

Cognitive profiles in bilingual children born to immigrant parents and Italian monolingual native children with specific learning disorders

Anna Riva
Renata Nacinovich
Nadia Bertuletti
Valentina Montrasi
Sara Marchetti
Francesca Neri
Monica Bomba

Child and Adolescent Mental Health
Department, University of Milan
Bicocca, San Gerardo Hospital,
Monza, Italy

Purpose: The aim of this study is to compare the Wechsler Intelligence Scale for Children® – fourth edition IV (WISC IV) intellectual profile of two groups of children with specific learning disorder, a group of bilingual children and a group of monolingual Italian children, in order to identify possible significant differences between them.

Patients and methods: A group of 48 bilingual children and a group of 48 Italian monolingual children were included in this study. A preliminary comparison showed the homogeneity of the two groups regarding learning disorder typology and sociodemographic characteristics (age at WISC IV assessment, sex and years of education in Italy) with the exception of socioeconomic status. Socioeconomic status was then used as a covariate in the analysis.

Results: Even if the two groups were comparable in specific learning disorder severity and, in particular, in the text comprehension performance, our findings showed that the WISC IV performances of the bilingual group were significantly worse than the Italian group in Full Scale Intelligence Quotient ($P=0.03$), in General Ability Index ($P=0.03$), in Working Memory Index ($P=0.009$) and in some subtests and clusters requiring advanced linguistic abilities.

Conclusion: These results support the hypothesis of a weakness in metalinguistic abilities in bilingual children with specific learning disorders than monolinguals. If confirmed, this result must be considered in the rehabilitation treatment.

Keywords: children, bilingualism, WISC IV, SLD

Introduction

The increase of the immigration rate in Italy in the last few decades has led to a higher number of diagnostic evaluations and treatments for bilingual children born to immigrant parents with specific learning disorders (SLD) at the Services of Child and Adolescence Psychiatry. Although several recent studies have been conducted on cognitive functions in bilingualism, few studies have been carried out on neuropsychological functioning of bilingual children and no studies on bilingual children with SLD.

Concerning cognitive functions and bilingualism, if previous studies were oriented to cognitive disadvantages of bilingualism, more recent studies instead support the hypothesis of positive effects of bilingualism.¹

The discrepancy of the results obtained in these studies is related to the strong different typology of the bilingual populations examined: earlier studies considered bilingual individuals as belonging to immigrant ethnic minorities with socioeconomic disadvantages, whereas the most recent studies recruited populations with a high level of bilingualism (eg, American residents in Canada, typically Francophone bilinguals).¹ Another interpretation of the contradictory findings arising from the studies about

Correspondence: Renata Nacinovich
Clinica di Neuropsichiatria dell'Infanzia e
dell'Adolescenza, Ospedale San Gerardo,
ASST Monza, Ospedale Nuovo, Scala A,
Piano II, Via Pergolesi, 33, 20900
Monza, Italy
Tel +39 3 9233 3579
Fax +39 3 9233 3321
Email renata.nacinovich@unimib.it

bilingualism–intelligence relation could be identified in the “Threshold Theory”, developed by Cummins in 1976, on the basis of which a high level of competence in both languages is necessary in order to see potential advantages of bilingualism on cognitive functioning.²

In regard to neuropsychological functioning in bilingual children, more recent studies outline a potential advantage in bilinguals regarding specific cognitive abilities, as executive functions,^{3–5} but a potential disadvantage concerning receptive and productive vocabulary size.⁶

Previous studies support the hypothesis of a potential advantage in metalinguistic abilities in bilinguals than monolinguals.⁷ For metalinguistic skill, we mean the ability “to think and reflect upon the nature and functions of language” or to think abstractly about the language. Friesen and Bialystok⁷ in a recent review on metalinguistic abilities in bilingual children indicated that bilinguals’ superior executive control abilities allow them to compensate for weaker linguistic knowledge in metalinguistic tasks where greater recruitment of control processes is required.

A limitation of these studies on neuropsychology is the tendency to study specific neuropsychological functions through specific tests, whereas few studies considered the neuropsychological functioning as a whole.

