

Language impairment in bilingual children

State of the art 2017

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Several migration waves within the past two decades have led to an increase in the number of children worldwide who start (pre)school in a language that is not their home language. While teachers can often tell that a monolingual child's language is not as expected for her age and speech and language therapists can successfully identify language impairment in monolingual children, this is far from obvious when the language they evaluate is the child's second language (L2). This was brought into the spotlight especially by Johanne Paradis and colleagues in the first decade of the 21st century (Paradis, 2005, 2007, 2010; Paradis, Crago, & Genesee, 2005/2006). Numerous studies (e.g., Bedore & Peña, 2008) have documented how bilingual children with Specific Language Impairment (SLI) are over- or under-represented in speech-language therapy caseloads. Over- and under-representation of bilingual children with SLI occurs because bilingual children's language trajectory differs from that of monolingual children, and therefore, monolingual norms cannot be used for bilingual children. Moreover, bilingual children's language trajectory is modulated by environmental factors over and above those relevant to monolingual children, e.g., onset and exposure to the two languages, quantity/quality of input, and status of the language pair (minority/majority), that lead to greater individual variability than in monolingual children. In addition, bilinguals should be assessed in both languages, but only a small number of language assessments have versions in more than one language. These are normed with monolingual children, and therefore, the norms cannot be used with bilingual children. Thus, all in all, there is a lack of standardised bilingual language assessments. This has important implications for differential diagnosis by speech and language therapists and decisions for early remediation.

The issue of over- and under-representation of bilingual children with SLI hit a nerve. It instigated interest across the globe and led to the funding of several

research projects, including the European Cooperation in Science and Technology (COST) Action IS0804 ‘Language Impairment in a Multilingual Society: Linguistic Patterns and the Road to Assessment’ (www.bi-sli.org). Consequently, our knowledge base on the profile of bilingual children with SLI has grown considerably. In addition, several assessment tools have been developed to assess the language abilities of bilingual children in both of their languages. For example, COST Action IS0804 designed a comprehensive set of tools for assessing the language abilities of bilingual children across a large number of languages (Armon-Lotem, de Jong, & Meir, 2015) and Elizabeth Peña and colleagues at the University of Texas have developed the Bilingual English Spanish Assessment (BESA), which has been normed for bilingual children in the USA (Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014).

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Twelve years after the seminal work by Paradis (2005), the field has developed considerably. A large number of studies have been published on the profile of sequential bilingual children with and without SLI. Some have addressed grammatical or semantic aspects in bilingual children with SLI, whereas others have addressed the role of working memory and executive functions in this population. In this section, we present a sample of these new studies as a background for the studies presented in this special issue.

The development of grammar in bilingual children with SLI was investigated in Castilla-Earls et al. (2016), who addressed the production of articles and object pronouns in Spanish-speaking bilingual children. The study used an elicited production task and separated the children into balanced and Spanish-dominant bilinguals. Castilla-Earls et al. found lower accuracy scores for children with SLI in comparison to children with typical language development (TLD) for both articles and object pronouns. Interestingly, in balanced bilingual children the difference between the two groups was similar for both articles and pronouns, but Spanish-dominant children showed a larger difference in articles than object pronouns. This study demonstrated that language dominance is an important factor that needs to be carefully considered when assessing bilingual children. It also suggested that clinical markers for SLI may have an unequal predictive value for different types of bilinguals.

The development of lexical-semantic knowledge has been investigated by Altman, Goldstein, and Armon-Lotem (2017) and Peña, Bedore, and Kester (2016). Altman et al. (2017) studied the lexical knowledge of children with Hebrew as L1 (monolinguals) and L2 (bilinguals L1 Russian) with the

LITMUS-CLT-Hebrew task. They showed that the lexical deficit reported for bilinguals when compared to monolinguals extended beyond receptive knowledge of nouns to receptive knowledge of verbs as well as expressive knowledge of both categories. They further argued that testing of expressive vocabulary reveals a qualitative difference in lexical knowledge between bilinguals and monolinguals, as monolingual variations in production were close in meaning to the target items, while bilinguals demonstrated gaps in their expressive lexicon using words with a larger distance from the target. Altman et al. reported that while the bilingual effect was significant for both receptive knowledge and expressive knowledge in both nouns and verbs, it was narrower for receptive knowledge of nouns.

