

The Language Development Process of Bilingual Children with Autism Spectrum Disorder: An Investigation into Gender Linguistic Differences

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Abstract

This paper is a descriptive correlational study that investigated the gender differences in the language development process among a group of 215 male and female bilingual children with autism spectrum disorder. A valid and reliable questionnaire was adopted and deployed to accomplish the study's objective. The caregivers of these autistic children were requested to complete and submit the questionnaire. Data analysis was made possible with the help of different statistical software tools. The study concluded that gender did significantly impact the participants' performance in four different linguistic domains: Listening, vocabulary, verbal grammar and sentence construction, and questions formulation. Females were found to have an upper edge over their male counterparts in these domains. Only one non-significant difference was observed in the listening comprehension domain, where both genders were found to experience the same level of difficulty. The limitations and recommendations of this study have been presented here as well.

Keywords: Autism spectrum disorders, bilingualism, differences, gender, language development

1. Introduction

Autism Spectrum Disorder (ASD) refers to a blanket term used for a heterogeneous mental disorder that affects children to varying degrees of impairment in their social interactions, thus causing nonverbal and verbal communication deficits and repetitive behaviours (Van Wijngaarden-Cremers et al., 2014). The prevalence and symptoms of this condition are experienced differently by both genders. Numerous studies have concluded that ASD is more prevalent in males compared to the female population (Halladay et al., 2015). The current diagnostic criteria for autism tend to target symptoms commonly observed in autistic males, resulting in delayed females' diagnoses. The diagnosis of male and female autistic children involves separate elements, with one of the greatest contributing factors being the Intelligence Quotient (IQ). Autism may occur in all kinds of children, ranging from those with extraordinary intellectual capabilities to those with severe mental challenges (Ozçalışkan & Goldin-Meadow, 2010; Posar et al., 2015). Similarly, an analysis of the variations between autistic children based on gender reveals that females who have ASD tend to possess a higher IQ compared to male autistic children. Females with higher IQ and ASD possess better language skills, thus helping them advance better in their language development process, compared to males (Carpenter et al., 1998; Erickson et al., 2012; Van Wijngaarden-Cremers, et. al., 2014).

As per Fombonne (2009), the male to female autistic children proportion stands at 4.3:1. This means that out of a population of 100, every 60 – 70 of them are likely to be males. As a result of such faulty diagnostic practices, most research studies tend to include a disproportionate share of male children, thus causing only the symptoms and issues faced by male children to be considered seriously. Due to these gender-based diagnostic differences between female and male children, females tend to suffer from missed or delayed diagnoses since their symptoms are not taken with as much seriousness as their male counterparts (Cheslack-Postava & Jordan-Young, 2012; Rivet & Matson, 2011). As a result, females tend to be misdiagnosed with other disorders instead of autism, resulting in a wide gender disparity where males are considered to be 4.3 times more likely to suffer from ASD compared to females. Several autistic symptoms apparent in one gender may not be visible in the female population, such as repetitive behaviours and communication deficits, causing female children to be misdiagnosed as normal (Goldman, 2013). For instance, a male and a female with ASD who display communication and language deficits may have completely different

responses to their social surroundings. Females are generally considered to have an expressive attitude towards their surroundings and engage in culturally bonded interests and social activities with a greater interest level of interest than males. As a result, a male autistic child withdrawing from social engagement may be observed and diagnosed accurately at a faster pace compared to a female autistic child since the latter may be able to perform better in social interactions, despite having the same condition (Leedham et al., 2020; Rynkiewicz et al., 2016).

As one of the ASD symptoms is related to the language development process, the present study aimed to reveal the role of gender in impacting language development in autistic children raised in bilingual environments. There is a significant lack of literature on the differences in symptoms exhibited by autistic male and female children. To find out how a difference in linguistic environments can affect each gender's language comprehension abilities, the researchers used data from a group of bilingual children with ASD to draw their conclusions. The importance of this study lies in the fact that it could provide new insights into the challenges faced by male and female children with ASD with regards to their language development process in bilingual environments and the degree to which their symptoms differ. The study attempts to plug current gaps in the literature surrounding autism in determining how gender differences might impact the language acquisition process in children with ASD. Given this, the research question of this study is:

- 1) What impact does gender have on bilingual children with ASD with regards to their first and second language development process?