The Wechsler Scales, one of the most used verbal test to examine the cognitive and neuropsychological functioning in children, have been partially used in different research to compare cognitive levels between bilinguals and monolinguals. Bialystok and Majumder in their study proved that the block design average score obtained by English–French bilinguals was significantly higher than both English monolinguals and English–Bengali bilinguals, but above all, that the performance of these two groups on the same subtest did not differ in a statistically significant way.⁸

Lauchlan et al compared the Wechsler Intelligence Scale for Children® – fourth edition (WISC IV) cognitive performances of two bilingual groups speaking an international language and a minority language (English–Gaelic bilinguals and Italian–Sardinian bilinguals) with the respective monolingual peers (English monolinguals and Italian monolinguals).⁹ The research highlighted a significantly higher ability of the English–Gaelic bilingual group in vocabulary and arithmetic subtests in comparison with the other three groups, Italian–Sardinian bilingual group included, and in block design in comparison with English and Italian monolinguals.

In a recent study, Karlsson et al reported for the first time the results of all the WISC IV core subtests administered to Finland monolinguals and Finland–Swedish bilinguals in two

age bands (7 and 10–11 years). The only difference to arise showed an advantage of monolinguals in symbol search and only in the younger age band.¹⁰

To our knowledge no studies have been otherwise conducted to evaluate the intellectual and neuropsychological profile of bilingual children with SLD.

The aim of this study was to compare the WISC IV profiles of two groups of children with SLD, a group of bilingual children born to immigrant parents and a group of Italian natives, in order to identify possible significant differences in their cognitive and neuropsychological functioning.

Patients and methods

Participants

The total sample consisted of 96 children with a diagnosis of SLD according to fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM–5)*, 48 bilingual children (31 boys and 17 girls) for the case group and 48 Italian monolingual native controls matched for age at the time when the intellectual test was administered, and sex and typology of diagnosis. The two groups differed in socioeconomic status (SES) measured with the Hollingshead Four-Factor Index of Socioeconomic Status. Sociodemographic features are described in Table 1.

Table 1 Sociodemographic and clinical data in bilingual and Italian children

Characteristics	Bilinguals	Italians	P-value
Sociodemographic characteristics			
WISC IV, age (mean [SD])	9.54 (1.98)	9.64 (1.98)	0.813
Gender, M/F (N)	31/17	31/17	
Years of education in Italy (mean [SD])	5.81 (2.09)	6.48 (2.09)	0.122
SES Hollingshead Index (N)			
Level 1	22	8	0.02*
Level 2	18	15	
Level 3	5	16	
Level 4	1	3	
Level 5	0	1	
Clinical characteristics			
SLD typology (N)			0.512
ISRD	2	5	
ISWED	6	11	
SRD + SWED	11	9	
SRD + SMD and/or SHD	2	3	
SWED + SMD and/or SHD	11	7	
SRD + SWED + SMD and/or SHD	16	13	

Note: *P-values <0.05 have been considered significant.

Abbreviations: F, female; ISRD, isolated specific reading disorder; Hollingshead Index, Hollingshead Four-Factor Index of Socioeconomic Status; IWED, isolated specific written expression disorder; M; male; SD, standard deviation; SES, socioeconomic status; SHD, specific handwriting disorder; SLD, specific learning disorder; SMD, specific mathematics disorder; SRD, specific reading disorder; SWED, specific written expression disorder; WISC IV, Wechsler Intelligence Scale for Children® – fourth edition.

The sample group consisted of 12 (25%) first-generation immigrants, minors born abroad that migrated/reunified with their parents in Italy by at least 5–7 years of age and 36 (75%) second-generation immigrants children born in Italy from either immigrated parents or mixed Italian-immigrant couples and entered in an Italian school at 3 years of age.

In the bilingual group, 40 (83.4%) children had parents who came from the same country and they were classified as follows: 18 (37.5%) from the Arab world, nine (18.8%) from North America and Europe, seven (14.6%) from South America, four (8.3%) from sub-Saharan Africa and two (4.2%) from Eastern Europe. Considering the remaining children of the bilingual group, seven (14.6%) immigrants were children of mixed couples, in particular four (8.3%) children had Italian fathers and European mothers, two (4.2%) children had Arab origin fathers and European mothers, and finally one (2%) child had an Italian father and a South American mother (for one child information is missing). The control group is composed entirely of children born in Italy from both parents of Italian origins.