Peña, Bedore & Kester (2016) used the semantics subtests from the aforementioned Bilingual English Spanish Assessment and tested two approaches to the assessment of balanced Spanish-English bilingual children at risk of language impairment in terms of diagnostic accuracy. They tested 78 children (15 with language impairment) in pre-school to early school years (4;0–6;11). The subtest in question involved multiple components testing semantic knowledge, such as characteristic properties, categorisation, function, similarities and differences, and analogies, among others. The first approach to assessment was the combined vocabulary scores of the two languages and entailed adding scores from the two languages; the other resembled a composite score whereby the scores from each language were plotted along an x,y axis and subsequently cut scores (above or below set threshold) were computed for the two languages simultaneously. Discriminatory function analysis was utilised to assess diagnostic accuracy where the cut scores from the subtests for the two languages were entered as variables. The results showed that classification of children as having language impairment when they fall below a set cut-off score on the tasks for both languages (each score set specifically for each language respectively) yielded more accurate prediction of children's language ability in comparison to classification on the basis of total score, with sensitivity and specificity both over 90%. Peña, Bedore & Kester interpreted the results as evidence for a need to assess bilingual children in both languages to maximise accuracy of diagnosis when there is concern for language impairment.

Executive functions (EFs) and working memory in bilingual children with SLI have been investigated in Engel de Abreu, Cruz-Santos, and Puglisi (2014) and Lukács, Ladányi, Fazekas, and Kemény (2016). Engel de Abreu et al. (2014) administered a series of EF tasks to Portuguese-Luxembourgish bilingual children with and without SLI as well as monolingual Portuguese-speaking children with typical language development. Digit recall and counting recall were used for verbal working memory, whereas the dot-matrix and odd-one-out were used for visuo-spatial memory. For selective attention, the participants were required to

identify pairs of similar objects as fast as possible. Interference suppression was assessed using a flanker task. Engel de Abreu et al. (2014) found no group differences for visuo-spatial working memory, but there were differences for verbal working memory (digit recall), with the children with SLI performing significantly less well than the typically developed monolingual and bilingual controls. The bilingual children with SLI performed similarly to the typically developing controls on the attention task but lower than the bilingual typical controls on the flanker task. The results indicated a weakness in verbal working memory for children with SLI, and contrary to other studies, a domain-general cognitive advantage for the bilinguals with language impairment which was not extended to the typically developed controls. The latter was interpreted as evidence for comorbidity of non-verbal executive function difficulties with language impairment and the possible benefits of bilingual exposure. Lukács et al. (2016) also used a large battery of EF tasks (simple and complex span, fluency, N-back, and Stroop tasks) to explore verbal and nonverbal EF abilities. The results showed deficits in some but not all abilities in the bilingual children with SLI with deficits attested mostly in the verbal tasks. In particular, differences relative to the TLD group were observed in the listening span and fluency tasks but not in inhibition and updating. Nevertheless, using digit span as a covariate (as a measure of verbal Short Term Memory) eliminated the differences on the verbal tasks. The authors suggested that these findings highlighted the role in verbal Short Term Memory in the linguistic performance of children with SLI.

Non-verbal working memory in bilingual children with language impairment was also investigated in Ebert (2014). This study however addressed the contribution of non-verbal working memory to sentence repetition (Sentence Recall, CELF-4) and non-word repetition in both languages, in a group of Spanish-English bilingual children. Non-verbal working memory scores were predictive of performance in the Recalling Sentences tasks for both languages, even when other variables, such as age, were controlled for. The non-word repetition task scores for Spanish and English were likewise significant predictors of Recalling Sentence scores for the respective language, when other variables were controlled for. The results suggest that domain-general capacities contribute to performance in sentence repetition.

Several studies have used new language assessments and report their sensitivity and specificity. Armon-Lotem and Meir (2016), for example, evaluated the sensitivity and specificity of three repetition tasks with varied linguistic load in Russian and Hebrew – forward digit span (FWD), non-word repetition (NWR) and sentence repetition (SRep) – in monolingual and bilingual children with and without SLI. They showed that performance on NWR and SRep, but not on FWD was sensitive to the impact of SLI among both monolinguals and bilinguals. They

further argued that even with these tools, better sensitivity and specificity were achieved when bilingual norms were used. Moreover, they argued that it is best to combine results of SRep in both languages (accuracy of 94%), but even using the societal language Hebrew alone yielded 91% accuracy, which is highly promising for future use in clinical evaluation even if testing is conducted only in the societal language. Finally, Grimm and Schulz (2014) addressed the difficulty in assessing bilingual children with SLI in their second language using a parental questionnaire to examine risk factors for SLI. Risk factors included late onset of single word and of multi-word utterances, family history of SLI, and written language deficits. This was tested among monolingual German speaking children with SLI and TLD. The questionnaire's results together with language assessment data were compared with the children's clinical diagnosis. The onset of multi-word utterances and family history of SLI were the best measures for differentiating between children with language impairment and children with typical language development. Grimm and Schulz (2014) suggest that any language test should be complemented by a parental questionnaire to reduce misdiagnosis.

