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Multilingual use assessment questionnaire: a proposal for assessing language and literacy experience

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The linguistic profile of multilingual individuals can vary significantly due to diversity in linguistic experience. This poses challenges for language researchers, educators, and clinical practitioners. We developed a Multilingual Use Assessment Questionnaire (MUAQ) to capture the heterogeneous nature of multilinguals profiles integrating three dimensions: self-assessment of language(s) competence, language(s) use for mental operations, and language(s) use in different contexts. The questionnaire was administered to bilingual Catalan/Spanish children and adults across three educational levels: elementary school (year 6), secondary school (year 10), and university level. The application of the MUAQ revealed that Catalan/Spanish bilinguals displayed variations in their self-assessed proficiency based on the type of linguistic activity required by each language. While high bilingual competence was concentrated in oral comprehension, production skills exhibited lower bilingual competence and a strong asymmetry between languages emerged in writing. Also, more pronounced preferences for one language were observed for Thinking and Counting. Whereas Catalan (the language of schooling) was more frequently preferred for Counting, a more multilingual approach was observed for Thinking. A significant heterogeneity was also evident in the language(s) used in different contexts, with each third of the study population demonstrating distinct patterns of linguistic behavior depending on the context. An Exploratory Factor Analysis (EFA) identified two key dimensions (linguistic competence skills and languages involved in mental operations) that accounted for a substantial portion of the variance, while the third dimension (language use in different contexts) bifurcated into situational/communicative vs. personal contexts. These results endorse multidimensional approaches for a comprehensive understanding of multilingualism.

KEYWORDS

bilingual children, multilingualism, linguistic profile, assessment tool, questionnaire, Spanish-Catalan bilinguals, self-reported linguistic competence

1 Introduction

Approximately half of the global population possesses some degree of multilingualism¹, residing in environments where they interact with and utilize two or more languages (Grosjean, 2010; Westby, 2014). The linguistic makeup of multilingual speakers can vary significantly. Various factors such as belonging to a literate or an illiterate community [with or without standardized language(s)], age of language acquisition, method of learning (e.g., formal instruction or immersion), extent and quality of exposure to different languages, and usage patterns across different communicative settings with diverse interlocutors contribute to this diversity. These varied language experiences can influence the formation of multilinguals' identities as well as their cognitive and neural development (Marian and Hayakawa, 2021).

Multilingual individuals may have different preferences for their primary language of comfort and assess their communicative competence differently for different language skills (e.g., listening, speaking, reading, writing). Furthermore, their linguistic behavior can vary depending on the context, i.e., at school, with friends, or during leisure activities like watching TV. The variations in language competence, the array of usage patterns across different contexts, as well as the combinations of languages used, result in a vast diversity of linguistic profiles. This diversity poses challenges not only for language researchers but also for educators and clinical practitioners (Nieva et al., 2020). Without adequate means of capturing this diversity and identifying which factors are crucial to describe the linguistic condition of participants in research, students, or language therapy users, both the scope of research findings and decisions about the language(s) of assessment and intervention would be on shaky ground.

The goal of this study is to develop an assessment tool that captures the diversity of multilingual individuals in linguistic abilities and patterns of use across a variety of contexts. Our aim is to provide a comprehensive and realistic evaluation that goes beyond the oversimplified monolingual versus bilingual categorization which is often used in studies involving multilingual populations.

Researchers have advocated for precise methods for assessing the linguistic profile of bilinguals to capture and quantify individual experiences, as well as to identify which of these experiences are more or less likely to have effects on language and cognition (Marian and Hayakawa, 2021; De Cat et al., 2023; Rothman et al., 2023). Having appropriate tools to assess individual multilingual experiences is crucial for understanding issues such as the impact of multilingualism on neurocognition, language processing, language acquisition, and educational outcomes (Rothman et al., 2023). Additionally, it will aid in distinguishing the potential effects of multilingualism on language development from developmental language disorders, thus preventing misdiagnoses (Gagarina et al., 2016; Tsimpli et al., 2016).