Inclusion and exclusion criteria

The inclusion criteria, in addition to a diagnosis of SLD, were as follows:

- No history of delayed language development/specific language impairment (for bilingual children in both first and Italian languages).
- Educational performance of average-high level.
- At least 5 years of school attendance in an Italian school (only for case group).
- Appropriate knowledge of both Italian language and native language evaluated through a clinic observation by a speech therapist and information supplied by their teachers (only for case group).

Both Italian and immigrant children characterized by clearly disadvantaged psychosocial conditions were excluded from the study.

Procedure

Participants were patients from the Outpatient Department of Child and Adolescent Psychiatry, University of Milan Bicocca, San Gerardo Hospital, Azienda Socio Sanitaria Territoriale ASST di Monza, and from the Outpatient Department of Child and Adolescent Psychiatry, ASST Vimercate with a first diagnosis of SLD certified by a multidisciplinary team composed of Child and Adolescent Psychiatrists, Psychologists and Speech Therapists, according to the most recent guidelines of the Italian Ministry of Health.¹¹

Data of both groups were collected between December 2014 and March 2016. All recruited participants underwent a psychiatric screening and a speech and neuropsychological assessment focused on learning proficiency and intellectual profile, according to diagnostic guidelines. Learning proficiency was assessed by means of tasks assessing reading and writing proficiency, whereas intellectual profile was evaluated through the latest version of the WISC IV.¹²

Children with isolated difficulties in mathematics and/or handwriting were excluded in order not to influence the results of the reading and writing proficiency tasks.

Parents and participants were told the purpose of the study and a written informed consent to participate was obtained. The research was reviewed and approved by the institutional review board of S Gerardo Hospital-ASST Monza.

Measures

WISC IV

WISC IV is an intelligence test designed on the most recent and broadly supported model of intelligence explained by the Cattell-Horn-Carroll theory (CHC).¹²

Although the factorial indexes have been constructed in order to represent the broad cognitive abilities of the CHC theory, Kaufman and Flanagan believe that cluster indexes provide a better evaluation of the CHC theory broad cognitive abilities, compared with that supplied by the four indexes described in the next paragraph.¹³

WISC IV consists of 15 subtests (10 core subtests and 5 supplemental subtests) that allow calculation of the full scale intelligence quotient (FSIQ), that represents the general cognitive abilities, and four indexes that describe the operation of specific domains, Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI) and Processing Speed Index (PSI).

The subtests are divided into the four indexes as follows:

- VCI: similarities, vocabulary, comprehension, information and word reasoning subtests.
- PRI: block design, picture concepts, matrix reasoning and picture completion subtests.
- WMI: digit span, letter-number sequencing and arithmetic subtests.
- PSI: coding, symbol search and cancellation subtests.

In addition to the four indexes, two other composite scores are computable: the subtests of VCI and PRI calculate the General Ability Index (GAI), and the subtests of WMI and PSI the Cognitive Proficiency Index.

Kaufman and Flanagan proposed to divide the subtests in eight groups called cluster in order to obtain a better

description of the CHC theory broad cognitive abilities, compared with that supplied by the four indexes.¹³

The subtests grouped in the clusters are shown below:

- Fluid reasoning (Gf) cluster: picture concepts, matrix reasoning and arithmetic subtests.
- Visual processing (Gv) cluster: block design and picture completion subtests.
- Verbal fluid reasoning (Gf-VERBAL) cluster: similarities and word reasoning subtests.
- Nonverbal fluid reasoning (Gf-NONVERBAL) cluster: picture concepts and matrix reasoning subtests.
- Lexical knowledge (Gc-VL) cluster: vocabulary and word reasoning subtests.
- General Information (Gc-KO) cluster: comprehension and information subtests.
- Long term memory (Gc-LTM) cluster: vocabulary and information subtests.
- Short-term working memory (Gsm-WM) cluster: digit span and letter-number sequencing subtests.