In light of this research question, the study hypothesizes that gender has an impact on the language development process of bilingual children with ASD.

2. Literature Review

In the last two decades, there have been numerous studies to determine gender linguistic differences. Gender linguistic refers to a part of language sociology, which studies the role played by gender on the language development and usage process, thus providing more information on linguistic diversity (Bargiela et al., 2016; Frota et al., 2016). Moradi (2017) stated that since gender is a complex concept, its impact may vary widely and influence language development greatly. An experimental study has claimed that one's speech perception abilities could be a reflection of their ideologies. This could impact how individuals interpret, hear, and respond during social interactions and use their linguistic abilities (Maegaard & Pharao, 2016). Various studies have also determined gender to be a major factor in determining one's language hearing abilities (Meyerhoff & Ehrlich, 2019). Meyerhoff (2014) studied how gender could impact the diffusion and transmission of language change. Likewise, differences in gender linguistics have also affected the language development process, its usage, and the degree of impact on members from both genders. Additionally, Xia (2013) identified that males and females tend to differ widely when it comes to their linguistic skills. He also studied the role of gender regarding the differences in how language was used differently by both genders and concluded that the female population was more affluent in pronunciation. Their vocabulary usage also differed widely based on gender. It was found that females preferred to use vocabulary that expressed their emotions better. Hancock and Rubin (2015) stated that males and females tended to use different words for the same purposes, thus causing the emergence of gendered language.

The influence of gendered language is also apparent in autistic individuals. Researchers have highlighted numerous instances of gendered differences occurring in autistic children. Since then, studies on autism have considered communication and language issues to be major impairment occurring in autistic children (Sturrock et al., 2020). Dworzynski et al. (2012) highlighted that female autistic individuals are generally misdiagnosed or may receive delayed diagnoses despite fulfilling the criteria needed for ASD. Since females usually have a higher IQ with even the lower percentiles starting from an IQ score of 70+, they perform better in social interactions. They also handle their emotional and social responsibilities better and are adept at expressing all their emotions (Giarelli et al., 2010). Such pragmatic and language differences tend to divert attention from underlying difficulties and prevent female children from being diagnosed accurately early on (Sturrock et al., 2020). When it comes to children who have the same communicative and social deficits, female autistic children tend to be shy and only exhibit diminished responses. In contrast, male children under similar circumstances may be entirely unresponsive to everything in their environment (Lai, Lombardo et al., 2015). Similarly, female children often go undiagnosed and fail to fulfil standard autism disorder criteria since they perform better in social situations (Sutherland et al., 2017). Given that gender norms tend to be culturally oriented, diagnosing ASD in female children is a monumentally challenging task, especially in bilingual cultures (Kaščelan et al., 2019).

Generally, autistic children tend to exhibit difficulties with several core communication and social behaviours. They also engage in repetitive behaviours. However, females with ASD exhibit completely different communication and

social abilities with only mildly restricted behavioural changes. (Head et al., 2014). Van Wijngaarden-Cremers et al. (2014) argued that since male and female children had different abilities, the criteria for autism diagnosis in females ought to be different. Similarly, female autistic children have better communication abilities than males (Adani & Cepanec, 2019; Park et al., 2012). Additionally, researchers were also able to identify the pragmatics, language skills, and certain other communicative abilities in autistic children, which were markedly different between females and males (Colon et al., 2019).