Proposals for quantitative and qualitative proxies for multilingual language profiles should move away from dichotomous labeling of language profiles (monolingual vs. multilingual, simultaneous vs. sequential, etc.) that fail to capture the complexities and nuances of multilingual experiences. Such labeling may, in fact, be responsible for

the contradictory results obtained concerning some central issues, such as the phantom-like appearance of cognitive effects of bilingualism (Leivada et al., 2021), or the identification of developmental delay(s) in bilingual children (Thordardottir, 2017). To acknowledge the differences between these labels does not suffice to overcome the deterministic variation underlying each label and across them: many multilingual individuals transcend these labels themselves (Rothman et al., 2023). Multilingualism needs to be conceptualized like a continuum or spectrum [e.g., Marian and Hayakawa (2021) and Rothman et al. (2023)]. The advantages and feasibility of a bilingualism quotient construct, that is, a valid and generalizable index of multilingual experience, have been supported in previous studies [e.g., Marian and Hayakawa (2021)].

In addition, the multidimensional multifaceted nature of bilingualism calls for identifying the components which are relevant to multilingual profiles to develop research approaches where these components are related to specific linguistic and cognitive outcomes (Rothman et al., 2023). For instance, self-evaluated multilingual competence is identified as positively impacting text length in text production in elementary and secondary school children (Tolchinsky et al., 2022); self-reported amount of Spanish used for academic writing in Spanish-English bilinguals accounted for differences in short-term memory tasks (Smith and Briggs Baffoe-Djan, 2019). However, there is still no consensus as to which components of the bilingual profile must be measured. Studies would greatly benefit from a greater transparency regarding both the components used for defining multilingual participants' profiles and the measures used to operationalize them (Marian and Hayakawa, 2021; De Cat et al., 2023). A recent review noted substantial variation in the documentation of key dimensions of bilingualism, such as language skills and activities performed in each language, among others (Kaščelan et al., 2022). In fact, divergent approaches to the multidimensional nature of multilingualism are considered partly responsible for the mentioned conflicting results (Valian, 2015).

The need for tools that measure multilingualism as a multidimensional factor becomes especially relevant in sociolinguistic situations like the one in Catalonia, the context of our study, where two official languages, Catalan, and Spanish, coexist and none of them is a minority language (Serrat et al., 2021). While Catalan is the main language of schooling, both languages are widely used, and there is virtually no monolingual Catalan population (Camus and Aparici, 2020; Tolchinsky et al., 2022). Catalonia has also a large immigrant population with various native languages (Institut d'Estadística de Catalunya (IDESCAT), 2019).

A recent systematic review identified 48 questionnaires for assessing linguistic profiles and/or documenting bilingual experience [see Kaščelan et al. (2022)]. Some of these questionnaires have been used in research on language development and cognitive performance, whether to characterize multilingual populations, to look for correlations between linguistic condition and the cognitive effects of multilingualism, or to investigate differences in the learning trajectories between monolingual and bilingual children. They have also been used to gather information on individuals' language dominance, or to make decisions about language(s) of assessment or intervention in clinical practice.

Among them, the Language Experience and Proficiency Questionnaire (LEAP-Q; Marian et al., 2007), for adults with a literacy level of secondary school in, at least, one of the languages; the Bilingual

¹ The terms multilingual and bilingual will be used here irrespective of the number of languages used by the speakers.

Language Profile (BLP; Gertken et al., 2014), for children and adults with a minimum schooling level of secondary school; or The Language Exposure Assessment Tool (LEAT; De Anda et al., 2016), a parental questionnaire for children aged 17 to 40 months, are available in Spanish (and the first two in Catalan). Although they have inspired our own questionnaire, none of them matched the age range and/or the particular sociolinguistic context of our own research.