Learning tasks

For the assessment of reading and writing proficiency, we administered tasks usually used in the Italian clinical context because of their proven validity and reliability for this purpose.

Reading ability was assessed through the Battery for the Assessment of Developmental Dyslexia and Dysorthographia (DDE-2) and MT Reading Tasks tests.^{14–16}

Writing skill was assessed through the DDE-2 test.¹⁴

Reading task

Children's reading skill was evaluated from three points of view:

- reading speed, measured by calculating the mean number of syllables per second that the child can read aloud;
- reading accuracy, expressed through the number of mistakes the child makes while reading aloud;
- written comprehension, from the total number of correct answers given to questions relating to a written text.

Reading speed and accuracy were evaluated through word and nonword reading tasks (DDE-2) in which the child has to read a list of words and a list of nonwords aloud (words that are nonexistent in the Italian language) and through the text reading task (MT Reading Tasks) in which the child has to read a passage aloud.

Reading comprehension ability was assessed through the text reading task (MT Reading Tasks) in which the child has to read a passage, aloud or silently, as he prefers, and then

answer a multiple choice questionnaire with the possibility of referring to the passage at any time he needs.

Writing task

Similar to the reading skills, writing accuracy was measured through the word and nonword writing texts (DDE-2) by counting the number of mistakes made in writing word and nonword lists.

Statistical analysis

The continuous variables are expressed through mean and standard deviation of the corresponding distribution; the categorical variables are expressed as absolute or percentage frequencies.

For the categorical variables "SLD Typology" and "SES" a descriptive analysis of the distributions was carried out by means of contingency tables and the *P*-value of frequencies comparison was evaluated through Pearson's chi-square test.

For the continuous variables, the *P*-value of comparison was obtained by means of one-way analysis of variance (ANOVA) test and one-way analysis of covariance (ANCOVA) test.

One-way ANOVA test was used for the parameters "WISC IV age" and "Years of education in Italy". The one way ANCOVA test was conducted on learning proficiency data and on WISC IV parameters for case-control comparison. For the covariance analysis, "SES level" was then considered as covariable. This choice was made in order to control the possible statistically significant effects of the variable SES, which is unequally distributed between the two groups. The level of significance was set at $P < 0.05$. Statistical analysis was performed using the SPSS 20.0 package (IBM Corporation, Armonk, NY, USA).

Results

To verify that the presence of 12 first-generation immigrant children and of seven children of mixed couples in the immigrant group did not compromise the homogeneity of the entire bilingual sample, a preliminary statistical analysis between these minority subgroups and the sample majority fraction on learning proficiency and WISC IV data were made. The results did not highlight any statistical difference. This was the reason why these subjects were included in the bilingual group.

Sociodemographic and clinical data of bilingual and Italian children are shown in Table 1. According to sociodemographic and clinical characteristics, bilingual and Italian groups can be considered homogenous for all the parameters

Table 2 Learning proficiency data of bilingual and Italian children

Learning proficiency	Bilingual, mean (SD)	Italian, mean (SD)	P-value
Reading ability			
Word speed z-scores	-1.25 (1.10)	-1.13 (1.01)	0.521
Word accuracy z-scores	-2.22 (2.26)	-1.41 (1.69)	0.330
Nonword speed z-scores	-0.82 (0.89)	-0.93 (1.09)	0.920
Nonword accuracy z-scores	-1.60 (1.81)	-1.05 (1.77)	0.322
Text speed z-scores	-1.22 (0.84)	-1.11 (0.79)	0.951
Text accuracy z-scores	-1.45 (1.37)	-0.45 (1.02)	0.001*
Text comprehension z-scores	-0.53 (0.88)	-0.29 (1.03)	0.211
Writing ability			
Word accuracy z-scores	-3.43 (3.33)	-1.87 (2.79)	0.014*
Nonword accuracy z-scores	-0.68 (1.25)	-0.38 (1.02)	0.519

Note: * $P < 0.05$ are considered significant.

