



Language Development in Bilingual Children with Autism Spectrum Disorder: A Systematic Review

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ABSTRACT

This article presents a systematic review of the scientific literature on language development in bilingual children with autism spectrum disorder (ASD). The aim is to examine whether second language acquisition may have beneficial effects for this population. The review followed the PRISMA guidelines and included 72 studies selected through a structured and transparent process. The reviewed sources were classified into three thematic dimensions: benefits of bilingualism, lack of benefits, and ASD-related characteristics influencing language learning. The findings indicate overall support for the positive impact of bilingualism, particularly regarding cognitive flexibility, verbal expression, and communicative development. In addition, pedagogical strategies for second language teaching in learners with ASD are discussed. While further research is still needed, current evidence supports the use of bilingualism as a pedagogical resource when implemented in appropriate educational settings.

KEYWORDS: Autism, language acquisition, bilingualism, systematic review, autism spectrum disorder

Desarrollo del lenguaje en niños bilingües con trastorno del espectro autista: una revisión teórica

RESUMEN

Este artículo presenta una revisión sistemática de la literatura científica sobre el desarrollo del lenguaje en niños bilingües con trastorno del espectro autista (TEA).

El objetivo es analizar si el aprendizaje de una segunda lengua puede tener efectos positivos en esta población. La revisión se realizó conforme a las directrices PRISMA, incluyendo 72 estudios seleccionados tras un proceso transparente y estructurado. Las fuentes revisadas se agruparon en tres dimensiones: beneficios del bilingüismo, falta de beneficios, y características del TEA que influyen en el aprendizaje lingüístico. Los resultados muestran un respaldo mayoritario hacia los efectos positivos del bilingüismo, especialmente en términos de flexibilidad cognitiva, expresión verbal y desarrollo comunicativo. Asimismo, se identifican estrategias metodológicas para la enseñanza de segundas lenguas a estudiantes con TEA. Se concluye que, si bien aún existen áreas poco exploradas, la evidencia disponible apoya el uso del bilingüismo como recurso educativo en contextos adecuados.

PALABRAS CLAVE: Autismo, adquisición del lenguaje, bilingüismo, revisión sistemática, trastorno del espectro autista.

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1. INTRODUCTION

Language development in children with autism spectrum disorder (ASD) has been an important area of study, though still insufficiently explored. In particular, second language (L2) acquisition in this population is not fully understood, especially when considering their first language (L1) acquisition.

In recent years, there has been an increased interest in researching how bilingualism affects individuals with ASD, highlighting the need for studies that go beyond cases where bilingualism occurs in individuals who are unable to effectively communicate in their L1, but can do so in their L2.

This article reviews the scientific literature on the effects of bilingualism in children with ASD, focusing on the potential benefits and challenges associated with L2 acquisition. Additionally, the pedagogical implications of these findings are discussed, suggesting strategies for teaching foreign languages to children with ASD.

2 METHODOLOGY

This study was conducted as a systematic review of scientific literature, following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure methodological transparency and academic rigor.

2.1 Search strategy

The literature search was performed in the Scopus, Web of Science, ERIC, and Google Scholar databases between January and March 2024. Boolean combinations of keywords were used, including: (bilingualism OR “second language acquisition” OR “language development”) AND (“autism spectrum disorder” OR ASD OR autism OR “neurodevelopmental disorder”). Searches were conducted in both English and Spanish. Only peer-reviewed articles, books, and conference proceedings were considered.

2.2 Inclusion and exclusion criteria

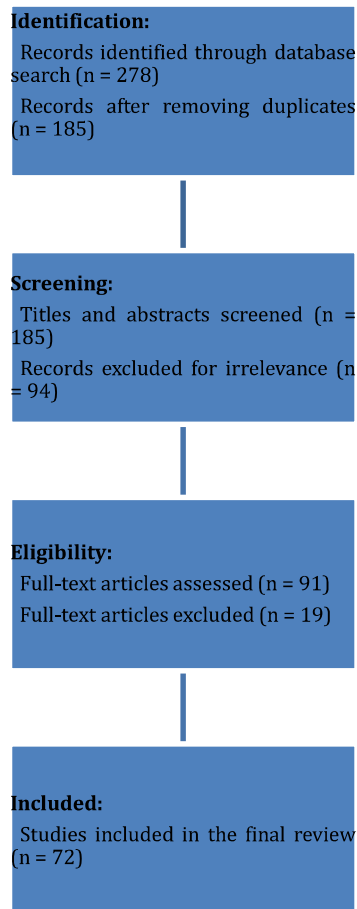
The inclusion criteria for the systematic review were as follows: studies had to be published between 2000 and 2024, written in either English or Spanish, and offer empirical or theoretical contributions that had undergone peer review. Additionally, the studies needed to explicitly address bilingualism in individuals diagnosed with autism spectrum disorder (ASD).