We aimed to construct a valid and reliable tool to obtain a more precise characterization of potential predictors of the individual differences observed in primary and secondary school children and adults, considering the complexity of the multilingual condition of our participants. We align with Rothman et al. (2023) on the convenience of having more than one measure at disposal. Different instruments may be designed to best capture distinct but complementary features of multilingual experiences and make them suitable for different questions, contexts, or specific age groups. In doing so, we advocate for a continuous rather than categorical view of multilingualism whereby not only should these dynamic factors be identified, but also the extent to which they help define an individual's multilingual profile.

We posit that speakers-writers' linguistic profile is among the factors influencing both learning trajectories and the quality of discourse. To this end, we developed a questionnaire to gather information about home literacy practices, family SES, language(s) use in different contexts, and self-assessment of language competence. We aimed to move beyond the monolingual/bilingual dichotomy, which does not entirely capture the complexities of the sociolinguistic situation in our studies, and to identify those dimensions of the linguistic profile relevant to multilingual contexts, ultimately contributing to the definition of multilingualism.

2 Methods

Our aim was to develop a multidimensional scale for assessing the linguistic profile of speakers integrating various dimensions: self-assessment of language/s competence, language(s) use for mental operations, and language(s) use in different contexts. This involved creating a survey questionnaire with specific items to measure these dimensions which was administered to bilingual Catalan/Spanish students across three educational levels: elementary school (year 6), secondary school (year 10), and university level.² Analysis of the responses allowed us to assess the questions' correspondence and internal structure of each dimension (dichotomous or graded), and the relationships among dimensions (correlated or unrelated).

2.1 Instrument structure and scoring

The survey questionnaire comprised three blocks of questions. The first block collected participants' demographic characteristics and asked basic questions about the languages spoken, while the second one addressed their literacy practices. The third block, focus of this

study, embraced three sets of questions hypothesized to measure different aspects of linguistic condition.

The first set assessed language competence in four linguistic skills through self-report. Participants rated their competence in speaking, oral comprehension, writing, and reading in a particular language on a 4-point scale (1 = *no gaire bé* 'not well', 2 = *regular* 'average', 3 = *bé* 'well', 4 = *molt bé* 'very well'). The same questions were asked for Catalan, Spanish and, if applicable, for a third language.

The second set evaluated language(s) use for two mental operations, i.e., frequency of use of a particular language for Thinking and Counting. These parallel questions were scored in a 4-point scale (0 = never, 1 = rarely, 2 = frequently, 3 = always) for Spanish, Catalan and, when applicable, for a third language.

The third set examined language use across various contexts. Participants indicated the language(s) they use in different situations (e.g., with family, friends, for watching TV), using a 7-point scale: 1 = always in Catalan, 2 = more in Catalan than in Spanish, 3 = in Catalan as well as in Spanish, 4 = more in Spanish than in Catalan, 5 = always in Spanish, 6 = more in another language than in Catalan or Spanish, and 7 = always in another language.

A fourth set of questions about language use in distance communication contexts (e.g., emails, social networks) was excluded from further analysis due to limited responses.

2.2 Data collection

A total of 268 Catalan students from three educational levels participated in the study: 69 from elementary school ($M = 11.6$), 123 from secondary school ($M = 15.8$), and 73 university students ($M = 21.1$). For 35.6% of the students Spanish is their home language, followed by 31.18% for whom Catalan is their home language and 23.1% for whom both Catalan and Spanish are. Less than 5.3% of the students reported other languages in addition to Catalan and Spanish, and 4.1% reported only another home language (See Supplementary Table S1).

Participants were evenly split regarding their comfort language choice. Catalan, either alone or followed by Spanish or another language, was preferred by 45.45% of the sample while 43.93% opted for Spanish, either alone or followed by Catalan or another language. Other languages were chosen as primary comfort language by 10.60% of the sample. The preference for Catalan tended to decrease from 66% in elementary school to 31.7% in secondary school, with an increase to 48.6% in university.