To sum up, recent studies of SLI among bilingual children move beyond the focus on morpho-syntax, exploring the separate and combined impact of bilingualism and SLI on lexical abilities, syntactic knowledge, verbal memory, and executive functions. The most important observation which emerges from these studies is that bilingualism does not have a determinant effect for children with SLI who were found to perform on-a-par with their monolingual peers in some studies, and even when they show lower performance, the gap between bilinguals with TLD and bilinguals with SLI is similar to what is observed among monolingual children. These studies are sensitive to the bilingual nature of this population. The bilingual focus of recent studies highlights the need to assess bilingual children in both languages to maximise accuracy of diagnosis and carefully consider language dominance, relying on the information provided by parental questionnaires. To this end, recent studies consider bilingually appropriate tools for assessment, such as sentence repetition, on the one hand, and parental questionnaires, on the other. As the study of bilingual SLI advances, researchers are interested not only in the linguistic symptoms but also in the possible sources. Studies of verbal memory demonstrate a weakness among bilingual children with SLI, which is predictive of their performance on sentence recall, a task that was found to be reliable for assessment. Such findings suggest that domain-general capacities contribute to the performance in sentence repetition. Studies of executive functions suggest a comorbidity of EF difficulties with language impairment on the one hand and the possible benefits of bilingual exposure on the other, yet the deficits attested in EF are not in all abilities and are more confined to verbal tasks.

The special issue

The papers in this special issue present seven new studies that address the profile of bilingual children with language impairment, predominantly children with SLI but also children with Autism Spectrum Disorder (ASD), an understudied group of children. These papers also present new assessment tools that have been developed for the identification of bilingual children with SLI. The studies address similar themes to the studies presented above.

Blom and Boerma (2017) and Meir (2017) explore the relationship between verbal memory and linguistic skills. Blom and Boerma (2017) examine the effects of bilingualism and language impairment on morphosyntax, vocabulary and verbal memory in simultaneous/early sequential bilingual children with L2 Dutch using a series of standardised assessments. They found an effect of language impairment on all measures with the TLD children having higher accuracy scores. An effect of bilingualism with monolinguals outperforming bilinguals was found for vocabulary and morphology but not for working memory. Subsequent analyses with language ability controlled for showed that the bilinguals outperformed monolinguals in the working memory tasks. On the vocabulary tasks, the bilingual LI group scored the lowest for accuracy suggesting that bilingualism adds an additional burden for vocabulary in children with language impairment. This was not found for the memory tasks, where the TLD and LI bilingual children did not perform differently to their monolingual controls; in fact, a comparison of effect sizes revealed smaller differences between the bilingual groups in comparison to the monolingual groups, suggesting a compensatory role for bilingualism in the context of language impairment. The reverse was found for effect sizes for the vocabulary and morphology tasks.

Meir (2017) investigates the independent and combined effects of SLI and bilingualism on verbal Short Term Memory (vSTM), in an attempt to understand the variation in language performance in these populations. She addresses this question by testing bilingual and monolingual children with and without SLI with verbal tasks that vary in the degree of linguistic load. Russian-Hebrew bilinguals were tested in both languages and were compared to monolingual speakers of each of their languages. Using Forward Digit Span (with the least demand on Long Term Memory), Nonword Repetition, and Sentence Repetition from the LITMUS test (with maximal demands), Meir shows the effect of bilingualism on syntactic abilities, with no bilingual effect on Forward Digit Span or Nonword Repetition. By contrast, the effect of SLI was observed for all three tasks with growing effect size as linguistic load increased. Moreover, when lexical abilities were controlled for, the bilingual effect disappeared, suggesting that the source of the bilingual effect lies in lexical knowledge. Exploring the source of the difficulty among children

with SLI, Meir shows that vSTM cannot explain the difficulties with Sentence Repetition, pointing to a deficit in long-term knowledge. The results of Meir's study show that despite some superficial similarity in linguistic performance, the source of difficulty in the two populations is different. The performance of the bilingual children is traced to limited lexical knowledge among, while for children with SLI, it stems from linguistic representation in Long Term Memory. The error patterns reported for each population in Meir and Armon-Lotem (2017) further support the distinct source of difficulty on Sentence Repetition, as bilingual errors were related to lexical substitution and the competition between the two languages, while children with SLI used simple sentences and sentence fragments with no embedding.