In a typical population, higher-level linguistic abilities tend to influence one's social to a great extent. Language development is also similarly influenced by these abilities. Language is likely to have a critical impact on a child's development. It aids them in understanding and communicating better while socialising with others and also while receiving formal instruction (Adani & Cepanec, 2019). Language is useful for expressing thoughts and emotions, whereas verbal communication expresses speech (Xia, 2013). Barbu et al. (2015) identified several gender-based differences in the language development process in children. Despite language being a universal component of proper human development, language acquisition tends to vary in female and male children since the former can understand and acquire language-related abilities before male children. During early developmental stages, females possess better social abilities compared to males. Many studies have also determined that females can grasp language faster than males (Simonsen et al., 2014). As a result, females have a minor but consistent upper hand in language development in the early stages. For example, the gender differences seen in language development reveal that female children are capable of developing language abilities faster than males, which is backed by evidence that proves female children to develop speaking abilities, understand and acquire grammatical usage, utilise longer sentences and deploy an extensive range of vocabulary, at a faster rate compared to males (Eriksson et al., 2012). Additionally, many studies have also concluded that females have an even vocabulary distribution throughout the entire gender, whereas there were major variations in the depth of vocabulary possessed by males. Marjanovič-Umek and Fekonja-Peklaj (2017) conducted a meta-analysis of how gender differences affected language abilities and discovered that females outpaced males in virtually every aspect of language development during the early stages. However, the language development process in autistic and non-autistic children is entirely different. Difficulties in different areas, like being unable to understand social cues or suffering from nonverbal or verbal restrictions, are often associated with autism (Eigsti et al., 2011). Researchers also highlighted the degree of variation in autistic children about their language development abilities (Tek et al., 2014). Furthermore, these language skill variations also extend to deficits in several formal aspects of a language. Autistic children suffer from receptive language issues compared to regular children. While some autistic children have vocabulary development issues, others have delayed verbal concept and grammar developmental issues (Boucher, 2012; Özyurt & Elik üçük, 2018; Park et al., 2012).

Numerous studies have sought to understand how monolingual and bilingual environments could impact language development in autistic and non-autistic children. Certain studies claim that both language cultures have distinct advantages in aiding language acquisition opportunities in children (Scheele et al., 2010). However, other studies also highlight that children who learn a second language by the age of six have greater chances of committing errors while using the language, thus limiting their ability to use and understand communication effectively in a second language (De Houwer, 2011). Another research study concluded that children living in monolingual environments respond and understand their native language better compared to other languages. However, bilingual children have been better at learning new words since they are exposed to a wide range of vocabulary, allowing them to learn multiple words to express the same thought (Hohle et al., 2020). Therefore, studies prove that children in monolingual and bilingual environments have completely different outcomes when it comes to acquiring grammatical structure, speech, and words whereas other studies believe that language development takes place independent of the type of environment the child is raised in. (Byers-Heinlein et al., 2020). When it comes to autism, various studies support the claim that a bilingual environment is more advantageous for children in boosting their communicative and cognitive domains (Poarch et al., 2012; Kroll & Bialystok, 2013). There have been plenty of studies that offer positive evidence regarding the different advantages of a bilingual environment for autistic children (Bialystock & Grundy, 2018; Barac et al., 2014). Besides, Paradise et al. (2011) believe that children raised in multilingual or bilingual environments receive lesser input per language compared to monolingual children. Vocabulary and grammatical skill development take longer in bilingual children compared to monolingual children. Paradise et al. (2011) concluded that though bilingual children had to contend with lesser input and suffered from grammar and vocabulary deficiencies, these differences tend to get ironed out when children advance in the language development process. However, bilingual children always perform better compared to their monolingual counterparts in the long run.