2.3 Analytical strategy

Responses to the survey questions were analyzed. A rescaling procedure combining the extent of use and command of Spanish, Catalan, and another language was applied to create ordinal scales for self-assessed linguistic skills, language(s) used for mental operations and language(s) use in different contexts. Exploratory factor analysis (EFA) was conducted to explore the structure of the linguistic profile emerging from the three dimensions measured. Subsequently, the correlations among these were examined to opt for the most parsimonious integration. In what follows, we present the scaling criteria and results for each set of questions.

² The MUAQ questionnaire is available in Spanish and Catalan, for children and for adults. It is at disposal upon request to the first author (Melina.Aparici@uab.cat).

3 Results

3.1 Self-assessment of language competence in different linguistic skills

A scale was developed based on responses to questions about language competence in different skills for Spanish, Catalan, and another language, separately. For the analysis, categories 1 and 2 (1 = *no gaire bé* 'not well', 2 = *regular* 'average') were combined due to less than 5% of answers. Only 16% (43 participants) of the whole sample declared to know another language besides Catalan and Spanish. The following final ordinal scale included five categories for speaking, oral comprehension, reading, writing.

If participants assessed their own competence in Spanish and Catalan as 'not well', they received the lowest value (1). In contrast, if respondents assigned 'very well' for both languages, they got the highest value of self-assessed competence in both languages (4). For the intermediate values, there were different combinations, such as 'well' in one language and 'not well' in the other one (2), or 'very well' in one language and 'well' in the other one (3). The fifth value was assigned to cases who also reported 'well' or 'very well' in a third language (5). Therefore, the lower values represent a self-feeling of low competence in one or more skills in both (1) or in one language (2). The higher values indicate relatively good (3) or very good (4) self-reported competence in one skill in both languages. The highest value (5) indicates competence in three languages.

Table 1 shows the percentage for each value of the scale in the four linguistic skills. Oral comprehension shows the highest rate of high competence in the two languages. In contrast, production skills, i.e., Speaking and Writing, in this order, show the highest rate of intermediate bilingual competence. However, Writing also displays the highest rate of self-perceived low competence in the two languages. Overall, rates are much lower for those values indicating low or monolingual competence than for those representing bilingual or high bilingual competence: nearly half the sample manifested good competence in the two languages, though not to the highest extent, and altogether, almost three-quarters of the sample self-reported as bilingual to some extent. The students who self-evaluate their competence in three languages as 'well' and 'very well' did so for Oral comprehension (9.9%) and less for Speaking, Reading, or Writing.

3.2 Language use for performing mental operations

A second scale was developed for assessing the frequency to which participants reported to think and count in one or more languages. Each question was asked for Spanish, for Catalan, and for another language, and responses were scored from 0 (never) to 3 (always).

The differing extent of use of the languages at stake for mental operations indicates that almost half of the sample thinks and counts always in one language, be it Spanish or Catalan (see frequencies of use in Table 2). The other half of the sample seems to behave bilingually in this respect, i.e., answering either 'frequently' or 'rarely' to the questions. In addition, as a group, our participants hardly ever use any other language for Counting, but around 20% do it for Thinking. However, these frequency data do not allow us to observe the language preferences in the same individual, that is, to what extent they use one or more languages for performing mental operations.

A rescaling procedure allows us to approach this issue. We assessed the combined value of each pair of languages (e.g., Spanish-Catalan, Spanish-Other, Catalan-Other) to distinguish between participants who report Counting or Thinking most frequently in one language from those who rather report performing these operations in more languages. A final mean across the three pairs was scaled from 1 to 6, where up to 3 means frequent use of one language, and from 3 up to 6 means frequent use of two or more languages. This scale was rescaled into a 1–3 range.

In notation $(\sum (R_i + R_j))/3$, $R_i = \text{Rate for } i \neq j$ and i, j are languages (Spanish, Catalan, Other), such that there are three possible pairs. In words, we added the score(s) of a pair of languages in, for example, Thinking and divided the result by three; this yields the extent to which one or more languages are used for this operation. If the value is lower than three, it means that only one language is most frequently used. Based on this procedure we developed a scale for participants' use of languages for each mental operation.

