexia. It is meant as a retrospective and preliminary follow up to the study on inferential reading in this population discussed in Cappelli (this volume) and aims to explore the role of vocabulary depth in such process. More specifically, it tries to verify whether vocabulary depth corresponds to greater accuracy in answering factual and inferential questions in the two groups, and it does so by comparing the effect of having to process words classified as "high-range", "mid-range" and "low-range" according to the depth of knowledge determined through an adapted Word Associates Test. Given the nature of the data, the results of the discussion cannot be generalised, but they can hopefully contribute to the debate on the role of lexical knowledge in reading comprehension and prompt further research on the matter.

2. Reading comprehension and dyslexia

Understanding the written text is more than an act of decoding: it involves the creation of a coherent mental model of the text that emerges from the creation of meaningful links between its individual components and the readers' knowledge of the language and of the world (Kendeou *et al*. 2014). Reading comprehension is a complex process to which both lower-level and higher-level operations equally contribute (Kendeou *et al.* 2014; Perfetti, Stafura 2014). Word decoding, vocabulary knowledge, semantic processing, and morphological and syntactic abilities are as essential to the successful construction of text meaning as inferential skills, good executive functions and attention-allocating abilities as well as efficient memory and comprehension monitoring skills (Cain, Oakhill 2012; Oakhill *et al.* 2015; Perfetti, Adolf 2012). Moreover, these "components" of the reading process interact in inextricable ways. Thus, good memory skills are necessary to develop vocabulary and background knowledge, and good vocabulary knowledge and efficient working memory support inferential processes (Barnes *et al.* 1996; Oakhill *et al.* 2015). At the same time, efficient

inferential and attention-allocation abilities are important for lexical development (Oakhill, Cain 2012; Prior *et al.* 2014).

It is believed that there is no significant difference in the cognitive components and higher-level processes involved in L1 and L2 reading (Grabe 2014). Lower-level processes, however, may be significantly impacted by the language of the text. Relevant differences in orthographic transparency (e.g., Italian shallow orthography vs. English deep orthography) may impact on word decoding. Limited (and possibly poorer) vocabulary and general background knowledge in the L2 may pose an obstacle to successful word-to-text integration processes (Jeon, Yamashita 2014; Li, Clariana 2019; Perfetti, Stafura 2014; Raudszus *et al.* 2018). A low proficiency level in the L2 may lead to situations of language transfer, which are neither necessarily nor always helpful for the outcome of reading comprehension tasks (Grabe 2014). Moreover, poor control of the L2 is associated with a greater depletion of the cognitive resources necessary for such tasks (In'nami *et al.* 2021).

Given the complexity of the reading comprehension process and the cognitive and linguistic characteristics of readers with dyslexia, it is far from surprising that studies have found differences in text understanding accuracy in these individuals (Cappelli this volume; Georgiou *et al.* 2022; Reis *et al.* 2020; Simi, this volume). Moreover, since specific learning disorders are associated with difficulties in foreign language learning (Ganschow, Sparks 2001; Kormos 2020; Nijakowska 2010; Schneider, Crombie 2012), it is fair to assume that reading in a foreign language (FL) may pose additional challenges to dyslexic readers, in line with Sparks and Ganschow's (1993) Linguistic Coding Differences Hypothesis, which sees L2 development trajectory as dependent on the L1 linguistic and cognitive abilities.

Recent studies have found that, although increasing the exposure to the written text favours compensatory processes (Santulli, Scagnelli 2017, 2022), people with dyslexia remain less fluent than their neurotypical peers in L1 reading even into adulthood. They are also less accurate in comprehension tasks (Cappelli, this volume; Georgiou *et al.* 2022; Reis *et al.* 2020; Simi, this volume). This may be due to the deficits in lower-level processes (e.g., decoding) as well as in primary executive functions (e.g., working memory and inhibition), which deplete the limited available resources that support the higher-level processes involved in inference making and in comprehension monitoring. In other words, comprehension difficulties might not be a direct effect of dyslexia, but the result of the exhaustion of the cognitive resources necessary for creating the mental model of the text (Cain *et al.* 2004a, 2004b; Eason *et al.* 2012; Kendeou *et al.* 2014; Perfetti, Hart 2002). Deficits in oral language skills, including at the lexical level, have also been found to contribute (Georgiou *et al.* 2022). Georgiou *et al.*'s (2022) metanalysis found a significant effect of orthographic consistency and of vocabulary knowledge

and reinforced the conclusion of previous studies that "children with dyslexia may experience deficits in broader language skills" (p. 221; cf. Cappelli, Noccetti 2022).

Because very diverse patterns of deficits can be found in people with dyslexia, both in lower- and higher-processes, great variance is found in data on accuracy in comprehension (Cain, Oakhill 2006; Georgiou *et al.* 2022; Oakhill *et al.* 2015). Discrepancies in the literature may also be due to an insufficiently fine-grained selection of the participants enrolled in the studies. Snowling *et al.* (2020) have indeed found that reading comprehension difficulties are more common in the case of comorbidity with other developmental language disorders, and that children with "pure" dyslexia only have mild deficits in text understanding, whereas their global performance remains within the normal range if assessed orally. However, most studies (including the present one) do not distinguish between participants with dyslexia and participants with dyslexia and comorbidities. This might return a picture of reading comprehension skills as more severely impacted by dyslexia specifically than they really are if compared to the reading comprehension skills of typically developed individuals. However, Georgiou *et al.* (2022) found that "individuals with dyslexia experience large difficulties in reading comprehension" (p. 221) even when vocabulary knowledge and orthographic transparency are controlled, although matching participants in the experiments according to their reading level rather than their age seems to reduce the gap. The format of questions (e.g., written vs. oral) may also produce a larger gap between readers with and without dyslexia (cf. Georgiou *et al.*'s (2022) and Reis *et al.*'s (2020) metanalyses and Keenan *et al.* (2008) for a discussion).

From a behavioural and applied point of view, however, regardless of the underlying causes, identifying differences in learners with a diagnosis of dyslexia (whether with or without associated difficulties) is of interest to people working with them in education and rehabilitation settings. Further research is necessary to clarify whether, rather than being inherently poor comprehenders, the differences observed in reading comprehension accuracy with respect to normotypical learners could ultimately be the secondary result of decoding difficulties and poorer language skills. Nevertheless, we believe that understanding the elements of the linguistic cotext and context potentially capable of influencing the reading behaviour of learners with dyslexia can advance our knowledge of their communicative profile and provide some useful insights for inclusive education.

3. Inferential reading and vocabulary

Cappelli (this volume) investigated reading comprehension accuracy in

Italian L1 and English FL in two groups of 22 young adults with and without dyslexia. The author tested accuracy in understanding simple short narrative texts and compared the performance of the two groups in answering factual, local inference and global inference questions in the two languages. EFL proficiency and knowledge of relevant vocabulary items in the texts were controlled to make sure there were no great disparities in this regard among the participants. The test included open and multiple-choice questions which required them to identify factual information, or derive local coherence (e.g., lexical inferences) and global coherence inferences (e.g., inferences that relied on the integration between textual and extra-textual information). Data were analysed both between and within groups and languages. Typically developed participants systematically outperformed dyslexic peers, although both groups were comparably accurate in answering factual questions in both languages. There was no significant statistical difference in accuracy between types of questions in the control group data, whereas dyslexic readers were less accurate in global coherence questions than in local coherence questions, and in the latter compared to the factual questions. The language of the text had a significant effect on inferential questions in both groups, although this significance was much larger for dyslexic learners.

Overall, data seem to show that dyslexic readers are not impaired in understanding explicitly communicated information in texts once vocabulary knowledge is controlled, but they are not efficient when it comes to deriving the inferences necessary to build a coherent model of the text. This is in line with the pragmatic inefficiency observed in dyslexic children and young adults (Cappelli *et al.*, 2018, 2022; Cardillo *et al.* 2018; Griffiths 2007; Simi this volume), as well as with the hypothesis that inferential reading (both in L1 and L2) is particularly taxing on impaired cognitive resources such as working memory, executive functions and on attention.

Cappelli's (this volume) results contrast with Bonifacci *et al.*'s (2017), who found that typically developing children were better comprehenders than their dyslexic peers in EFL, but not in their first language. This discrepancy might indicate that, while dyslexic adult readers become more accurate in decoding (although remaining slower and less fluent than neurotypical adults), the gap in inferential comprehension might widen over time. A possible explanation is that the disparity in vocabulary and general background knowledge increases over the years as a consequence of the so-called "Matthew effect" (Stanovich 1986): the more one reads, the more one gains in terms of lexical and encyclopaedic knowledge. If exposure to the written page is reduced due to the issues caused by dyslexia, such gain is smaller, and this will favour a progressive decrease in the exposure to the written text, when the complexity of the materials in scholastic and extra-scholastic contexts increases and difficulties become harder to overcome.