Many studies have analysed gendered language differences present in autistic children to understand how they

impact the diagnosis of autistic children. Reetzke et al. (2015) conducted a detailed review of the link between structured pragmatic language and exposure to a bilingual environment among Chinese children who have autism. This study, involving 54 autistic children, determined that there were no major changes in the pragmatic and structural language development process in children raised in bilingual environments. Another study that compared monolingual and bilingual autistic children discovered that bilingual children were not at risk of facing additional language developmental delays, thus backing the observation that multilingual children were not overwhelmed by being exposed to different languages. Instead, it was found to support their language acquisition abilities (Hambly & Fombonne, 2012). A different comparative study conducted on monolingual and bilingual autistic children carried out a systematic review of both environments and decided that there were minute variations between expressive and receptive language outcomes, thus supporting the observation that bilingual children were not at a disadvantage compared to their monolingual peers (Lund et al., 2017). But Zhou et al. (2019) highlighted that a bilingual environment offered significantly higher advantages to autistic children in their longitudinal and cross-sectional research studies, which was conducted on children aged between 12 – 26 months. It was concluded that bilingual children made better gestures as they advanced their communication abilities and were at zero disadvantage due to their bilingual environment.

When it comes to gender differences, autism is more frequently diagnosed in males compared to females. Parish-Morris et al. (2017) discovered an interesting fact of females being misdiagnosed frequently since their autistic features tended to be camouflaged by their other characteristics. This camouflaging generally took place in words and the usage of pauses to fill awkward gaps during their social interactions. Females were also observed to use the ‘umm’ sound more frequently during their conversations. Another study investigating the communication and language differences between females and males concluded that females with ASD verbalised affective words better than males. However, both of them were at a significant disadvantage compared to verbalisation and learning of affective words compared to regular children (Kauschke et al., 2016). Previous studies that sought to understand communication and language usage in high-performance children with ASD also explain why autistic females are likely to receive a delayed diagnosis concluded that females outperformed males in semantic and pragmatic tasks. Additionally, the strengths and weaknesses of the communication and language abilities of autistic children were placed under intense scrutiny in this study (Marjanovič-Umek & Fekonja-Peklaj, 2017; Sturrock et al., 2020). Another study discovered that gender differences in autism allow females to camouflage their deficiencies better than male counterparts. Their ability to hide their emotions and fit in with their social surroundings was vastly better than males since they were capable of building better relationships and using expressive language with ease. Hull et al. (2020) also highlighted that autistic children often used social camouflaging tactics to mask all their autistic features. A comprehensive comparison of non-autistic and autistic children was carried out to understand whether gender differences would influence masking behaviours in either group. It was concluded that autistic females were far more capable of social camouflaging during their social interactions. Finally, Hull et al. (2017) stated that several characteristics of autism, like impaired language and social communication abilities, which were widespread in the males, were not as easy to diagnose in females.

To conclude, several studies have been carried out to study the language development process in autistic children, the effect that gender variations were deemed to have, and the overall impact that a bilingual environment could have on language development of children diagnosed with ASD. Similarly, researchers have also carried out many studies comparing communication and language development in autistic children with non-autistic children. But every one of these studies tended to highlight a few aspects, such as bilingual environments or gender differences and measure its impact on language development. The studies further discussed the overall impact that gender or language environment could have on the language development process in children with ASD. The current study has not been able to find any clear study that specifically studied the link between gender differences and a bilingual environment while also studying the impact of language environment among children with ASD. To plug the existing gaps in autism-related literature, this study has sought to conduct a comprehensive investigation of the link between language development, gender differences, and a bilingual environment to determine whether gender differences directly impact a bilingual autistic child’s language development process.

3. Research Method

The current paper is a quantitative descriptive correlational study that targeted a population of children with autism spectrum disorder raised in a bilingual environment. This research design is used to determine prevalence and relationships among variables.