The means for the created scale indicate that participants' multilingual use is significantly more frequent [$t(259) = 7.30$, $p < 0.001$] for Thinking (1.59, $SD = 0.46$) than for Counting (1.40, $SD = 0.36$). However, participants do not appear to use more than one language indistinctly for Thinking and Counting, but rather they have a preferred language for each operation (Supplementary Table S3).

TABLE 1 Percentage and (frequency) in each value of the scale of self-assessed competence in four linguistic skills.

	Speaking	Oral comprehension	Reading	Writing
1. Low competence	1.5% (4)	0.8% (2)	2.7% (7)	8.7% (23)
2. Monolingual competence	9.8% (26)	1.1% (3)	5.7% (15)	20.5% (54)
3. Bilingual competence	53.4% (141)	20.2% (53)	46.2% (122)	48.5% (128)
4. High bilingual competence	32.2% (85)	68.1% (179)	40.9% (108)	21.6% (57)
5. Competence in three languages	3.0% (8)	9.9% (26)	4.5% (12)	0.8% (2)
Mean	3.25	3.85	3.39	2.85
SD	0.73	0.63	0.78	0.88

Mean = 3.34; SD = 0.61; alpha = 0.807.

TABLE 2 Percentages and (frequencies) of use of languages for mental operations ($n = 264$).

	Spanish	Catalan	Another language
<i>Thinking</i>			
0. Never	7.8% (20)	15.8% (15)	46.1% (105)
1. Rarely	24.9% (64)	21.6% (56)	35.5% (81)
2. Frequently	27.2% (70)	24.7% (64)	14.5% (33)
3. Always	40.1% (103)	47.9% (124)	3.9% (9)
<i>Counting</i>			
0. Never	9.6% (25)	12.4% (32)	74.1% (163)
1. Rarely	20.8% (54)	22.8% (59)	20.9% (46)
2. Frequently	23.1% (60)	24.3% (63)	3.6% (8)
3. Always	46.5% (121)	40.5% (105)	1.4% (3)

TABLE 3 Percentages and (frequencies) of bilingual behavior in various situations according to the language use scale ($n = 264$).

	At home	At school, with friends	Out of school, with friends	For reading	For watching TV
1. Monolingual use	54.2% (143)	40.9% (108)	49.2% (130)	26.9% (71)	8.0% (21)
2. Mid-level bilingual use	31.8% (84)	41.7% (110)	34.8% (92)	39.8% (105)	59.8% (158)
3. Balanced bilingual	13.8% (37)	17.4% (46)	15.9% (42)	33.3% (88)	32.2% (85)

3.3 Language use in different contexts

A third scale was developed for participants' linguistic behavior in several contexts of use: at home, at school and out of school with friends, when reading books, and when watching TV shows, movies, or series. In any of these contexts, participants may exhibit monolingual to balanced bilingual behavior. If the languages at stake are reported to be used to the same extent in a certain context ("Catalan as Spanish"), the rank in bilingual use is the highest (code 3), while always using one language in that context regardless of which one ("Always Catalan" or "Always Spanish") represents the lowest rank in bilingual use (code 1). If both languages are used in different degrees ("More Catalan than Spanish," "More Spanish than Catalan," or "More in another language"), a mid-level rank is assigned (code 2).

When we ranked language choice in particular contexts, half of the participants appeared as monolingual language users (see the percentage of participants' behavior by situation in Table 3). Participants do not use the two languages indistinctly but rather use only one language in a given situation (and maybe the other language in another situation). When it comes to reading, though, only a quarter of the sample does resort to only one language. The other half of the sample behave bilingually by situation, either to some extent (using both languages, but one more than the other, in a given situation), or in a balanced manner (using both languages to the same extent in a given situation), except for the home context, where most participants tend to use only one language. However, less than 20 percent behave as balanced bilinguals within the same situation, except for reading, where more participants report using both languages to the same degree.