Conversely, exclusion criteria involved eliminating studies that did not focus on ASD, works addressing bilingualism without any connection to autism, and duplicated records across databases.

2.3 Selection process

As shown in Figure 1, the source selection process followed a phased approach consistent with the PRISMA protocol. A total of 278 records were initially identified. After removing duplicates ($n = 93$), 185 titles and abstracts were screened, resulting in the exclusion of 94 records due to lack of relevance. Subsequently, 91 full-text articles were assessed in detail, of which 72 were retained based on their methodological quality and thematic relevance.

Figure 1. PRISMA flow diagram of the study selection process.



2.4 Data analysis

The selected studies were classified into three analytical dimensions:

1. Cognitive and linguistic benefits of bilingualism ($n = 28$)
2. Challenges and lack of benefits ($n = 18$)
3. ASD-related language acquisition characteristics ($n = 26$)

This classification allowed for an integrated and critical synthesis of findings across theoretical and empirical perspectives.

3 STATE OF ART

3.1 Bilingualism and Cognition

At the dawn of the history of bilingualism as knowledge acquisition, Saer (26) conducted pioneering research comparing the verbal intelligence of monolingual Welsh and English bilingual children, concluding that monolinguals outperformed bilinguals (Mattschey et al., 16). This view was supported by authors such as Darcy (26), Peal & Lambert (12), and Macnamara (19), who noted delays in verbal intelligence, expressive difficulties, and smaller vocabulary sizes in bilingual children (Morton & Harper, 719).

However, following Cummins' Threshold Theory (12), benefits appear once L1 acquisition is consolidated. Hamers & Blanc (20) and Birdsong (26) argued that mastering L1 is essential to avoid negative consequences like L1 attrition (Bylund, 688). Verbal biases in intelligence testing were also identified (Diaz, 23; Petersen et al., 1499), while socioeconomic factors were highlighted as more decisive than bilingualism itself (Morton & Harper, 719; Kay-Raining et al., 52; Peristeri et al., 2092).

Evidence then began to show that L2 dominance correlates with divergent thinking (Peal & Lambert, 12; Cummins, 13; Gollan et al., 562), increased cognitive and pragmatic flexibility (Ben-Zeev, 1010; Gollan et al., 562), improved cognitive control (Morton & Harper, 722; Treccani et al., 320; Bialystok, 3), and benefits in attention and inhibition (Birdsong, 22). Neuroimaging studies revealed that language switching activates the left hemisphere (Cummins, 12; Diaz, 25; Ardila, 102), particularly the frontal lobe (Treccani et al., 320). Kovelman et al. (159) found that while both monolingual and bilingual speakers show activation in language areas, bilinguals exhibit greater blood oxygenation and activity in the left inferior frontal cortex (Bialystok, 11). For Kovelman et al. (158), bilinguals possess dual lexicons and manage parallel, independent processing of both languages.

Despite these findings, some researchers question the consistency of bilingualism's cognitive benefits (Valian, 3; Klein, 549), arguing that they may depend on specific tasks and individual contexts. Nonetheless, continued research highlights its utility in performance, memory, and the mitigation of age-related cognitive decline (Veenstra et al., 8).

From a critical standpoint, a balanced review of the available evidence is necessary, particularly given the relative scarcity of studies reporting null or negative effects. This contextual background is important when exploring the implications of bilingualism in individuals with autism spectrum disorder.

3.2 Communication in ASD

ASD must be understood within a triad of disorders (Wing, 327): difficulties with social interaction, communication, and insufficient flexibility in thinking and behaviour (López-

Ibor Aliño et al., 28). It is essential to underline the lack of a theory of mind (Grandin, 137), defined by Baron-Cohen et al. (43) as poor perception of the listeners' needs (Martín-Borreguero, 112) and an inability to imagine what others feel (Bogdashina, 25). Jindal-Snape et al. (77) explain some symptoms as a Gestalt mode (little appreciation of the meaning and internal structure of expressions) versus an Analytical one (understanding meaning and the internal structure of expressions) that characterize typical individuals.