Two more papers make use of the LITMUS tools developed in COST Action IS0804 to address the language assessment theme in this volume, namely Antonijevic, Durham, and Chonghaile (2017) and De Almeida et al. (2017). De Almeida et al. (2017) evaluate the effectiveness of using measures from the LITMUS tools (nonword repetition, sentence repetition and parental questionnaires) in order to diagnose SLI in bilingual 5-to 8-year-old children in France compared to their monolingual peers. The effectiveness of the non-word repetition (NWR) and sentence repetition (SRep) as diagnostic tools were assessed by calculating their sensitivity and specificity at a cut-off point of 80% accuracy for both measures. Sensitivity and specificity for diagnosing SLI in monolinguals was at 88% and 83% for the NWR and 94% and 92% for the SRep, respectively. For diagnosing SLI in bilingual children the two measures were less effective; sensitivity and specificity for the NWR were 81% and 79%, while for the SRep the two metrics were lower at 76% and 72%, respectively, while the cut-off score was lowered to 60%. On these grounds, De Almeida et al. (2017) argue that these two tests can function as potential diagnostics of language impairment in bilingual children, although some overlap between impaired and unimpaired children remains within the bilingual groups.

Antonijevic et al. (2017) further explore the effectiveness of the bilingual use of the sentence repetition task developed as part of the LITMUS tools, but then in the English-Irish context. The paper presents the results from the novel SRep task designed for Irish and compares it to the English SRep task. The results show that performance in L2 Irish was weaker than performance in L1 English. The paper further explored the bilingual background factors that impacted the performance of the English-Irish bilingual children, showing that for the studied population, age of onset and length of exposure did not impact children's performance, while the type of input provided within the schooling system did. Moreover, crosslinguistic influence from English was the major source of error types observed in the children's performance in Irish. Finally, in order to evaluate its adequacy for future

use with bilingual children with SLI, the discriminability of the different sentence types and of particular sentences was explored and particular weaknesses were identified for future improvements.

Two papers in this issue venture beyond linguistic abilities. Tsimpli, Peristeri, and Andreou (2017) compare the ability of monolingual and bilingual children with SLI to produce clitics with their performance on Theory of Mind (ToM) reasoning tasks, and Laloi, de Jong, and Baker (2017) explore the impact of bilingualism and SLI on children's performance in tasks tapping on EFs. Tsimpli et al. (2017) investigate the impact of bilingualism on the ability of children with SLI (compared with children with TLD) to produce clitic pronouns in Greek. This was measured in an experimental context with a task designed to elicit 1st and 3rd person clitics and in a picture-based narrative retelling task that presents a richer and more natural context. This was complemented by testing both groups with SLI on first- and second-order ToM reasoning tasks to explore potential sources of differences between the two groups with SLI. An effect of language impairment was found for 3rd person clitics in the clitic elicitation task, in which both monolingual and bilingual children with TLD outperformed their peers with SLI. By contrast, bilingual children with SLI benefited from the enriched context in the narrative task, and demonstrated improved performance that made them no different from their peers with TLD. Further exploration of the differences between monolingual and bilingual children with SLI, showed a bilingual advantage in the production of 1st person clitics, which is accounted for in terms second-order ToM abilities. These findings suggest that the performance of children with SLI on clitic production reflects not only their language abilities, but also their cognitive abilities manifested in their sensitivity to discourse constraints and ToM abilities.

Laloi, de Jong, and Baker (2017) explore the impact of bilingualism and SLI on children's performance in tasks tapping on EF abilities focusing on response inhibition, in an attempt to provide an alternative to language based assessment of SLI among bilingual children. This study stems from the growing literature questioning the existence of a bilingual advantage in EF, on the one hand, and the possible tie between linguistic performance among children with SLI and EF abilities, on the other. Laloi et al. used a visual stop signal task to measure response inhibition among 5–8-year-old children who spoke French as L1 (monolinguals) or L2 (bilinguals), with typical language development and with SLI. They found no effect of bilingualism while documenting a negative effect of SLI. As the children in this study were screened for ADHD, the negative effect of SLI could not be traced to comorbidity. Even when nonverbal IQ and SES were controlled for, the effect of SLI remained. Moreover, when looking into the specificity of the task, it was found that 72% of the children with SLI had difficulty in response inhibition. Nevertheless, 44% of the bilingual children also found response inhibition

difficult, yielding low sensitivity of 56%. These findings are too low to make it possible to use response inhibition as a clinical marker in diagnosing children with SLI. That is, while the negative effect of SLI could have suggested that SLI is related to EF abilities, the latter finding challenges this suggestion as it does not hold for a third of the children with SLI. Moreover, the individual variation observed in both groups further suggests that a deficit in EF is not necessarily tied to linguistic abilities and might be related to maturational variation. This is furthermore supported by Marton, Campanelli, Scheuer, Yoon, and Eichorn (2012), for example, who studied older children with the same task as Laloi et al. and found no effect of SLI of response inhibition.