This will cause dyslexic young readers to fail to keep pace with their neurotypical peers. Thus, although controlling vocabulary appears to moderate the effects of dyslexia in reading comprehension tasks (Georgiou *et al.* 2022), differences remain in experiments carried out with age-matched participants. In Cappelli's (this volume) study, issues with vocabulary knowledge may have stretched beyond the knowledge of the lexical items specifically tested, and poorer global lexical competence and general background knowledge may have contributed to limiting the generation of inferences, which in turn might have led to the construction of an "impoverished representation of the text" (Kendeou *et al.* 2014) and consequently to a failure to thoroughly understand the narrative texts presented.

Conflicting results such as those discussed above prompt reflection on the role of vocabulary knowledge in reading comprehension, including the type of knowledge that influences the outcome of any reading comprehension task. There is a strong correlation between vocabulary knowledge and good reading abilities in both the L1 and the L2 (Cain, Oakhill 2014; Daugaard *et al.* 2017; Droop, Verhoeven 2003; Grabe, Stroller 2011; Oslund *et al.* 2018; Perfetti, Stafura 2014; Prior *et al.* 2014; Quinn *et al.* 2015, 2019; Suggate *et al.* 2018). Indeed, Perfetti and Stafura's (2014) Reading System Framework claims that word-to-text integration is central in the whole process. In their model, the word identification system mediates the interaction between form and meaning, and if lexical meanings cannot be properly activated, comprehension fails (Oakhill *et al.* 2015). This is supported by the fact that a larger vocabulary database has been found to be a reliable predictor of reading comprehension success (Cain, Oakhill 2014; Carroll 1993; Li, Clariana 2019). This view is compatible with the hypothesis that reduced lexical skills in readers with dyslexia is one of the causes of comprehension difficulties that become more evident over time, since failing to being extensively exposed to texts hampers vocabulary development and growth (Stanovich 2000). Of course, knowing all the words in a text is not necessary since context contributes to deriving the meaning of a few unfamiliar items. Morphological competence and syntactic awareness also support word recognition and meaning retrieval in the L1 (Perfetti, Adlof 2012; Wagner *et al.* 2007) and in the L2 (Grabe 2009).

Perfetti and Stafura (2014) also stress the role of the quality of lexical representations: better quality representations result in faster word retrieval and integrative processes. Thus, both vocabulary breadth (i.e., the number of words in the lexical database) and vocabulary depth (i.e., how much one knows about each word in the lexical database) contribute to understanding a text successfully (Cain, Oakhill 2014; Ouellette, 2006; Tannenbaum *et al.* 2006). However, Cain and Oakhill (2014) found that their impact is not the

same on all aspects of reading. Vocabulary knowledge is more important for inferential processes than for the recall of factual details in the text and, more specifically, it influences global coherence inference derivation more than local cohesion inferences (Cain, Oakhill 2014). The authors also found that vocabulary depth is responsible for greater variance in readers' performance than vocabulary breadth. Indeed, vocabulary depth allows readers to create meaningful associations in the text and to construe a good mental model, since different facets of word meaning become more or less significant when words are combined into phrases and sentences (Oakhill *et al.* 2015). Moreover, "having rich, detailed and precise semantic representations of words makes it more likely that thematically-related inferences will be made to establish coherence" (Cain, Oakhill 2014, p. 651). Vocabulary breadth, on the other hand, has been found to correlate significantly with decoding abilities (Ouellette 2006), but not with inference derivation. In line with this observation, Quinn *et al.*'s (2019) longitudinal study on children with and without learning disabilities reports that vocabulary development was a significant indicator of change in reading comprehension, and that the latter was a leading indicator of change in vocabulary size for neurotypical children. However, the same was not true for children with a learning disorder: for them "there were no significant cross-lagged pathways, indicating that although these constructs have correlated growth, there are no direct, instrumental relations between vocabulary and reading comprehension" (p. 626). The authors explain these observations with the possibility that readers with learning disabilities such as dyslexia rely less on vocabulary knowledge for text comprehension tasks. This view of the role of measures of vocabulary size is compatible with the hypothesis that dyslexic readers might indeed have a smaller vocabulary due to decoding issues (Cappelli 2022; Swanborn, Glopper 2002), and that it is the latter, rather than vocabulary size per se, that contributes to depleting the resources required for other (higher-level) reading-related processes. This complex interaction of factors (i.e., smaller vocabulary and poorer lexical representations, poor memory and executive functions, impaired attention, and monitoring skills) would ultimately emerge as reading comprehension difficulties in dyslexic individuals.

Most of the studies mentioned above have focused on the L1. Contrary to Quinn *et al.* (2019), Li and Kirby (2014) found that both vocabulary breadth and depth correlate significantly with L2 reading comprehension accuracy and Li *et al.* (2021) stressed the role of receptive vocabulary size. A possible explanation might be that, when reading in a foreign language (and of a foreign culture), readers will have to rely on their knowledge of the individual lexical items in the text more than native speakers, who can find support for text interpretation in other levels of the linguistic system as well

(e.g., syntactic and morphological awareness). Word frequency is another factor that appears to influence reading comprehension in a foreign language (Nation 2006; Schmitt *et al.* 2011). Masrai (2019) has found that high-frequency and mid-frequency word ranges have the most significant impact, whereas low-frequency vocabulary does not have a significant effect on reading comprehension. The author also observed that, for low-proficiency learners, only high-frequency words explain variance in L2 reading comprehension. Mid-frequency words, on the other hand, make a difference for high-proficiency L2 readers. The important role of vocabulary depth is confirmed in L2 reading comprehension too. Prior *et al.* (2014) point out that even readers with a beginner proficiency level are better at lexical inferencing if they have more precise and efficient lexical representations, because vocabulary depth is associated with "increased automatization of word reading, which frees up resources for higher level processing" (p. 1467).

4. The study

4.1. Research question

Cappelli (this volume) found that readers with dyslexia struggle to comprehend texts, especially when inferences and integrations of literal meaning with prior knowledge (both lexical and encyclopaedic) are required. Building on these observations, we carried out an explorative qualitative analysis of the results of a reading comprehension task given to two groups of English foreign language learners, one with and one without dyslexia (henceforth referred to as focus group or DYS and control group or CG). We hypothesised that, in the case of L2 reading, poor lexical knowledge and the presence of ambiguous, vague or polysemic vocabulary may result in difficulties for the comprehension process. The question we intended to explore was, therefore, whether the differences observed in dyslexic and non-dyslexic readers' accuracy in answering factual, local inference and global inference questions may be traced back to differences in lexical competence or rather to a pre-existing deficit in the processing and integration of textual and extra-textual information. Our hypothesis was that learners who had a deeper knowledge of certain words would answer questions more accurately.

4.2. Participants

The data for this study were obtained from 36 students of the University of Pisa: 18 young adults (Nmale=9; Nfemale=9) with a diagnosis of developmental dyslexia and 18 controls (Nmale=9; Nfemale=9). The mean age of the focus group (DYS) was 21;7 and that of the control group (CG)

was 20;5. The students (from different degree programmes) were Italian native speakers, and all had attained the CEFR B1 level (intermediate) in English, which was one of the requirements of their undergraduate programmes when the experiment took place.

The cognitive profile of the DYS group was not homogeneous. Indeed, the level of severity of their condition ranged from severe to moderate and almost all the members of the DYS group had been diagnosed with a co-occurring deficit, mostly dyscalculia and/or dysgraphia. Despite the differences, the DYS participants were not divided into subgroups in consideration of the fact that their diagnoses of dyslexia were issued by different health services and reported different tests that would not allow for an equal comparison between the participants. Moreover, although the correlation of the DYS group's cognitive profiles to the test results would better account for the differences in their answers and possibly explain the causes of the difficulties they had in understanding the texts, the relatively small number of the participants would not allow for statistically significant interpretations. Furthermore, despite research having posited a correlation between dyscalculia and grammatical processing (cf. Carreiras *et al.* 2010), attention, cognitive flexibility and processing speed (Agostini *et al.* 2022), the way the comorbidities interfere with text comprehension and inference making is not clear and their correlation to the data of this study would be mere speculation. Therefore, this study should be understood as a behavioural investigation that aims to compare text comprehension skills between a group of subjects with developmental dyslexia (with or without comorbidity) and a group of typically developed individuals of the same age, educational level, and EFL proficiency level (CEFR B1).

4.3. Materials and methodology

The data discussed in the following sections come from the retrospective investigation of the accuracy in answering questions relative to four very short texts in English. The questions analysed relied on the knowledge of seven target lexical items: *bank*, *beautiful*, *curious*, *date*, *drink*, *flat*, and *write*. The criteria for this choice are discussed in sections 4.3.1 and 4.3.2. The texts were part of a reading comprehension task which had been used in class at the end of a course designed for dyslexic EFL learners at the Language Centre of the University of Pisa. The task was not experimental: it was part of a progress assessment test, which aimed at verifying whether, after dedicated instruction, the participants in the course could successfully read short narrative passages, as is expected of learners who have reached an intermediate proficiency level (CEFR B1) in the foreign language.