Communication becomes a strategy. The autistic author Grandin (138) employs repeated images; she memorizes them although she cannot associate them. Cognitively speaking, the meaning of words is a generalization (Vygotsky et al., 97) inherent in the understanding process. The complexity of thought and human language is linked to the spoken word. Older psychological linguistics explained the process of verbal thinking by defining it as speech without sound (Vygotsky et al., 101). So, what about people with autism, whose thought is visual but who must communicate through words? When Grandin accesses her own memory, she sees "videos" with the needed images, but she needs to experience them first to fill her video library. There are no generalized concepts. Her mind works like the computer programs used to make high-tech special effects in movies. It works slowly, however (Grandin, 140).

In short, the symptoms of the disorder are limitless and affect the linguistic and communicative level: muteness, echolalia, sophisticated speech, hyperlexia ... Today, ASD is studied in rats, as there are no patterns of specific differences in connectivity for individuals. The neurobiological basis of social dysfunction and the reasons for a high prevalence of ASD in males are still little known (Cho et al., 13213).

3.3 Bilingualism linked with ASD

Autistic people are damaged in both cerebral hemispheres (Bialystok, 4); the most serious cases show severe alterations on the left side, while those with Asperger's syndrome (78) only in the right hemisphere, this being the region most related to autistic behaviours (Prizant, 296). Studies have observed that the right hemisphere is more active in those with ASD (Bogdashina, 18; Tager-Flusberg & Caronna, 469), especially cases of high performance and Asperger's syndrome. During linguistic functioning, the dominant hemisphere is the right one, while in typical individuals it is the left one. The brain areas used by autistics to solve verbal conflicts are used by typical individuals to deal with non-verbal issues (Bialystok, 5). With this view, Martín-Borreguero (115) argues that pragmatic deficits in those with ASD can be caused by the right brain becoming hyperactive because of atypical hemispheric activity, in which the right hemisphere dominates during activities normally associated with the left one (as it is for language). Bogdashina (16) reiterates that the brains

of people with ASD are more highly developed in the areas associated with comprehension (Wernicke) than those associated with production (Broca).

Regarding the neurological changes caused by bilingualism, bilinguals develop different neural representations for each language, based on their formal characteristics. This may involve the use of channels in healthy areas of the brain in individuals with ASD (Kovelman et al. 153). Thráinsson (12) explores the case of three autistic teenagers fond of computer games who fail to acquire L1 (Icelandic). The repetitive computer input reinforced L2 development in these young people having difficulties in L1. However, current research on the development of languages and bilingual development maintains that good command of the L1 is required for the acquisition of an L2.

“If an ASD child can produce L2 fluently, but L1 like a foreign speaker, either the theories of how a child acquires their languages are insufficient or the ASD child has in fact full processing potential in their L1. This potential is transferred to the L2 production area, which is not affected by the neurological disorder” (Thráinsson, 32).

The author, then, would recommend consecutive bilingualism and late childhood L2 exposure: if there were communication difficulties in L1 because of a neurological disorder, L2 could be used to achieve communication (Thráinsson, 22). It is unfortunate that Thráinsson’s studies appear in an unpublished paper yet represent a radical turn in approaching obstacles to communication in autistic individuals and even lead to a reconsideration of theories on the acquisition of a primary language.

Along these lines, Bialystok (6) states that individuals who speak an L2 develop density in the lower left parietal area. Speaking more than one language stimulates neural zones, increases white matter density, and improves executive control. The latest research using mental status examination techniques reveals that the use of an L2 leads to more efficient processing of stimuli that could contribute to cognitive impairment prevention (Grundy et al., 280).

The negative arguments are that bilingualism increases the difficulties of language in ASD (Ardila, 111) and interferes with learning. Moreover, it has disadvantages for typical individuals: delayed language acquisition, interference between the two systems and reduced vocabulary. They stress that children with specific language impairment (SLI) have limiting language impediments in acquiring their L1, making the acquisition of an L2 difficult. However, the effects of bilingualism on cognition are related to maturational factors and are negative only if subjects have not exceeded a certain age. On the contrary, bilingualism has advantages such as mental flexibility, greater attention and inhibition and increased cognitive strategies. Bilinguals have increased flexibility and awareness in the

pragmatic use of language (Ardila, 106). Bilingualism is easy for typical children, because they only need to learn words and grammatical regularities, but people with autism suffer more difficulties in acquiring an L2 (Marian et al., 72). Lack of generalization (Döpke, 12) and pragmatic problems are insurmountable obstacles: negotiating turns in conversations, choice of reference expressions, eye contact, body language and facial expressions (Eigsti et al., 682).