Finally, Gonzalez-Barrero and Nadig (2017) address verbal fluency in bilingual children with Autism Spectrum Disorders, an understudied group. The authors investigated the impact of ASD and bilingualism on children's performance on a verbal fluency task (the word association subset of CELF-4), a task that taps both on lexical and semantic skills as well as on executive functions. While vocabulary is often limited among bilingual children when tested in a single language, executive functions have been reported to be enhanced (but see Laloi, 2017). Gonzalez-Barrero and Nadig (2017) found that monolingual children with ASD produced significantly fewer correct words related to a given semantic category when compared both to neurotypical monolinguals and to bilinguals with ASD (who had similar receptive vocabulary skills). By contrast, no evidence for bilingual advantage was found on measures of EF related to verbal fluency. Moreover, no bilingual effect was observed for correct words related to a given semantic category among neurotypical children. The authors speculate on the reasons for the bilingual advantage in verbal fluency among the children with ASD, and the lack of advantage in EF related measures.

Summary and future research

The papers in this special issue present cutting-edge studies in the exploration of SLI among bilingual children. Some of these studies address the potential bilingual advantage, and one study, exploring bilingualism and ASD, actually shows such an advantage among children with ASD. The studies of bilingual SLI aim, on the one hand, to shed light on the source of the similarities and differences between bilinguals and children with SLI, in the hope to be able to better understand the linguistic difficulties presented by these populations, and on the other hand, to test the potential value of different tools, some of which developed in the framework of COST Action IS0804, for disentangling bilingualism from SLI. While these studies

are able to answer some questions, they open the door for others. The open issues can be divided along these two axes.

Several of the studies in this issue used repetition tasks and in particular sentence repetition and non-word repetition. These tasks tax both vSTM and linguistic abilities to varied degrees. Both Blom and Boerma (2017) and Meir (2017) demonstrate the impact of SLI on vSTM with no effect of bilingualism. Both studies further find enhanced memory skills among bilinguals when linguistic ability is controlled for, which in Blom & Boerma's paper seems to extend to bilingual with SLI. These findings call for further investigation of the role of vSTM and working memory in SLI and the impact of bilingual exposure on its development, exploring the possibility of using cognitive measures for disentangling bilingualism and SLI. Moreover, it is worth exploring which memory systems are related to successful performance on SRep, in order to better understand what is really tested by this task.

Laloi et al. (2017) expand the attempt to go beyond the linguistic abilities to an exploration of response inhibition. While significant between group differences were found, suggesting that difficulties in inhibitory control might play a role in SLI, the task itself was not accurate enough to be used for clinical purposes. The individual variation calls for in-depth evaluation of the relation between linguistic abilities and inhibitory control to understand the relevance of this latter variable. The findings of Laloi et al. further suggest that a more intensive exploration of executive functions is necessary with more tasks that tap into other EF abilities.

As bilingualism was found to impact lexical and grammatical abilities, it seems only right to question the impact of variation in the input. The studies in this special issue do not address the difference between simultaneous and sequential bilinguals, or the impact of different balance of exposure to the two languages on the children's performance. Nor do they compare across different language pairs, even when the HL varies within the same study. In future research, it would be interesting to explore the error patterns among different bilingual populations for the impact of the HL and to compare error patterns of bilinguals to those found in SLI. Differences in patterns of exposure might also be related to SES and this in turn may contribute to the different results reported across the studies for NWR. On the practical side, the promising results of the LITMUS tools used in the papers in this issue call for adaptations to more languages and dialects (e.g., Antonijevic et al., 2017). In particular, SRep is shown in several papers to tease apart bilingual children with TLD from monolinguals and bilinguals with SLI. In this context, it is important to point out that it is not enough to show significant differences between the groups. Rather, any attempt to generalize the use of these tools to the clinical setting requires evidence for the ability of the task to accurately distinguish children with TLD from those with SLI at the individual level. As pointed

out by some of the studies in this issue, this might require the use of bilingual norms for bilingual children. Clearly, more studies are needed before any test can be standardised.

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