To validate the scale, we performed a cluster analysis (k -means, $k = 3$) that resulted in assigning respondents to a preferred cluster, that is, a preferred combination of situations in which they behave

multilingually (Supplementary Figure S1). The results show three groups of similar size, based on the values in five situational measurements ranked on a scale from 1 to 3. Except for TV watching that had high bilingual use of language in the three groups, although significantly higher in group 3, each group showed a more bilingual behavior in one situation than in the others. Group 1 ($n = 73$) had a more bilingual use of languages at school with friends, whereas group 2 ($n = 100$) showed more bilingual behavior in reading, though less than for TV watching, and group 3 ($n = 91$) behaved more multilingually in reading and at home. A complementary analysis of variance across the five situational variables resulted in a significant group-difference in all five bilingual measures.

3.4 An integrative characterization of linguistic condition

A final integrative exploratory factor model (EFA) was performed to explore the structure of linguistic condition emerging from the three dimensions measured. We attempted to test whether the obtained measurements could be approached as one representative scale or require a separate consideration of the different measured dimensions.

EFA results (Supplementary material, Table 4) highlighted four factors. Factor 1 covered the component skills of linguistic competence and factor 2 related to the language(s) involved in mental operations. These two factors map the differentiation that motivated two different sets of the survey questions. In contrast, factor 3 only covered a subset of contextual uses of language, the more situational/communicative contexts of use –with friends at school and out of school – while factor 4 related to the more personal contexts –at home, for reading, for watching TV. The

TABLE 4 Factor analysis results for six questions; Factor loadings and descriptives.

	Factor 1	Factor 2
Reading	0.81	-0.01
Speaking	0.69	0.07
Oral comprehension	0.68	-0.04
Writing	0.62	-0.01
Counting	-0.06	0.79
Thinking	0.07	0.64
Mean	0.74	0.50
SD	0.18	0.12
Reliability	0.784	0.658
Eigenvalue	2.56	1.43
Percent of shared variance	42.63%	23.76%

distinction between communicative uses of language (factor 3) and more personal uses (factor 4) emerged from the EFA. However, as four factors, the model performed poorly. The two factors that point at communicative and personal contexts of use contributed only a small part (5.74 and 3.77%, respectively) out of the total shared variance (eigenvalue lower than 1) and showed low internal consistencies as expressed in the reliabilities.

Only a separate consideration of factors 1 and 2 (component skills of linguistic competence and language(s) involved in mental operations) leaving apart the uses of language in communicative and more personal contexts (factors 3 and 4) increased the explanatory power of the analysis. Table 4 shows that these two factors (that embrace six questions) obtained an eigenvalue higher than 1. Factor 1 accounted for 43% of the variance while factor 2 accounted for 24% of the variance in the definition of linguistic condition.

Despite their low explanatory power, the four factors provide a meaningful and interpretable empirical arrangement of the survey's theoretical grounds. Low internal consistencies are understandable given that items are independent of each other while sharing theoretical ground.

Nevertheless, to determine how integrated the four factors in shaping participants' linguistic condition are, we calculated the correlations among them, where each factor was calculated as the mean across its relevant items (Supplementary Table S5). Correlation results showed that only language(s) used for Thinking and Counting are relatively highly correlated ($r=0.51$).

4 Discussion

The starting point of this study was the acknowledgment that the linguistic makeup of multilingual individuals can vary significantly due to multiple factors such as the age at which they acquired languages, exposure to languages, and usage patterns across different contexts. Given the complexity and diversity inherent in multilingual experiences, there is a need to develop assessment tools that move beyond dichotomic, simplifying categorizations, aiming to capture the nuanced nature of multilingual profiles.

The Multilingual Use Assessment Questionnaire (MUAQ) was conceived to address this need by identifying dimensions crucial for defining the profiles of multilingual individuals. We detailed the measures and rescaling procedures employed to operationalize each dimension, thus facilitating the mapping of their internal structure and the relationships among dimensions (Marian and Hayakawa, 2021; Rothman et al., 2023).