Abbreviation: SD, standard deviation.

tested, except for SES in which Italian children have SES level significantly higher than bilingual ones as demonstrated by chi-square test results: $\chi^2(4) = 0.02$.

Learning proficiency data of bilingual and Italian children are described in Table 2. The bilingual group performed statistically worse than the Italian group in terms of text reading accuracy ($F_{(1,86)} = 11.843$, $P = 0.001$, $\eta^2 P = 0.0121$) and word writing accuracy ($F_{(1,86)} = 6.268$, $P = 0.01$, $\eta^2 P = 0.068$). The two groups did not statistically differ regarding the other learning proficiency parameters assessed.

WISC IV data of the two groups are summarized in Tables 3–5. The bilingual group obtained statistically significant worse performances than the Italian group on four subtests, three indexes and four clusters.

The two groups differed in FSIQ ($F_{(1,85)} = 4.672$, $P = 0.03$, $\eta^2 P = 0.05$), General Ability ($F_{(1,82)} = 4.680$, $P = 0.03$, η^2

Table 3 WISC IV subtests data of bilingual and Italian children

WISC IV subtests	Bilingual, mean (SD)	Italian, mean (SD)	P-value
Similarities	9.35 (2.37)	11.04 (2.95)	0.015*
Vocabulary	9.10 (2.68)	10.50 (2.62)	0.206
Comprehension	10.33 (2.79)	11.50 (2.93)	0.069
Information	7.55 (3.07)	9.52 (1.96)	0.002*
Word reasoning	8.26 (2.70)	10.23 (2.55)	0.018*
Block design	10.19 (2.14)	10.15 (2.46)	0.905
Picture concepts	10.60 (2.71)	11.38 (2.78)	0.526
Matrix reasoning	10.77 (2.88)	10.92 (2.47)	0.497
Picture completion	10.72 (2.90)	11.67 (2.50)	0.195
Digit span	8.13 (2.37)	9.27 (2.30)	0.016*
Letter-number sequencing	8.28 (2.25)	8.94 (2.77)	0.321
Arithmetic	8.11 (2.73)	8.96 (3.12)	0.357
Coding	8.40 (2.37)	8.31 (2.06)	0.800
Symbol search	9.46 (2.41)	9.85 (2.60)	0.950
Cancellation	9.32 (3.52)	9.61 (2.93)	0.195

Note: * $P < 0.05$ are considered significant.

Abbreviations: SD, standard deviation; WISC IV, Wechsler Intelligence Scale for Children® – fourth edition.

Table 4 WISC IV indexes data of bilingual and Italian children

WISC IV indexes	Bilingual, mean (SD)	Italian, mean (SD)	P-value
FSIQ	95.26 (8.79)	100.85 (9.77)	0.033*
General ability	99.85 (10.62)	106.37 (10.18)	0.033*
Cognitive proficiency	89.37 (9.58)	92.77 (10.68)	0.190
Verbal comprehension	97.87 (12.73)	105.00 (11.31)	0.069
Perceptual reasoning	102.68 (11.60)	105.06 (12.18)	0.381
Working memory	88.51 (11.28)	95.60 (13.28)	0.009*
Processing speed	93.60 (11.25)	93.88 (10.65)	0.839

Note: * $P < 0.05$ are considered significant.

Abbreviations: FSIQ, Full Scale Intelligence Quotient; SD, standard deviation; WISC IV, Wechsler Intelligence Scale for Children® – fourth edition.

$P = 0.05$) and Working Memory ($F_{(1,84)} = 7.245$, $P = 0.009$, $\eta^2 P = 0.08$) indexes.

According to subtests, significant differences emerged in similarities subtest ($F_{(1,86)} = 6.189$, $P = 0.02$, $\eta^2 P = 0.07$), in word reasoning ($F_{(1,84)} = 5.860$, $P = 0.02$, $\eta^2 P = 0.06$), in information subtest ($F_{(1,85)} = 10.551$, $P = 0.002$, $\eta^2 P = 0.1$) and in digit span subtest ($F_{(1,86)} = 6.038$, $P = 0.02$, $\eta^2 P = 0.07$). No significant differences emerged in the comprehension and vocabulary subtests.