Language disorders cause delays in the acquisition of an L2, but cases of bilingual children with SLI have only been addressed in a few studies (Verhoeven, et al., 1798) and are unable to provide a coherent picture. Although bilingual children with disorders do not have serious problems with phonological skills such as articulation, they do offer delays in lexicon, morphology and syntax (Seung et al., 53). The impact of exposure to bilingual education in children with autism has not been studied systematically, but difficulties can be expected, and experts recommend that parents be aware that bilingualism in autism is a still unstudied field (Hambly & Fombonne, 1342). While there is no evidence that bilingualism causes delays (Hambly & Fombonne, 1348), it is extremely difficult for children with delays to acquire an L2 (Kay-Raining et al., 52). From an analytic viewpoint, the environment in which children are raised should be assessed, given that, as observed in the information outlined below, if the environment is bilingual, even children with disorders can develop neuronal channels for each language and their kinesthetic possibilities are increased.

Regarding Thráinsson's studies (12), we must remember that children with ASD showed an extraordinary fluency in English, even though it was impossible for them to keep a conversation in their L1. The author advises bilingual education for autistics in every case, including bilingualism at home, and recommends bilingualism for improving their overall communications development.

Children with SLI/ASD can become bilingual (Paradis et al., 113) without subsequent delays in language acquisition (Beauchamp & MacLeod, 250), as studies by Valicenti-McDermott et al. (945) show, comparing children with ASD who are bilingual in English and Spanish with monolingual children with the same disorder. In fact, an L2 plays a key role in regulating patterns of verbal communication in students with disorders (Wire, 125). In addition, it has been observed that bilingual children with ASD acquire more gestural ability, and lose the rigidity shown in their L1 (Lumsden, 13).

Bilingualism may mitigate difficulties with mental flexibility experienced by children with ASD (González-Barrero & Nadig, 12) but does not seem to affect their working memory. Similarly, exposure to L2 in children with ASD is not associated with delayed cognitive and

functional communications skills (Iarocci et al., 10). Between ASD monolingual and bilingual children, there are no significant differences or extra delays in language development (Li et al., 21). Thus, bilingualism benefits aspects related to mental flexibility, attention, memory, concentration, the prevention of cognitive decline, the regularization of verbal patterns and gestural abilities. Likewise, the use of an L2 involves the use of different brain pathways that may not be affected by the disorder in the case of subjects with ASD.

3.4 Teaching an L2 to children with ASD

According to the different psychological functions of the special child, integration (Vygotsky, et al., 105) and early therapy are recommended, since both have positive results in language acquisition and cognition (Tager-Flusberg, et al., 335; Romero & Uddin, 516). Environment is also a crucial aspect of support (Jellett et al., 39); in stimulating household's children are more willing to become integrated into the school environment (Tager-Flusberg & Caronna, 469).

Oral communication is essential for teaching a second language. Several strategies for teachers of autistic students have been developed (Wire, 123) with respect to the triad of impairments (Wing, 327; Wire, 123). Among them: alleviating the deterioration of social interaction through individual work; taking into consideration their unusual social communications skills (distorted language, echolalia, atypical voices or selective muteness); taking advantage of these students' preference for routine and their extraordinary memory, making effective use of their inflexibility when confronted with change.

Jindal-Snape, et al. (79) and González Silva (611) recommend continuous monitoring to ensure that autistic students' linguistic, communicative and behavioural needs are met in educational programs. Language benefits can be significant, especially in the initial stages. Although children with Asperger's syndrome can decode complex sounds and imitate accents with unusual precision (Martín-Borreguero, 115), outstanding attributes for learning languages, difficulties will persist and students will require greater attention (Tager-Flusberg & Caronna, 469). Moreover, echolalia (Wire, 123) may hinder integration, though several linguists (Prizant & Duchan, 241; Monfort, 59) consider it to be an integral part of linguistic and cognitive development, an aid for comprehension and language production.