Drawing from existing research [e.g., Kaščelan et al. (2022) and De Cat et al. (2023)], we posited that self-evaluated competence in receptive and productive skills (speaking, oral comprehension, reading, and writing), and the language(s) utilized for mental operations and in specific contexts with particular interlocutors are pivotal components of multilingualism.

The application of the MUAQ revealed that answers to basic questions about home and preferred language(s) offer limited insights into the linguistic profiles of our study population and/or sociolinguistic context, Catalonia, where there is no majority language (Serrat et al., 2021). In our study, every participant is bilingual to some extent; responses regarding their language of comfort and languages spoken at home were evenly divided between Spanish, Catalan, and both languages. However, responses to more specific questions proved to be more illuminating in capturing the nuances of the linguistic profile, particularly among Catalan bilingual students.

It was through an analysis of participants' self-evaluated competence across different skills in Spanish, Catalan, and a third language that we discerned a concentration of high bilingual competence in oral comprehension, whereas production skills exhibited lower bilingual competence. Notably, a stronger sense of proficiency asymmetry between languages emerged in writing. Bilinguals displayed variations in their self-assessed proficiency levels based on the type of linguistic activity required by each language (Grosjean, 2008; Dewaele, 2011).

Consistent with Dewaele (2011), we observed more pronounced preferences for one language when bilinguals were asked to indicate their language preferences for Thinking and Counting. These mental operations appeared to reveal varying degrees of bilingualism, with Catalan (the language of schooling) being more frequently preferred for Counting and a more multilingual approach observed for Thinking.

Furthermore, a significant heterogeneity was evident in participants' responses regarding the language(s) used in different contexts, with each third of the study population demonstrating distinct patterns of linguistic behaviors depending on the context. One third had more bilingual use of languages at school with friends, another showed more bilingual behavior in reading and TV watching, and the last third behaved more monolingually with friends at school and out of school but multilingually at home, in reading, and in watching TV. These findings confirmed that multilingualism is not a unified construct (Kremin and Byers-Heinlein, 2021). Nevertheless, we explored whether this heterogeneity demanded separate consideration of the different measured dimensions.

The results of the EFA underscored the multidimensionality of multilingualism. While two hypothesized dimensions (linguistic competence skills and languages involved in mental operations) accounted for a substantial portion of the variance, the third dimension (language use in different contexts) bifurcated into situational/communicative vs. personal contexts. In this arrangement, factors of the linguistic condition pertaining to aspects that are more individual by nature exhibited higher explanatory power than those relating to the use of languages in specific contexts, which revealed a previously unanticipated distinction among contexts of use. This reaffirms the elusive and context-specific nature of differences in language use (Dewaele, 2011).

While a comprehensive consideration of multidimensionality slightly diminished explanatory power, it provided a meaningful and interpretable empirical framework grounded in the theoretical underpinnings of the survey. It emphasized the strong independence of different indicators, as evidenced by the lack of correlation among them, thus supporting multidimensional approaches that contribute to a comprehensive understanding of the multilingualism construct.

This report has primarily focused on delineating the development of a multidimensional scale for assessing the linguistic profile of bilingual Catalan/Spanish speakers by integrating various hypothesized dimensions. The linguistic profile generated by the questionnaire responses would assist educators and clinicians in recognizing the distinctive heterogeneity of multilingual knowledge. In other words, the term "bilingual" encompasses a diversity of competences and patterns of language use. Therefore, there is a need for tools that prevent us from drawing conclusions about competence levels based solely on observations in isolated contexts or abilities. This way, in cases of significant performance imbalances between contexts or skills, educational or therapeutic interventions could be better guided. Future endeavors will concentrate on elucidating the relationships between speakers' language and literacy experiences and the characteristics of their linguistic profiles.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MA: Writing – review & editing, Writing – original draft, Investigation, Conceptualization. ER: Writing – review & editing, Methodology, Investigation. LT: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization.

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Conflict of interest

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.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2024.1394727/full#supplementary-material>

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