The analysis of the clusters showed statistically significant differences in the two groups in Gf-VERBAL cluster ($F_{(1,69)} = 4.124$, $P = 0.05$, $\eta^2 P = 0.056$), Gc-VL cluster ($F_{(1,70)} = 5.662$, $P = 0.02$, $\eta^2 P = 0.07$), Gc-KO cluster ($F_{(1,61)} = 4.116$, $P = 0.05$, $\eta^2 P = 0.06$) and Gsm WM cluster ($F_{(1,73)} = 5.970$, $P = 0.02$, $\eta^2 P = 0.08$).

Discussion

To our knowledge, this is the first study conducted on a sample of bilingual children with SLD in which a comparison with natives on the intellectual profile through the WISC IV test is explored. Concerning sociodemographic and clinical

Table 5 WISC IV clusters data of bilingual and Italian children

WISC IV clusters	Bilingual, mean (SD)	Italian, mean (SD)	P-value
Gf cluster	99.45 (10.46)	103.02 (12.77)	0.309
Gv cluster	102.32 (13.74)	106.21 (12.42)	0.267
Gf-NONVERBAL cluster	104.10 (13.16)	107.28 (12.85)	0.453
Gf-VERBAL cluster	94.63 (11.67)	102.98 (12.92)	0.046*
Gc-VL cluster	92.92 (13.30)	103.38 (10.92)	0.020*
Gc-KO cluster	93.47 (13.62)	101.10 (12.04)	0.047*
Gc-LTM cluster	90.68 (14.09)	99.64 (10.97)	0.078
Gsm-WM cluster	89.05 (10.14)	94.53 (11.39)	0.017*

Note: * $P < 0.05$ are considered significant.

Abbreviations: Gc, crystallized intelligence; Gc-KO, general information; Gc-LTM, long term memory; Gc-VL, lexical knowledge; Gf, fluid reasoning; Gf-NONVERBAL, nonverbal fluid reasoning; Gf-VERBAL, verbal fluid reasoning; Gsm-WM, short-term working memory; Gv, visual processing; SD, standard deviation; WISC IV, Wechsler Intelligence Scale for Children® – fourth edition.

characteristics, the only statistical significant difference between the two groups is related to SES: the SES of the immigrant families was lower than the Italian families. Therefore SES was considered as covariable in the present statistical analysis in order to avoid possible influences on learning tasks and WISC IV results.

The analysis made highlighted the absence of statistically significant differences between the two groups regarding learning proficiency, except for text reading accuracy and word writing accuracy parameters in which the bilingual group obtained lower scores than the Italian group.

At the same time it is important to underline that in the sample group the text comprehension performance, which constitutes the best parameter in order to assess the efficacy of reading ability (I read and I understand what I read) is not statistically worse than the one of the Italian group.

Finally, as a further confirmation of a SLD severity equivalence, similar performances were obtained in nonword writing and nonword reading tests in the two groups, tasks that investigate sublexical or indirect reading route, which is the most used reading route in bilinguals.¹⁷

These data partially agree with a previous Italian study that compared 28 immigrant children with specific reading disorder and/or specific written expression disorder, aged between nine–13 years and fully educated in Italy, with 28 Italian children matched for age and disorder severity level, in which significant differences in the two groups were found in the parameters word reading accuracy, text reading accuracy and word writing accuracy.¹⁸ Driven by these considerations we compared the WISC IV complete intellectual profile of the two groups. The sample group showed statistically significant worse performances than the Italian group in all the subtests, index and clusters concerning finer aspects of the language, such as the ability to identify significant relationships between concepts, abstraction and generalization skills, and the metalinguistic abilities.