The texts were created by the authors in collaboration with native English-speaking teachers to include a range of syntactic structures and

lexical items that, by the end of the course, should have been familiar to the students and varied in length, ranging between 65 and 108 words. We used *Text Inspector*,[2] an online tool developed by the Centre for Research in English Language Learning and Assessment (CRELLA) at the University of Bedfordshire, to control readability level, lexical CEFR level and diversity and the use of metadiscursive elements (e.g., attitude markers and logical connectives). The same texts were subsequently presented to a control group of learners without specific learning disorders[3].

Since one of the known weaknesses of FL learners with dyslexia lies in the acquisition of vocabulary (Cappelli 2022), the course was designed to include multimodal vocabulary instruction (Cappelli, Noccetti 2016), and the texts were prepared to assess whether the knowledge of specific B1 level vocabulary items would result in successful reading comprehension. To this aim, different types of questions were proposed which required the learners to recall factual information or to derive local and global inferences. We assumed that this would only be possible if they knew the specific focus words in the text.

Before the reading comprehension task, participants with and without dyslexia were tested for vocabulary knowledge with an adapted version of Nation and Beglar's *Vocabulary Size Test* (VST; Nation, Beglar 2007) and with an adapted version of Read's *Word Associates Test* (WAT; Read 1993). The 18 participants without dyslexia which formed the control group were selected from a larger group of learners (N= 64) to specifically match the results of the members of the DYS group in the two vocabulary tests. The data obtained from these tests were first used for didactic purposes: the VST data were used to select lexical items to include in the test and the WAT data were used to verify the depth of knowledge of a selection of lexical items which learners had encountered in the lessons. Later, the data obtained from the WAT were compared to the results of the reading task, in the attempt to identify possible correlations between the participants' vocabulary depth and the accuracy in answering different types of questions in the two groups. A detailed description of the tests used to collect data is presented in sections 4.3.1 and 4.3.2 below.

4.3.1. The Adapted Vocabulary Size Test

In order to select words for the test, the DYS group and the CG took a vocabulary test adapted from Nation and Beglar's vocabulary size test.

[2] https://textinspector.com/ (25.8.2022).

[3] Due to the limits imposed by the nature of the present publication, only the passages and the questions that are relevant for the illustration of the results are presented in the sections dedicated to their discussion.

Nation and Beglar's test, in its online format[4], requires the participant to recognize the meaning of 140 words. The words are presented one at the time, on successive slides, without the possibility of going back. For each word, an example sentence and five options to choose from are given: four definitions or synonyms of the test word and a 'I do not know' option.

The adaptation of Nation and Beglar's test consisted of the translation into Italian of the five multiple-choice options to avoid errors due to poor understanding of the latter rather than of the test words. The results were meant to show the vocabulary breadth of the participants in terms of the number of word families they knew. However, the results of the test were only used for didactic purposes, and more specifically, to create a list of words known to all learners which we could include in the reading comprehension texts. After a careful comparison of the dyslexic learners' test results, 21 polysemous words known to all of them and appropriate for the CEFR B1 proficiency level were selected: *ball*, *bank*, *beautiful*, *case*, *complex*, *curious*, *date*, *drink*, *fast*, *flat*, *fresh*, *game*, *general*, *jam*, *mind*, *press*, *rock*, *run*, *season*, *trip*, and *write*. These words were used to create an adapted version of Read's (1993, 1998) *Word Associates Test* to determine how deep the learners' knowledge of these items actually was.

4.3.2. The Adapted Word Associates Test

The *Word Associates Test* (Read 1993, 1998) attempts to assess the quality of the participants' lexical knowledge. Understanding vocabulary depth is useful because it gives information on how efficiently and appropriately a speaker can use a lexical item both receptively and productively. Measuring this dimension of vocabulary knowledge, though, is not easy and there is no universal agreement on the reliability of the available tests (cf. Schmitt *et al.* 2011). For the purpose of this study, we chose to adapt Read's (1993,1998) WAT, since its format easily allows the tester to assess the participants' familiarity with the meaning of specific focus words. The test presents the focus word followed by eight other lexical items, four of which are associated with the target word in terms of either synonymy or collocations. From this list, participants must select the four words which they believe are associated with the focus words. In order to do this, however, they must be able to imagine a context of use for the latter, and the more precise they can be, the better they are said to know the word. For example, in the original test the word *sudden* comes with the options *beautiful*, *quick*, *surprising*, *thirsty* and *change*, *doctor*, *noise*, and *school* (Read 1993). The associated words are *quick*, *surprising* as synonyms and *change* and *noise* as collocates. Although

[4] https://my.vocabularysize.com/session/evstxx (25.8.2022).

the test has some limitations, such as being susceptible to guessing, lacking rigorous validation and being less reliable for scores in the middle of the scoring scale than for the values at the extremes (Schmitt *et al.* 2011), it has been extremely popular and widely used both for research and didactic purposes for over two decades (Qian, Schedl 2004).

We created questions for the lexical items not included in the original test following the model. This revealed that not all the 21 words were known equally well. We selected two words from the top (i.e., *drink* and *write*), two from the middle (i.e., *beautiful* and *curious*) and three from the bottom of the scoring scale (i.e., *bank*, *date* and *flat*) and we analysed qualitatively the accuracy in answering questions that required knowledge of these lexical items.

5. Results and discussion

Two different analyses were carried out on the data collected from the reading comprehension task. Firstly, we analysed the answers of DYS and CG to questions demanding different degrees of both inferential processing and memory engagement to verify whether the trend was the same observed by Cappelli (this volume). Secondly, in order to observe the impact of lexical knowledge on text comprehension accuracy, we carried out a qualitative investigation of the answer given to questions which involved knowledge of the focus words selected through the WAT. Sections 5.1 and 5.2 discuss the results of the two analyses.

5.1. Accuracy in answering the different types of questions

Figure 1 and figure 2 show the percentages of correct answers per question category (i.e., recall, factual, local inference and global inference questions) in DYS and CG respectively.

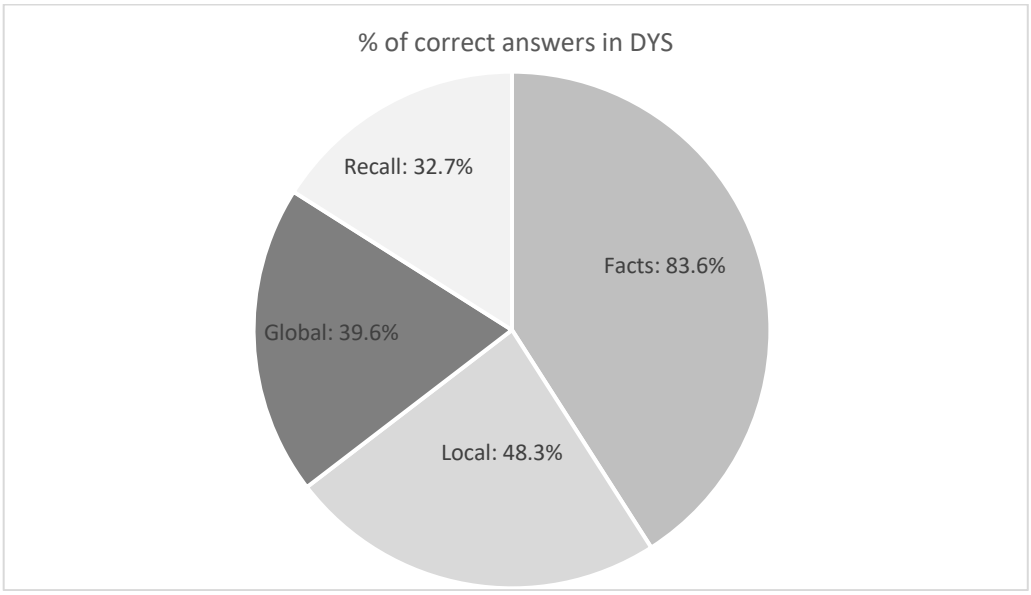

Figure 1
Percentage of correct answers for each type of questions for the DYS group.