As for material resources and support for teaching autistic students an L2, music is suggested (Lim & Draper, 532; Meyer, 7). Another crucial resource is the computer (Wire, 125; Moore & Calvert, 359), since children with ASD understand more words than they produce (Gregor & Campbell, 189) and because of the visual nature of their thought processes. Hence, it is advised that teachers use visual aids with ASD students (Jordan &

Powell, 19; Döpke, 16; Monfort, 59). For Grandin (138), an autistic author and entrepreneur, learning another language must be done through reading: from the printed word to the mnemonic image. According to Thráinsson (22), a machine that decodes language is simpler and its assimilation by ASD students with their characteristic visual thinking, is easier. This reduces the anxiety caused by actual social situations (Aresti-Bartolome & Garcia-Zapirain, 7769). Some authors, such as Alemi et al. (2), are investigating the effect of robots on teaching L2 to children with autism.

3.5 Didactic implications for second language teaching

The findings analyzed in this study have important implications for teaching second languages to individuals with ASD. First, it is essential to adopt methodological approaches adapted to the cognitive and communicative particularities of autistic learners. Recommended strategies include:

- Use of visual aids: Individuals with ASD tend to process visual information better, so the use of pictograms, charts, and diagrams is recommended (Jordan & Powell, 19; Monfort, 59).
- Structured and predictable teaching: Routine and anticipation facilitate learning in ASD students, reducing anxiety associated with L2 communication (Wire, 128).
- Integration of technology and digital resources: Computer-based programs and the use of robots have proven effective in teaching second languages to autistic children (Alemi et al., 6; Aresti-Bartolome & Garcia-Zapirain, 7769; Wainer et al., 46).
- Individualized instruction and positive reinforcement: Learning an L2 in ASD individuals should be approached in a personalized manner that enhances their communicative skills without causing frustration (Jindal-Snape et al., 79).
- Use of music as a didactic tool: Music therapy has shown positive effects in language teaching for individuals with ASD, facilitating vocabulary and grammar acquisition (Lim & Draper, 540; Meyer, 7).

In conclusion, teaching second languages to individuals with ASD requires an adapted approach that considers their specific needs, employing methodologies that enhance their communicative abilities while minimizing their difficulties.

4 Conclusions and Discussions

To sum up, teachers should approach their students with ASD without thinking of them as children with an illness (González Silva, 612), from an integrationist perspective, with empathy towards the pupils and their environment. In this orientation, Klin (109) points out the need for educational services, adequately equipped and Martin & Milton, the

importance of media attention (3). This raises awareness of children with ASD in regular school rooms, any limitations being due to the type of intervention (González Silva, 618). Of the 72 sources consulted, 26 contributed information on characteristics of ASD; 28 showed the benefits of bilingualism; and 18 professed a lack of benefits. We note, therefore, greater support for bilingualism (see Table 1).

Table 1. Summary of the main ideas

Benefits of bilingualism
1. Bilinguals show more cognitive flexibility (Ben-Zeev, 1016; Gollan et al., 562; Morton & Harper, 719; Mattschey et al., 6; Grundy et al., 280).
2. Bilinguals develop different neural representations for each language, increasing cell activity (Diaz, 23; Kovelman et al., 153; Bialystok, 3; Treccani et al., 320).
3. Early exposure to L2 is beneficial (Krashen, 1982; Saglimbeni, 12).
4. Students with ASD show motivation to acquire L1 and L2 vocabulary using computers (Moore & Calvert, 359; Gregor & Campbell, 189).
5. Language delay is not an impediment to learning languages (Paradis et al., 113; Lumsden, 13).
6. Bilingualism and integration are possible with appropriate educational services (Anguita Acero, 9; Klin, 109).
7. L2 has an important role in regulating patterns of verbal communication in students with ASD (Wire, 123; Valicenti-Mc Dermott et al, 945).
8. Students with ASD can benefit from L2 teaching (Martín-Borreguero, 115; González Silva, 612).
9. Teaching an L2 with music is recommended, especially with autistic students (Lim & Draper, 532; Meyer, 7).
10. ASD subjects, unable to acquire their L1 properly, are successful learning an L2 (Thráinsson, 12).
11. Children with ASD can become bilingual and bilingualism does not cause delays (Beauchamp & MacLeod, 250; Garrido et al., 90).
12. Bilingualism can mitigate difficulties with mental flexibility in children with ASD and has a positive impact on memory (González-Barrero & Nadig, 12. Veenstra et al, 8).
13. L2 exposure in children with ASD is not associated with delayed cognitive or language skills (Iarocci et al., 10; Li et al., 21).
Lack of benefits of bilingualism
1. Monolinguals outperform bilinguals in verbal intelligence (Saer, 26).