In particular, the sample group displayed difficulties with Similarities and Word Reasoning subtests that require sophisticated semantic abilities such as the skill of making inferences on language, but not in the Vocabulary subtest, that is a subtest which assesses the significance of the words, evaluating the level of mastery and accuracy of the language expressive functions.¹² Another statistically significant difference between the two groups emerged in the scores of the subtest digit span belonging to the WMI, which represents the ability of memorizing information in short-term

memory and manipulating it in order to get to a solution and that is a subtest that requires auditory discrimination and short-term auditory memory. Apparently in opposition to the result just described, there were no differences between the two groups in letter-number sequencing scores, also belonging to WMI, which requires a greater linguistic contribution because not only does the subject have to repeat the numbers in ascending order, but he/she also has to repeat the letters in alphabetical order. Nevertheless this result can be explained by the statement that this subtest, unlike the previous one, requires a greater involvement of the executive functions.

In accordance with these results differences in the two groups emerged in the WMI, Gf-VERBAL cluster, and Gc-VL cluster that measure broad cognitive abilities and are calculated using the subtests described above.

In addition, despite the fact that all their scores were within the normal range, the bilingual children performed significantly lower on two general intellectual functioning indexes: the FSIQ ($P=0.03$) and the GAI ($P=0.03$). These results in the bilingual group confirm a more severe difficulty in facing some verbal subtests, but not in nonverbal tasks where the two groups' performances did not differ. This finding is in line with the lack of statistically significant differences obtained by Murineddu in a study in which 44 immigrant children and 37 Italians were compared in visuospatial ability tasks.¹⁸

This hypothesis of a frailty in metalinguistic abilities in the bilingual group, despite the absence of specific linguistic test evaluation, is supported by the facts that the clinical sample had an adequate knowledge of both Italian and native languages evaluated through clinical observation conducted by speech therapists, information supplied by their teachers, and finally that all the children have been educated in an Italian school for at least 5 years. Finally, none of the bilingual children had a history of delayed language development/specific language impairment in Italian or in their native language.

Other differences that emerged in the two groups seem to be related to their conditions of being immigrants, for example, a statistically significant trend in the difference in the two groups in the comprehension subtest that explores general principles and social situation comprehension learned due to personal experiences and the education received and represents an index of the children's ability to adapt to daily life situations.¹³ This trend is likely due to the intrinsic difficulties of the migratory condition that influences not only

education in general, but also the process of emotional maturity necessary for interpersonal relationships management and for personal growth.

Moreover, the subtest with the highest statistically significant differences was information, a task that assesses knowledge through questions about educational programs related to the different disciplines.¹² This result explains the difference in the two groups in the cluster Gc-KO where the sample group shows a clearly poorer cultural-educational background than natives; this result is in line with scholastic failure rates data reported by the Italian Ministry of Education.^{11,19}

This result cannot be attributed solely to SLD, condition but to other aspects that can negatively affect learning in bilingual children, such as lack of motivation, low self-esteem, negative feelings and lack of interest toward school²⁰ and that needs to be taken into consideration because it can seriously compromise the scholastic integration of these children.

Conclusion

In conclusion, results of our study support the evidence in the literature of similarities between the cognitive level of bilinguals and monolinguals. The in-depth analysis of the different subtests and clusters of the WISC IV profiles, however, highlighted some peculiarities in the bilingual sample belonging to the VCI and the Working Memory Index and in their related clusters. These results argue for the presence of difficulties attributable to the meta-linguistic skills that weigh on the SLD of the immigrant children more than their Italian peers. These results are partially in contrast with literature that supports a potential advantage of non-SLD bilingual children in metalinguistic abilities³ but are in line with results of a recent review⁵ that confirm that this advantage is possible because the linguistic weakness is compensated by bilinguals' superior executive control abilities. Probably our result in the bilingual group is due to the influence of the condition of SLD on the efficacy of the executive functions.

Results of our study need to be confirmed by further research but we believe that if these results are confirmed they must be taken into strong consideration in order to plan a rehabilitative treatment ad hoc for these children.

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Disclosure

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors report no conflicts of interest in this work.