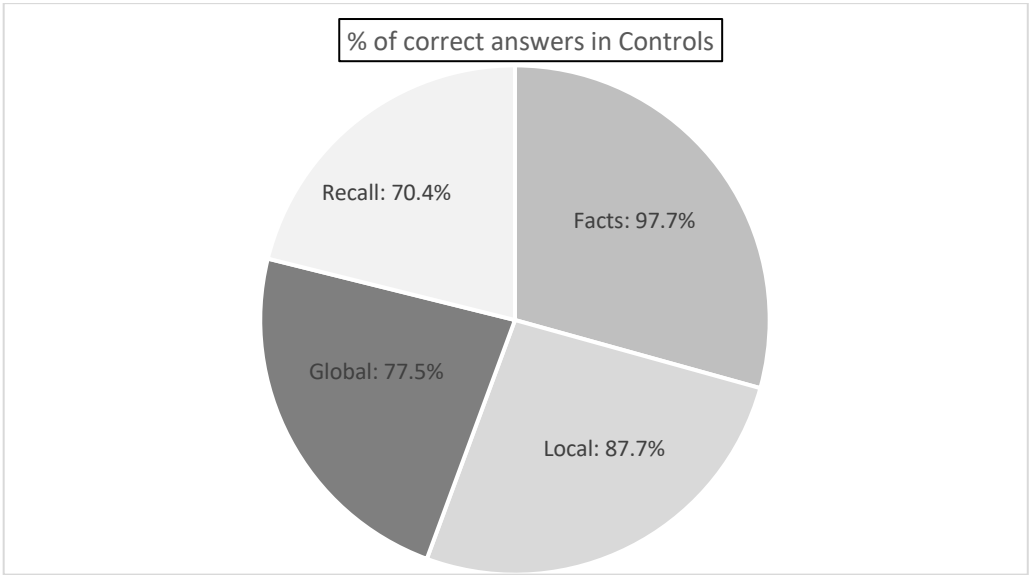

Figure 2
Percentage of correct answers for each type of questions for the CG.

In terms of accuracy, the CG outperformed the DYS group in every category of questions, in line with the results described in Cappelli (this volume). Factual questions returned more correct answers in both groups, namely 83.6% for the DYS group and 97.7% for the CG. This is not surprising given that this type of question does not depend on short-term nor working memory but relies on facts stated in the text explicitly and always available for reference.

Interestingly, data show a larger intra-group difference between accuracy in answering factual questions compared to other types of questions. For instance, whereas in the CG's data the difference in the percentage of correct answers given to factual questions (97.7%) and to questions involving local inferences (87.7%) is only 10%, the same values in DYS's results show a 35.3% gap (i.e., 83.6% accuracy vs. 48.3% accuracy). The same disparity is observed when comparing accuracy in answering factual questions and recall questions in the two groups, with a 50.9% difference in DYS's accuracy (i.e., 83.6% vs. 32.7%) and a 17.3% difference in CG's accuracy (i.e., 97.7% vs. 27.3%).

We interpret these data as a confirmation of Cappelli's (this volume) conclusions that people with dyslexia struggle more than controls when they need to process information that is not directly available in texts. Their difficulty is also shown by the scores obtained in the other types of questions, with a similar trend to that described in Cappelli's (this volume) study. More specifically, readers with dyslexia seem to answer factual questions better than local inference questions, which in turn are answered more accurately than global inference questions. This is compatible with the hypothesis that questions involving local inferential processes are also characterised by a relatively low engagement of memory systems, given that the necessary information can still be found in the text (Cain, Oakhill 2014). Nevertheless, if we observe inter-group values, the difference in inferential question accuracy is much greater than in factual question accuracy. Whereas the CG answered local inference questions correctly 87.7% of the time, the DYS group only gave 48.3% correct answers. Such a difference indicates that making inferences is somewhat costly for the DYS group, even when the necessary information is at their disposal in the text. Therefore, inferential questions require a greater processing effort than factual questions. Inefficiency in the integration of different types of information necessary to recover the intended meaning is very likely the main source of such difficulty. Indeed, combining several, diverse facts implies committing them to memory for the time necessary for their processing and for finding a logical pattern that is compatible with what one knows about the world so as to create a coherent mental model of the text (Kendeou *et al.* 2014). Although the short-term memory system is probably less engaged in these than in other types of inferences (e.g., global inferences, see below), due to the recoverability of the information from the cotext, the processing of local inferences still requires considering several possible interpretations and the ability to inhibit the data that are not pertinent to the expected scenario. This overload of plausible competing data and scenarios is likely to cause slow processing and errors (Cain *et al.* 2004a, 2004b; Kendeou *et al.* 2014; Perfetti, Hart 2002).

A similar demand of cognitive resources is involved in processing global inference questions (Cain, Oakhill 2014), which ranked third in accuracy percentages, with 39.6% correct answers in the DYS group's tests and 77.5% correct answers tests by the CG. In these types of questions, text comprehension is mostly based on extra-textual (world) knowledge that is crucial for integrating what is stated and what is not explicitly said in the text. This process requires the support of an efficient working memory system and, of course, a vast range of background knowledge. In addition, all data need to be processed synthetically, in order to create a reliable mental model of the text. Notoriously, people with dyslexia are poor readers lacking metacognitive skills (Santulli, Scagnelli 2022) and visual selective attention due to a deficit in orienting and focusing (Facoetti *et al.* 2000). The inefficiency of these abilities leads to difficulties in taking on a more general and global perspective of the written text. As a consequence, this might hinder the selection of all the information needed to interpret the text and correctly build a coherent model of the text itself.

Finally, participants with dyslexia were most inaccurate when answering questions based on fact recalling. They gave 32.7% correct answers vs. 70.4% correct answers by the controls. The DYS group's answers, more than those of the CG, reveal a generalised difficulty in focussing and isolating the facts in the texts. Although answering recall questions needs to be sustained by memory systems, it is likely that the poor results obtained by the DYS group also depend on their analytical way of processing data and, therefore, on missing (or underestimating) the information that is most relevant in the texts in order to answer the questions. A paired *t*-test was carried out on the means of the correct answers for each group of questions of DYS (M=51, SD=22.6) and CG (M=83.3, SD=11.9). Results indicate a large difference between the groups, $t(3)=5.3$, $p<.05$. The analysis confirms previous studies (Cain, Oakhill 2014; Oakhill, Cain 2012; Perfetti, Adolf 2012) on DYS people that highlight difficulties in making inferences when they are necessary for understanding text.

5.2. Accuracy and vocabulary depth

Even if the ability to draw inferences mostly depends on cognitive efficiency, such as working memory and attentional skills, some linguistic features of the text and the readers' vocabulary knowledge contribute to increasing the difficulty of the task (Cain, Oakhill 2014; Oakhill *et al.* 2015). For this reason, we carried out a qualitative analysis of the answers in which the participants obtained the worst results to verify whether vocabulary knowledge played a role in such outcomes or whether other factors may explain them. In particular, we tried to verify whether the WAT data were linked to greater accuracy in answering inferential comprehension questions.

We did not include recall answers in our analysis. The trend in accuracy apparently matched what was observed in factual and inferential questions, but there was no reliable way to verify whether the target lexical items (i.e., *write*, *drink*, *beautiful*, *curious*, *bank*, *flat* and *date*) contributed to remembering textual information. The participants could, in fact, choose to relate the content of the text both in English and Italian as well as the words to express it. Although it is reasonable to think that readers tend to remember what they understand best (and indeed high-range focus words were associated with better recall), many factors contribute to making information memorable, and, as the test was not planned as an experiment in advance, it seemed that no sound conclusions could be drawn by any such analysis. On the contrary, the factual and inferential questions were designed with target lexical items in mind, so the impact of those selected for the retrospective analysis was more easily explored.

First, we tried to verify whether the percentages of correct answers to questions which required understanding of the selected target words matched differences in vocabulary depth. In other words, we expected that the participants would be more accurate in answering questions relying on the knowledge of *write* and *drink*, than in those relying on the understanding of *beautiful* and *curious*, and that they would be even less accurate in answering questions relying on their knowledge of the meaning of *bank*, *date* and *flat*. This turned out not to be the case, for either group. More specifically, although both the DYS group (87.65%) and the CG (98.61%) were better at answering factual questions involving high-range words than lower-range words, they gave more correct answers in questions involving low-range words (79.61% and 97.45%) than mid-range ones (61.08% and 90.02%). The same trend was observed for both groups in local inference questions and in the DYS group in global inference questions too. For the CG, our initial hypothesis was confirmed in global inference questions, since the accuracy percentage was 68.26% for the high-range words, 56.86% for the mid-range words and 36.11% for the low-range words. Interestingly, the percentage of correct answers relying on the knowledge of high-range words was above average for both groups in all three types of questions (i.e., factual, local inference and global inference; cf. values above and fig. 1 and fig. 2). The accuracy scores of answers relying on the knowledge of mid- and low-range words, on the other hand, were generally lower than the average scores for all types of questions in both groups, with the sole exception of low-range words in the CG's answers to local inference questions (96.87% vs. 87.7%).

Since the data did not confirm our initial hypothesis, we carried out an analytical qualitative investigation of the individual answers to the three types of questions. Sections 5.2.1, 5.2.2 and 5.2.3 discuss some unexpected results in factual, local inference and global inference questions and propose

possible explanations.

5.2.1. Factual questions

Figure 3 shows the performance of the two groups in the individual factual questions with percentages of accuracy.