2. Bilingualism is harmful if the child is still in the stage of L1 acquisition (Darcy, 22; Peal & Lambert, 12; Macnamara, 19; Cummins, 12; Hamers & Blanc, 20; Marian et al., 72; Birdsong, 16; Döpke, 16; Bylund, 690; Eigsti et al., 682; Ardila, 99).
3. Autistics tend to reproduce problems in L2, as with echolalia (Prizant & Duchan, 241).
4. SLI causes a delay in the acquisition of L2 (Verhoeven et al., 1798).
5. Difficulties for autistics when learning an L2 can be predicted (Hambly & Fombonne, 1342).
6. Parents should know that there is little or no research about bilingualism in autism (Kay-Raining et al., 52).
7. The benefits of bilingualism are cognitively inconsistent (Valian, 3).
8. Currently, the research is inconclusive, although initial studies reported advantages in the bilinguals' cognitive processes (Klein, 549).
Features of Autism
1. The main symptom is poor development of social interaction (Kanner, 53; Asperger, 1944).
2. The right hemisphere of the brain performs functions that the left one should execute (Prizant, 296).
3. Theory of mind: anomaly in autism thinking patterns that prevent the subject from being empathetic (Baron-Cohen et al., 39; Frith, 19; Grandin, 137; Bogdashina, 8).
4. The psychological functions of the special child should be considered: their integration into the education system, early therapy and family support (Vygotsky et al., 97; Jordan & Powel, 19; Tager-Flusberg et al., 335; Tager-Flusberg & Caronna, 469; Jellett et al., 39; Martin & Milton, 3; Papadopoulos et al., 894; Davis, et al., 1605; Howard et al. 179).
5. The symptoms are based on difficulties insocial interaction and communication, and lack of flexibility (Wing, 327; López-Ibor Aliño et al., 28).
6. Some children with Asperger's syndrome are hyperlexic, with difficulties understanding spoken language (Grigorenko et al., 1079).
7. Little appreciation of the meaning and the internal structure of expressions (Jindal-Snape et al., 77).
8. ASD may involve damage in the two hemispheres (Muñoz-Yunta et al., 111).
9. It is necessary for parents, teachers and therapists to coordinate (Balbuena Rivera, 63).
10. Although many individuals with Asperger's syndrome can develop numerous language skills, comprehension may be impaired (Saalasti et al., 1574).
11. Specific language skills can be used to improve social skills (Monfort, 59).
12. The current autism criteria are not established as definitive (Artigas-Pallarès & Paula, 568).
13. ASD and Asperger individuals are grouped in the same diagnostic category both in ICD-10 and DSM-V (APA, 23; Garrabé de Lara, 257).

14. Technology can reduce anxiety in real social situations (Aresti-Bartolomé & García-Zapirain, 7769).
15. The neurological basis of social dysfunction in individuals with ASD remains poorly understood (Cho et al., 13213).

It should be clarified that generally, authors who argue that there are no benefits, determine their position by not having passed the stage of L1 acquisition. Although some research casts doubt as to the benefits of bilingualism on cognition, there is no evidence to show that individuals with ASD experience delays due to learning an L2. Theorists conclude that both within the home and at school, bilingualism is favourable for individuals with ASD. It would be prudent here to insist that science assess new and rigorous contributions that can serve as a basis for undertaking research employing more generous samples with the aim of improving conditions for persons with autism.

As a result, the answer to the question, are there any benefits to symptoms of ASD if individuals acquire an L2? is affirmative. However, there are two aspects awaiting future analysis: once passed the stage of L1 acquisition or without having passed it. Autism remains a challenge for researchers; there is still no absolute certainty about the causes. This study represents a small part of attempts to understand the phenomenon, but on this occasion, the perspective reveals distinct approaches. Bilingualism proves to be an effective tool for improving some of the symptoms of ASD. Furthermore, applying adapted didactic strategies can improve second language learning in individuals with ASD, providing effective tools for their communicative and social development.

5 Author Contributions

Conceptualization, C.S. and A.M.; formal analysis, C.S.; methodology, A.M. and C.S.; visualization, C.S. and A.M.; writing—original draft, C.S. and A.M.; writing—review and editing, A.M. All authors have read and agreed to the published version of the manuscript.

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