References

1. Hakuta K. *Mirror of Language: The Debate on Bilingualism*. New York: Basik Books; 1986.
2. Cummins J. The influence of bilingualism on cognitive growth: a synthesis of research findings and explanatory hypotheses. *Working Papers on Bilingualism*. 1976;(9):1–43.
3. Adesope OO, Lavin T, Thompson T, Ungerleider C. A systematic review and meta-analysis of the cognitive correlates of bilingualism. *Rev Educ Res*. 2010;80(2):207–245.
4. Macnamara BN, Conway ARA. Novel evidence in support of the bilingual advantage: Influences of task demands and experience on cognitive control and working memory. *Psychon Bull Rev*. 2014;21(2):520–525.
5. Bialystok E. Coordination of executive functions in monolingual and bilingual children. *J Exp Child Psychol*. 2011;110(3):461–468.
6. Rivera Mindt M, Arentoft A, Kubo Germano K, et al. Neuropsychological, cognitive, and theoretical considerations for evaluation of bilingual individuals. *Neuropsychol Rev*. 2008;18(3):255–268.
7. Friesen DC, Bialystok E. Metalinguistic ability in bilingual children: the role of executive control. *Riv Psicolinguist Appl*. 2012;12(3):47–56.
8. Bialystok E, Majumder S. The relationship between bilingualism and the development of cognitive processes in problem solving. *Appl Psycholinguist*. 1998;19(1):69–85.
9. Lauchlan F, Parisi M, Fadda R. Bilingualism in Sardinia and Scotland: exploring the cognitive benefits of speaking a minority language. *Int J Billing*. 2013;17(1):43–56.
10. Karlsson LC, Soveri A, Räsänen P, et al. Bilingualism and performance on two widely used developmental neuropsychological test batteries. *PLoS One*. 2015;10(4):e0125867.
11. ISS-Istituto Superiore di Sanità [Italian National Institute of Health]. *Consensus Conference Disturbi Specifici dell'Apprendimento [Consensus Conference Specific learning disorders] 2011*. Available from: www.snlg-iss.it/cc_disturbi_specifici_apprendimento. Accessed August 16, 2015. Italian.
12. Wechsler D. *Wechsler Intelligence Scale for Children—Fourth Edition Administration and Scoring Manual*. San Antonio, TX: Pearson; 2003.
13. Flanagan DP, Kaufman AS. *Essentials of WISC-IV Assessment*. New York, NY: Wiley; 2009.
14. Sartori G, Job R, Tressoldi PE. *DDE-2: Batteria per la Valutazione della Dislessia e Della Disortografia Evolutiva [Battery for the Assessment of Developmental Dyslexia and Dysorthographia]*. Florence, Italy: Giunti O.S. Organizzazioni Speciali; 1995. Italian.
15. Cornoldi C, Colpo G. *Nuove Prove di Lettura MT per la scuola secondaria di I grado, [New MT Reading Tasks for the secondary school of first grade]*. Florence, Italy: Giunti Organizzazioni Speciali Editore; 1995. Italian.
16. Cornoldi C, Colpo G. *Prove di Lettura MT per la scuola primaria [MT Reading Tasks for primary school]*. Florence, Italy: Giunti Organizzazioni Speciali Editore; 1998. Italian.
17. Scortichini F, Stella G, Morlini I, Zanzurino G, Scorza M. La diagnosi di Dislessia e Disortografia Evolutiva nei bambini bilingue (L2). Evidenze sul ruolo del lessico [Developmental Dyslexia and Dysorthographia diagnosis in bilingual children (L2). Evidences on lexical role]. *Dislessia*. 2012;9(3). Italian.

18. Murineddu M. Le difficoltà di apprendimento dei bambini stranieri [Learning difficulties in foreign children]. *Psicologia e Scuola*. 2011;(15): 32–39. Italian.
19. ISMU-Istituto per lo Studio della Multiethnicità [Italian Institute for the study of multiethnicity]. *Alunni con cittadinanza non Italiana tra difficoltà e successi. A.S.2013/2014, [Schoolchildren with non Italian citizenship between difficulties and results]*. Available from: www.ismu.org/alunni-con-cittadinanza-non-Italiana/. Accessed August 11, 2015. Italian.
20. Murineddu M, Duca V, Cornoldi C. Difficoltà di apprendimento scolastico degli studenti stranieri [Scholastic learning difficulties in foreign children]. *Difficoltà di Apprendimento*. 2006;12(1). Italian.

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