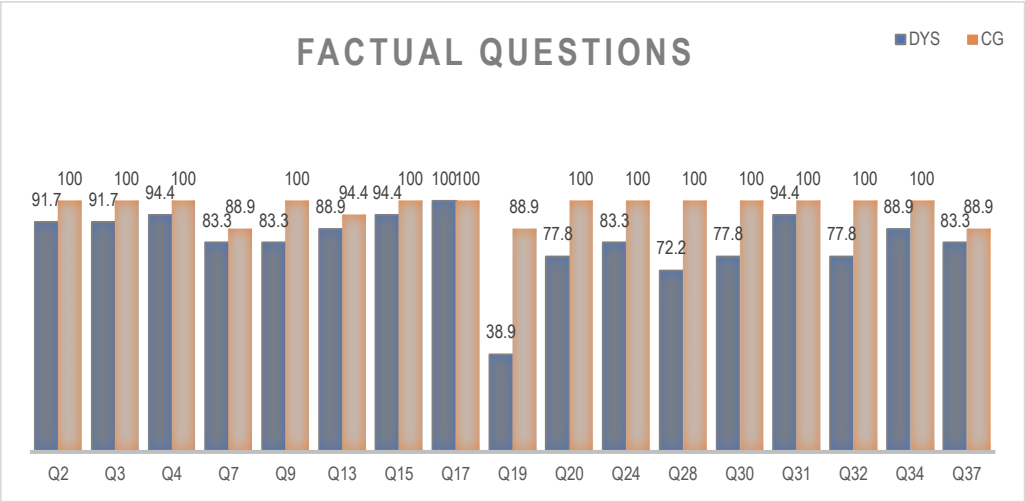

Figure 3
Percentages of correct answers to factual questions in the two groups.

As already mentioned, DYS obtained good scores when answering factual questions and their results did not deviate much from those of the CG. However, when assessed individually, fig. 3 shows that some questions were answered less accurately than others.

One such question was Q19, which received 38.9% correct answers from the DYS group, whereas 88.9% of the CG answered it correctly: a value which, although not a ceiling performance, remains in line with the scores obtained in other factual questions. The question relies on the interpretation of the adjective *beautiful*, that is, a mid-scale item according to the WAT's results. It follows a text about a person who "is a beautiful woman but only wears ugly man's clothes, smokes a cigar and she never combs her hair". The question asked whether the woman is good-looking ("Marta is a good-looking woman, true or false?"). The correct answer was of course 'yes', but the fact that the woman is also described with features that can take on negative connotations (e.g., cigar smoker, wearing masculine clothes and not taking good care of one's hair), together with the co-occuring word *ugly*, might have induced the participants to choose the wrong option. This might in fact be the result of the inferential processing of this information which led readers to give a subjective and evaluative reading of the passage. Participants were also asked to motivate their answers. Interestingly, the dyslexic participants reported some of these features as the reason for their

answer, thus showing a strong effect of contextual elements in their interpretation. This hypothesis seems to be supported by the percentages of correct answers (72%) given when the adjective *beautiful* is used with the meaning of "nice/generous" (e.g., in Q28, fig. 3) in contexts that are more consistent with this sense, that is, when text interpretation does not require the inhibition of features that contrast with the sense in which the adjective is used.

> […] He was very uncomfortable. There was a vending machine in the corridor, but he had forgotten his wallet in the hotel. The teacher offered him some coins. That was so nice of her! She was such a *beautiful* person. [our emphasis]
>
> What does it mean that the teacher was a beautiful person? Select one:
> a. she was nice [correct answer]
> b. she was elegant
> c. she was good-looking

Although some of the participants in the CG group were also influenced by their subjective reading of the passage, overall, most of them answered strategically according to what was actually stated in the description. This result is in line with other studies that show that people with dyslexia tend to rely on their personal experience when interpreting written texts, as they lack more effective reading strategies (Cappelli 2019; Santulli, Scagnelli 2022).

5.2.2. Local inference questions

The participants in the DYS group were generally less accurate than the CG in answering questions involving local inferences (see fig. 4).

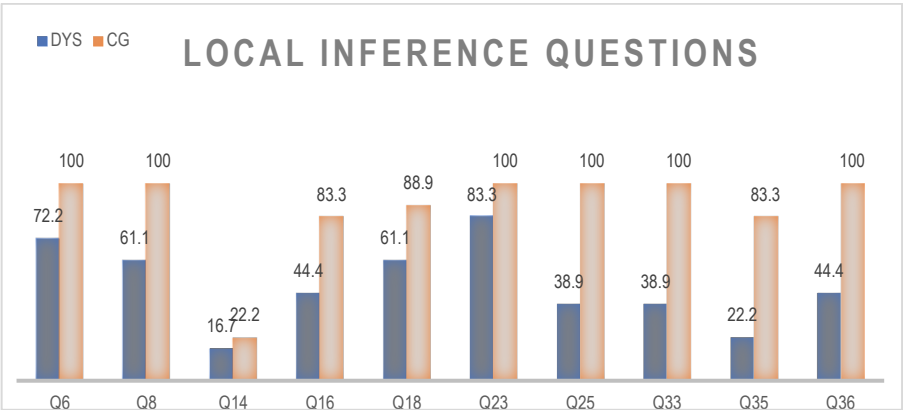

Figure 4
Percentages of correct answers to local inferential questions in DYS and CG.

Our retrospective analysis of the participants' answers showed that readers

with dyslexia were most accurate in answering Q6 and Q23, both of which relied on the comprehension of two focus words (i.e., *flat* and *drink* respectively). The accuracy in answering Q23 matched our initial hypothesis, since *drink* was one of the two high-range words selected. However, the percentage of correct answers to Q6 with respect to those obtained in other questions (e.g., Q35 and Q36, relying on knowledge of *beautiful*, a mid-range word) was unexpected, because *flat* was one of the low-range words selected.

A thorough qualitative exploration of the performance of the DYS group showed that participants with dyslexia gave more correct answers to questions in which all the words were used in their denotative most common senses. In addition, we noticed that in these, as well as in other questions which were answered accurately (e.g., Q8 and Q18), the portion of the text to which the questions referred contained all the information required to make the inference and did not include descriptions that might confuse the reader, as in the case of Q19 discussed in section 5.2.1. By way of example, Q23 (fig. 4) refers to a passage that describes a man, Luke, who went running and drank from his bottle because he was thirsty. The question asked whether Luke had too much alcohol and got drunk, thus requiring the reader to disambiguate the sense of *drink* in the context.

> Luke had a very busy morning. He had some tea, wrote some postcards to friends back home and then went to run in the park. It was very hot, and he *drank* [our emphasis] a lot from his bottle. […]
>
> Luke drank too much alcohol and went to class drunk.
> - True
> - False [correct answer]

The situation described is familiar and the inference can be easily drawn by integrating the linguistic information found in the cotext and the reader's general knowledge, which favours the construal of a coherent model of the text. The same seems to be the case for all the other questions that obtained over 60% correct answers in the tests by the DYS group.

In contrast, both the DYS and CG participants were the least accurate in questions which could not be answered by referring to one's experiential background, but required linguistic analysis, careful reading, as well as logical thinking in order to draw the local inference. An example is provided by Q14 and Q16, which elicited many wrong answers from both groups (i.e., DYS 16.7% vs. CG 22.2% and DYS 44.4% vs. CG 83.3% correct answers respectively). They referred to the same text about a woman, Martha, who is defined as "a very *curious* person" because of the way in which she dresses and behaves. One of her peculiarities is that her apartment "is full of books, but they all have pink covers and green covers". Q14 asked whether the woman "likes discovering and learning new things". This question proved to

be tricky for both groups, probably because they were misled by the reference to the "many books" in the following sentence, which prompted them to interpret *curious* (a mid-range word) as 'eager to learn' rather than 'bizarre'. Q16 asked whether Martha read "all sorts of books". In this case, the question did not rely on any focus word *per se*, but on the statement that she owns only books with pink and green covers. The question cannot be answered by resorting to one's own life experience or subjective judgment but requires a linguistic analysis of the text. A possible explanation is that the participants were influenced by the answer given to Q14, and hence by the misinterpretation of *curious* as 'eager to learn' rather than as the less frequent sense in which it was used in the text of 'not ordinary/uncommon'. Interference with the Italian *curioso* might also have played a role in the outcome of the test. C*urious* has two possible translations into Italian: *curioso*, 'eager to know', and *strano*, 'uncommon/bizarre' (although *curioso* can also be used in this sense, as in English, but it is not as common). Negative semantic transfer might be partially responsible for the high percentages of wrong answers by all participants in Q14, and a 'cascading effect' might have resulted in poorer accuracy in both groups in Q16 too, although the CG was remarkably more accurate than the DYS group in answering the latter question.

Dyslexic readers might have struggled more with Q16 because of their reduced cognitive flexibility, which makes comprehension monitoring and reanalysis more difficult than for typically-developing peers (Raudzus *et al.* 2017). Moreover, the adjective is used in a paragraph which is distant from the part of the text that is the focus of the question, hindering information retrieval.

Overall, it appears that processing local inferences is simpler if the information is easily retrievable, if the meaning of focus words is not ambiguous, and if their interpretation can rely also on scenarios compatible with familiar situations. If these conditions are not met, the chance of comprehension difficulties is greater. By way of example, we can consider the accuracy in answering Q35 and Q36, both focusing on the mid-range focus word *beautiful*. The text spoke of a singer who "sings beautifully" and who is going to sing at her banker's wedding if things go well with the business that she helped her establish. Q35 asked whether the singer is beautiful when she sings and Q36 asked whether she is good at what she does. Both groups were less accurate in interpreting *beautifully* in its sense of 'well', although this proved especially challenging for the DYS participants. All the readers in the CG answered Q36 correctly, whereas the DYS group's answers were only correct 44.4% of the time. A possible explanation is that both groups answered the question by drawing a global inference rather than a local lexical one, basing their conclusion on the experience that if

somebody sings professionally and is hired to sing at a wedding, they must be good at what they do. The participants with dyslexia might have been less accurate than the participants in the control group because they are generally less efficient in drawing global inferences or because they had more difficulties in inhibiting the 'good-looking' reading of *beautiful* and were influenced by the faulty interpretation of the word *beautifully* that had been compelled by the previous question. Although the data do not allow one to draw any certain conclusion, they point towards the fact that vocabulary knowledge can either facilitate or hinder inferential processing.

5.2.3. Global inference questions

The combined effect of lexical and inferential skills might also explain participants with dyslexia's above average accuracy in answering the global inference question Q26. As discussed in section 5.1, the DYS group was not very accurate in answers to global inference questions (fig. 5).

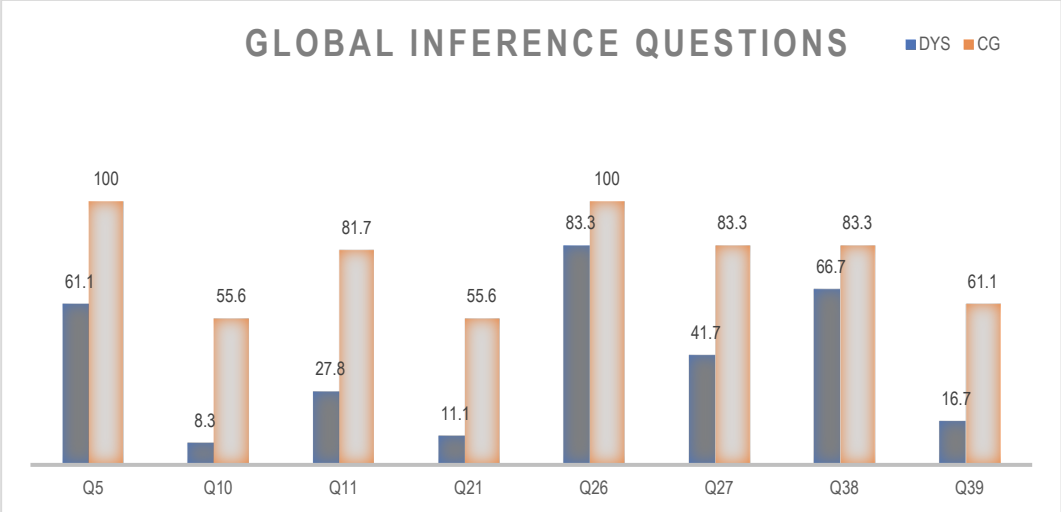

Figure 5
Percentages of correct answers to global inferential questions in DYS and CG.

However, Q26 obtained 83.3% correct answers. The question relied on the interpretation of *drink* (i.e., a high-range focus word) in its most basic sense of 'consuming a liquid substance', and no participant had much trouble answering the question correctly, similarly to Q23 discussed in section 5.2.2. Nevertheless, both Q10 and Q11, which also relied on the correct understanding of the word *drink*, were answered incorrectly by the vast majority of the participants with dyslexia (91.7% and 72.2%) and by many participants in the CG (44.4% and 18.3%). *Drink* was here used in its narrower sense of 'having alcoholic beverages'. These differences seem to indicate that when *drink* is used in its primary and more generic meaning

(e.g., Q23 in fig. 4 and Q26 in fig. 5), both local and global inferences are made easily by most readers with and without dyslexia. In contrast, when the word is used in its narrower sense (e.g., in Q10 and Q11 in fig. 5), the efficiency in drawing global inferences appears to decrease, with a dramatic drop in accuracy. Interestingly, the same effect can be observed in Q21, which relies on the understanding of the adjective *curious* in its secondary sense of 'unusual/uncommon' like in Q14 (cf. 5.2.2). In this case, the DYS group answered correctly only 11.1% of the time and the CG gave 55.6% correct answers.

In addition to lexical disambiguation, answering global inference questions requires great pragmatic effort. To answer Q10 and Q11, besides selecting the correct sense of *drink*, readers must gather information which is scattered throughout the text and integrate it with extra-textual knowledge (e.g., numerous bottles on the floor can be a sign of excessive drinking, drunkenness may cause embarrassment) so as to build a coherent model of the test. The answers to Q10 and Q11, thus, depend on the ability to focus on the relevant aspects of the text, which is generally a strategy acquired by the skilled reader, on deep knowledge of the meaning of *drink*, and on the ability to imagine a scenario that is compatible with the information gathered and the knowledge acquired, which is a function of the working memory. It seems reasonable to conclude that the processing demands of lexical and inferential operations combine and, in so doing, contribute to depleting the limited resources available for text comprehension, thus resulting in less efficient reading.

6. Concluding remarks

The study aimed to explore whether the difficulties observed in the reading comprehension accuracy of most readers with dyslexia when answering inferential questions (cf. Cappelli this volume; Simi this volume) could be traced back to vocabulary depth or if they were rather ascribable to pragmatic processing deficits. Our hypothesis was that vocabulary depth would be associated with greater accuracy in all types of questions. This turned out not to be the case, with the sole exception of the answers given to global inference questions by the CG.

The unexpected results for each question relying on high-, mid- and low-range focus words (in terms of vocabulary depth knowledge) were qualitatively analysed. Overall, we observed that, although high-range words seem to correspond to greater accuracy, low-range words led often to more correct interpretations than mid-range words. Even high-range words, however, did not always correspond to correct answers. In some cases, more basic (and likely more frequently encountered) senses of the focus words

(e.g., *drink* as 'drinking liquids') seemed to compete with and prevail over their narrower or less common senses (e.g., *drink* as 'drinking alcoholic beverages'), thus leading to wrong interpretations. In such contexts, readers with dyslexia appear to resort to subjective evaluation or personal experience to answer questions, which may result in misinterpretations of the text. Indeed, they succeed better in interpreting the text when the sense of the words fit nicely in the context, without the need for reanalysis, when finding information in the text was quite simple and when the situation described could be interpreted using one's own experience and beliefs. This strategy can be rather unsuccessful, because text interpretation does not rely on shared general background knowledge but on individual experience, which may or may not match the writer's intentions. The control group differed in this respect. Participants without dyslexia were more strategic readers and managed to self-correct better than their dyslexic peers.

Difficulty in selecting the correct sense of relevant words, especially if it is a secondary or less common one, and if the context includes competing elements, seems to correspond to reduced efficiency in drawing global inferences. Indeed, inferences place a heavy burden on memory systems and especially on working memory, which must be efficient to allow for the integration of textual and extra-textual information. This is a well-known problem for individuals with dyslexia (cf., Männel *et al.* 2015; Menghini *et al*. 2011), who are notoriously unsupported by an effective mnestic system (cf., Gupta 2015; Hatcher, Snowling 2002; Kormos, Smith 2012; Speciale *et al.* 2004). Further investigation should be carried out to cast more light on the relation of vocabulary breadth and depth and pragmatic-inferential skills and the effect of their interaction in foreign language reading comprehension tasks.

The limitation of this investigation is that the data discussed were not collected following a rigorous experimental design. Although comparable data were gathered from a control group in order to control the specific learning disorder variable, the original ones were opportunistically retrieved retrospectively from materials originally designed for foreign language learning testing and used as part of a final assessment protocol within an English course for learners with dyslexia. Therefore, the observations made in Section 5 cannot be considered conclusive and have no pretence of generalizability.

Nonetheless, the behavioural patterns emerging from the investigation of different types of questions and the obvious differences with the CG's performance offer a starting point for a more controlled experimental design and provide suggestions for language teachers. These preliminary observations are in line with Perfetti and Stafura's Lexical Quality Hypothesis, and should they be confirmed in foreign language learning too,

the depth of vocabulary knowledge (i.e., the quality of the lexical representation), as well as text structure should be considered as two fundamental and interdependent variables impacting the ability of making successful inferences, both local and global. This has as a logical consequence that, despite their cognitive characteristics, readers with dyslexia should succeed in drawing the inferences required to correctly interpret textual information, if supported in the acquisition of the necessary lexical knowledge and if properly trained to find relevant information in the text and to inhibit the unnecessary one.

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References

Agostini F., Zoccolotti P. and Casagrande M. 2022, *Domain-General Cognitive Skills in Children with Mathematical Difficulties and Dyscalculia: A Systematic Review of the Literature*, in "Brain sciences" 12 [2], pp. 239-273.

Araújo S. and Faísca L. 2019, *A meta-analytic review of naming-speed deficits in developmental dyslexia*, in "Scientific Studies of Reading" 23 [5], pp. 349-368.

Araújo S., Huettig F. and Meyer A. 2020, *What underlies the deficit in rapid automatized naming (RAN) in adults with dyslexia? Evidence from eye movements*, in "Scientific Studies of Reading", pp. 1-16.

Barnes M.A., Dennis M. and Haefele-Kalvaitis J. 1996, *The effects of knowledge availability and knowledge accessibility on coherence and elaborative inferencing in children from six to fifteen years of age*, in "Journal of Experimental Child Psychology" 61, pp. 216-241.

Bonifacci P., Canducci E., Gravagna G. and Palladino P. 2017, *English as a foreign language in bilingual language-minority children, children with dyslexia and monolingual typical readers*, in "Dyslexia" 23 [2], pp. 181-206.

Cain K. and Oakhill J. 2006, *Profiles of children with specific reading comprehension difficulties*, in "British Journal of Educational Psychology" 76 [4], pp. 683-696.

Cain K. and Oakhill J. 2012, *Reading comprehension development from seven to fourteen years: Implications for assessment*, in Sabatini J., Albro E. and O'Reilly T. (eds.), *Measuring up: Advances in how we assess reading ability*, Rowman & Littlefield Education, Lanham, MD, pp. 59-76.

Cain K. and Oakhill J. 2014, *Reading comprehension and vocabulary: Is vocabulary more important for some aspects of comprehension?*, in "L'Année Psychologique" 114 [4], pp. 647-662.

Cain K., Oakhill J. and Bryant P.E. 2004a, *Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills*, in "Journal of Educational Psychology" 96 [1], pp. 671-681.

Cain K., Oakhill J. and Lemmon K. 2004b, *Individual differences in the inference of word meanings from context: The influence of reading comprehension, vocabulary knowledge, and memory capacity* in "Journal of Educational Psychology" 96 [4], pp. 671-681.

Cain K. and Oakhill J. 2014, *Reading comprehension and vocabulary: Is vocabulary more important for some aspects of comprehension?*, in "L'Année psychologique" 114 [4], pp. 647-662.

Carreiras M., Carr L., Barber H.A. and Hernandez A. 2010, *Where syntax meets math: Right intraparietal sulcus activation in response to grammatical number agreement violations*, in "NeuroImage" 49 [2], pp. 1741-1749.

Carroll J.B. 1993, *Human cognitive abilities: A survey of factor-analytic studies*, New York, Cambridge University Press.

Cappelli G. (this volume), *Reading Comprehension in Young Adult Learners of English with and without Dyslexia*.

Cappelli G. 2022, *The Impact of Dyslexia on Lexico-Semantic Abilities: An Overview*, in Cappelli G. and Noccetti S. (eds.), *A Linguistic Approach to the Study of Dyslexia*, Multilingual Matters, Bristol, pp. 211-239.

Cappelli G. 2019, *Pragmatic and lexical skills of learners with dyslexia and EFL learning*, in Coppola M. M., Di Blasio F. and Francesconi S. (eds.), *Contact Zones: Cultural,*

Linguistic and Literary Connections in English, Trento University Press, Trento, pp. 55-74.

Cappelli G. and Noccetti S. 2016, *Teaching specialized vocabulary to dyslexic adult second-language learners: A proposal for multimodal lexical input enhancement*, in Bonsignori V. and Crawford Camiciottoli B. (eds.), *Multimodality Across Communicative Settings, Discourse Domains and Genres*, Cambridge Scholars Publishing, Newcastle on Tyne, pp. 37-64.

Cappelli G. and Noccetti S. (eds.) 2022, *A Linguistic Approach to the Study of Dyslexia*, Multilingual Matters, Bristol.

Cappelli G., Noccetti S., Arcara G., and Bambini V. 2018, *Pragmatic competence and its relationship with the linguistic and cognitive profile of young adults with dyslexia*, in "Dyslexia" 24 [3], pp. 294-306.

Cappelli G., Noccetti S., Simi N., Arcara G., and Bambini V. 2022, *Dyslexia and Pragmatic Skills*, in Cappelli G. and Noccetti S. (eds.) *A Linguistic Approach to the Study of Dyslexia*, Multilingual Matters, Bristol, pp. 240-262.

Cardillo R., Basso Garcia R., Mammarella I. C. and Cornoldi C. 2018, *Pragmatics of language and theory of mind in children with dyslexia with associated language difficulties or non-verbal learning disabilities*, in "Applied Neuropsychology: Child" 7 [3], pp. 245-256.

Carreiras M., Carr L., Barber H.A., and Hernandez A. 2010, *Where syntax meets math: Right intraparietal sulcus activation in response to grammatical number agreement violations*, "NeuroImage" 49 [2], pp.1741-1749.

Daugaard H. T., Cain K. and Elbro C. 2017, *From words to text: inference making mediates the role of vocabulary in children's reading comprehension*, in "Reading and Writing: An Interdisciplinary Journal" 30 [8], pp. 1773–1788.

Droop M. and Verhoeven L. 2003, *Language proficiency and reading ability in first and second language learners*, in "Reading Research Quarterly" 38, pp. 78-103.

Eason S.H., Goldberg L.F., Young K.M., Geist M.C. and Cutting L.E. 2012, *Reader–text interactions: How differential text and question types influence cognitive skills needed for reading comprehension*, in "Journal of Educational Psychology" 104 [3], pp. 515-528.

Facoetti A., Paganoni P., Turatto M., Marzola V. and Mascetti G.G. 2000, *Visual-spatial attention in developmental dyslexia*, in "Cortex" 36 [1], pp. 109-123.

Ganschow L. and Sparks R. 2001, *Learning difficulties and foreign language learning: A review of research and instruction*, in "Language Teaching" 34 [2], pp. 79-98.

Georgiou G.K., Martinez D., Alves Vieira A.P., Antoniuk A., Romero S. and Guo K. 2022, *A meta-analytic review of comprehension deficits in students with dyslexia*, in "Annals of Dyslexia" 72, pp. 204-248.

Grabe W. 2009, *Reading in a second language: Moving from theory to practice*, Cambridge University Press, Cambridge, UK.

Grabe W. 2014, *Key issues in L2 reading development*, in "Proceedings of the 4th CELC Symposium for English Language Teachers-Selected Papers", pp. 8-18.

Grabe W. and Stoller F. 2011, *Teaching and Researching Reading*, Longman Pearson, Harlow.

Griffiths C.B. 2007, *Pragmatic abilities in adults with and without dyslexia: A pilot study*, in "Dyslexia" 13, pp. 276-296.

Hatcher J. and Snowling M.J. 2002, The phonological representations hypothesis of dyslexia: from theory to practice, in "*Dyslexia and literacy: Theory and practice*", pp. 69-84.

In'nami Y., Hijikata Y. and Koizumi R. 2021, *Working Memory Capacity and L2 Reading: A Meta-Analysis*, in "Studies in Second Language Acquisition", pp. 1-26.

Gupta P. 2012, *Word learning as the confluence of memory mechanisms: Computational and neural evidence*, in Faust, M. (ed.), *The Handbook of the Neuropsychology of Language*, Blackwell Publishing Ltd., Malden, pp. 147-163.

Jeon E.H. and Yamashita J. 2014, *L2 reading comprehension and its correlates: A meta-analysis*, in "Language learning" 64 [1], pp. 160-212.

Keenan J.M., Betjemann R.S. and Olson R.K. 2008, *Reading comprehension tests vary in the skills they assess: Differential dependence on decoding and oral comprehension*, in "Scientific Studies of Reading" 12, pp. 281–300.

Kendeou P., Van Den Broek P., Helder A. and Karlsson J. 2014, *A cognitive view of reading comprehension: Implications for reading difficulties*, in "Learning disabilities research & practice" 29 [1], pp. 10-16.

Kormos J. 2020, *Specific learning difficulties in second language learning and teaching*, in "Language Teaching", 53 [2], pp. 129-143.

Kormos J. and Smith, A.M. 2012, *Teaching English as a foreign language to students with specific learning differences*, Multilingual Matters, Bristol.

Li P. and Clariana R.B. 2019, *Reading comprehension in L1 and L2: An integrative approach*, in "Journal of Neurolinguistics", 50, pp. 94-105.

Li M. and Kirby J.R. 2014, *Unexpected poor comprehenders among adolescent ESL students*, in "Scientific Studies of Reading" 18, pp. 75-93.

Li M., Geva E., D'Angelo N., Wee Koh P., Chen X. and Gottardo A. 2021, *Exploring sources of poor reading comprehension in English language learners*, in "Annals of Dyslexia" 71, pp. 299-321.

Lonergan A., Doyle C., Cassidy C., MacSweeney Mahon S., Roche R.A., Boran L. and Bramham J. 2019, *A meta-analysis of executive functioning in dyslexia with consideration of the impact of comorbid ADHD*, in "Journal of Cognitive Psychology", 31 [7], pp. 725-749.

Männel C., Meyer L., Wilcke A., Boltze J., Kirsten H., and Friederici A. D. 2015, *Working-memory endophenotype and dyslexia-associated genetic variant predict dyslexia phenotype*, in "Cortex" 71, pp. 291-305.

Masrai A. 2019, *Vocabulary and Reading Comprehension Revisited: Evidence for High-, Mid- and Low-Frequency Vocabulary Knowledge*, in "SAGE Open", https://doi.org/10.1177/2158244019845182.

Meisinger E.B., Breazeale A.M. and Davis L.H. 2021, *Word-and Text-Level Reading Difficulties in Students with Dyslexia*, in "Learning Disability Quarterly", pp. 1-12.

Menghini D., Finzi A., Carlesimo G.A. and Vicari S. 2011, *Working memory impairment in children with developmental dyslexia: is it just a phonological deficit?*, in "Developmental neuropsychology", 36 [2], pp. 199-213.

Nation I.S.P. 2006, *How large a vocabulary is needed for reading and listening?* In "Canadian Modern Language Review" 63 [1], pp. 59–82.

Nation P. and Beglar D. 2007, *A vocabulary size test*, in "The Language Teacher" 31 [7], 9-12.

Nijakowska J. 2010, *Dyslexia in the foreign language classroom*, Multilingual Matters, Bristol.

Oakhill J.V. and Cain K. 2012, *The precursors of reading ability in young readers: Evidence from a four-year longitudinal study*, in "Scientific studies of reading", 16 [2], pp. 91-121.

Oakhill J.V., Cain K. and Elbro C. 2015, *Understanding and teaching reading comprehension: A handbook*, Routledge, London.

Oslund E.L., Clemens N.H., Simmons D.C. and Simmons L.E. 2018, *The direct and indirect effects of word reading and vocabulary on adolescents' reading comprehension: Comparing struggling and adequate comprehenders*, in "Reading and Writing" 31, pp. 355-379.

Ouellette G.P. 2006, *What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension*, in "Journal of Educational Psychology", 98, pp. 554-566.

Perfetti C. and Adolf S. 2012, *Reading comprehension: A conceptual framework from word meaning to text meaning*, in Sabatini J., Albro E. and O'Reilly T. (eds.) *Measuring up: Advances in how we assess reading ability*, Rowman & Littlefield Education, Lanham, MD, pp. 3-20.

Perfetti C. and Hart L. 2002, *The lexical quality hypothesis*, in "Precursors of functional literacy" 11, pp. 67-86.

Perfetti C. and Stafura J. 2014, *Word knowledge in a theory of reading comprehension*, in "Scientific studies of Reading" 18 [1], pp. 22-37.

Prior A., Goldina A., Shany M., Geva E. and Katzir T. 2014, *Lexical inference in L2: Predictive roles of vocabulary knowledge and reading skill beyond reading comprehension*, in "Reading and Writing" 27 [8], pp. 1467-1484.

Qian D.D. and Schedl M. 2004, *Evaluation of an in-depth vocabulary knowledge measure for assessing reading performance*, in "Language Testing" 21 [1], pp. 28-52.

Quinn J.M., Wagner R.K., Petscher Y. and Lopez D. 2015, *Developmental relations between vocabulary knowledge and reading comprehension: A latent change score modeling study*, in "Child Development" 86, pp. 159-175.

Quinn J.M., Wagner R.K., Petscher Y., Roberts G., Menzel A.J. and Schatschneider C. 2019, *Differential codevelopment of vocabulary knowledge and reading comprehension for students with and without learning disabilities*, in "Journal of educational psychology" 112 [3], pp. 608-627.

Ramus F., Rosen S., Dakin S.C., Day B.L., Castellote J.M., White S. and Frith U. 2003, *Theories of developmental dyslexia: insights from a multiple case study of dyslexic adults*, in "Brain" 126 [4], pp. 841-865.

Raudszus H., Segers E. and Verhoeven L. 2018, *Lexical quality and executive control predict children's first and second language reading comprehension*, in "Reading and Writing: An Interdisciplinary Journal" 31 [2], pp. 405-424.

Read J. 1993, *The development of a new measure of L2 vocabulary knowledge*, in "Language Testing" 10 [3], pp. 355–371.

Read J. 1998, *Validating a test to measure depth of vocabulary knowledge*, in Kunnan A. (ed.), *Validation in language assessment*, Lawrence Erlbaum, Mahwah, NJ, pp. 41-60.

Reis A., Araújo S., Morais I.S. and Faísca L. 2020, *Reading and reading-related skills in adults with dyslexia from different orthographic systems: a review and meta-analysis*, in "Annals of dyslexia" 70 [3], pp. 339-368.

Santulli F. and Scagnelli M. 2017, *The improvement of silent reading strategies through Super Reading*, in "The Journal of Inclusive Practice in Further and Higher Education" 9 [1], pp. 88-100.

Santulli F. and Scagnelli M. 2022, *Reading as Multi-Layer Activity: Training Strategies at Text Level*, in Cappelli G. and Noccetti S. (eds.), *A Linguistic Approach to the Study of Dyslexia*, Multilingual Matters, Bristol, pp. 286-304.

Simi N. 2022, *Reinterpretation Processes and Humour Understanding in Young Adults with Dyslexia*, in "Lingue e Linguaggi" 54 (this volume), pp. 111-129.

Schmitt N., Wun Ching Ng J. and Garras J. 2011, *The Word Associates Format: Validation evidence*, in "Language Testing" 28 [1], pp. 105-126.

Schneider E. and Crombie M. 2012, *Dyslexia and foreign language learning*, David Fulton Publishers, Abingdon.

Smith-Spark J.H. and Fisk J.E. 2007, *Working memory functioning in developmental dyslexia*, in "Memory" 15, pp. 34-56.

Smith-Spark J.H., Fisk J.E., Fawcett A.J. and Nicolson R.I. 2003, *Central executive impairments in adult dyslexics: Evidence from visuospatial working memory performance*, in "European Journal of Cognitive Psychology" 15, pp. 567-587.

Smith-Spark J.H., Henry L.A., Messer D.J., Edvardsdottir E. and Zięcik A.P. 2016, *Executive functions in adults with developmental dyslexia*, in "Research in Developmental Disabilities" 53-54, pp. 323-341.

Snowling M.J., Hayiou-Thomas M.E., Nash H.M. and Hulme C. 2020b, *Dyslexia and Developmental Language Disorder: comorbid disorders with distinct effects on reading comprehension*, in "Journal of Child Psychology and Psychiatry" 61 [6], pp. 672-680.

Sparks R.L. and Ganschow L. 1993, *The impact of native language learning problems on foreign language learning: Case study illustrations of the linguistic coding deficit hypothesis*, in "The Modern Language Journal" 77 [1], pp. 58-74.

Speciale G., Ellis N.C. and Bywater T. 2004, *Phonological sequence learning and short-term store capacity determine second language vocabulary acquisition, in* "Applied Psycholinguistics", 25 [2], pp. 293-321.

Stanovich K.E. 1986, *Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy*, in "Reading Research Quarterly" 21 [4], pp. 360-407.

Stanovich K.E. 2000, *Progress in understanding reading: Scientific foundations and new frontiers*, Guilford Press, New York.

Suggate S., Schaughency E., McAnally H. and Reese E. 2018, *From infancy to adolescence: The longitudinal links between vocabulary, early literacy skills, oral narrative, and reading comprehension*, in "Cognitive Development" 47, pp. 82-95.

Swanborn M.S.L. and de Glopper K. 2002, *Impact of reading purpose on incidental word learning from context*, in "Language learning" 52 [1], pp. 95-117.

Tannenbaum K.R., Torgesen J.K., and Wagner R.K. 2006, *Relationships between word knowledge and reading comprehension in third-grade children*, in "Scientific Studies of Reading", 10, pp. 381-398

Wagner R., Muse A. and Tannenbaum K. 2007, *Promising avenues for better understanding implications of vocabulary development for reading comprehension*, in Wagner R., Muse A. and Tannenbaum K. (eds.), *Vocabulary acquisition: Implications for reading comprehension*, Guilford Press, New York, pp. 276-291.

Wolf R.C., Sambataro F., Lohr C., Steinbrink C., Martin C. and Vasic N. 2010, *Functional brain network abnormalities during verbal working memory performance in adolescents and young adults with dyslexia*, in "Neuropsychologia", 48 [1], pp. 309-318.