3.1 Participants

The study was conducted on a group of 215 bilingual children with ASD chosen by a purposive sampling method ($M=1.4930$; $SD=.50112$). 106 male participants accounted for 49.3% of the group ($M=1.5472$, $SD=0.50013$) and 109 female participants accounted for 50.7% of the group ($M=1.4404$, $SD=0.49872$). All of them were bilingual and diagnosed with autism, as per the reports of their caregivers. The age of the participants ranged between 5 – 8 years. This age was chosen purposefully since children in this age are believed of mastering a good number of vocabulary, use different kinds of tenses (grammar is about to be mature), follow multi-step instructions, listen well, have good sentence structures (in terms of word order), use complex sentences, able to formulate questions, tell various attributes about certain objects, categorize objects along with extra precise traits, can write, understand the difference concerning fantasy and reality, provide short verbal reports, make predications, rationalize decisions, and provide some solutions as well as explanations (Al-khresheh, 2020; Clark, 2016). Inability to master any of these skills at the above mentioned period of age indicates a language development problem which might be considered as one of the ASD symptoms.

3.2 Instrument

As the study sought to determine the differences between bilingual autistic males and females in terms of their first and second language development, a questionnaire designed primarily to aid this purpose was adopted from Al-khresheh (2020). The questionnaire was then revised to include only 29 items to reduce the time needed to fill in the questionnaire and making it at ease, which were distributed among four different linguistic domains, namely listening (4 items), vocabulary (7 items), verbal grammar and sentence construction (14 items), and questions formulation (4 items) as depicted in Table 3 below. To measure how different both bilingual autistic males and females in terms of their language development, a five-point Likert scale was used, involving the following responses (always, often, sometimes, rarely, and never). ‘Never’ indicates a high level of difficulty, whereas ‘always’ indicates no difficulty. The analysis confirmed the validity and reliability of the questionnaire as seen in Table 3 in the analysis section.

3.3 Data Collection

To collect data amid the COVID-19 crisis, the questionnaire was administered via online means. Due to the limitation of face to face interaction and the difficulty of finding such autistic children in one place, the best way to collect the required data was through social network platforms. Some authentic online platforms were carefully selected and a request to post the survey link on these platforms was obtained. These online social network platforms are regularly used by caregivers who have children with ASD. The objective and importance of this study were clearly explained and a request to fill in the questionnaire was issued as well. A gentle reminder was also sent to complete the follow-up process.

3.4 Data Analysis

After relevant data statistics were collected, three different statistical software tools were utilised to analyse the data: the SPSS software 24, AMOS, and JASP. SPSS was applied for calculating the study’s descriptive statistics, correlation matrix, Exploratory Factor Analysis (EFA) and Cronbach's Alpha (α). AMOS was also applied for calculating the Confirmatory Factor Analysis (CFA), composite reliability, AVE, and fit indices. JASP was used for finding out the direct effect and indirect effect of gender on the questionnaire's domains.

In order to calculate the psychometric properties of the study’s instrumentation, researchers used the Structural Equation Modeling (SEM). They started with EFA and CFA statistical methods to verify the validity and reliability of the instrumentation used in this study. A detailed verification of the instrument’s content and construct validity has been carried out as well with reference to the aforementioned statistical methods. The principal component analysis was executed to examine the construct validity and determine the factors based on which the factors have been loaded and for labelling these factors appropriately. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity (BST) has been calculated to ascertain the appropriateness of data used for the analysis as well. The results displayed a KMO value of 0.870. Kaiser (1974, cited in Watkins, 2018) stated that factor analysis could be carried out, provided the KMO value was greater than 0.6. The KMO value acquired in this study is greater than the values recommended by Kaiser. The Chi-square statistic obtained at the end of the BST displayed the normal distribution of the data with multiple variables. The BST also had a significant impact on the study’s findings (Chi-Square = 2796.381; $p=0.000$). Table 1 refers to different items (29 in number), which are best suited to assess four important linguistic domains. In the initial EFA that showed 34 items along with their Eigenvalues, their four-factor structure was higher than 1, which explained 51.737% of the total variance observed in the instrumentation domains. This

value is the sum of all values of the four domains and indicates the loading of each domain in the following:

Table 1. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cum %	Total	% of Variance	Cum %	Total	% of Variance	Cum%
	1	7.56	26.07	26.07	7.56	26.07	26.07	4.70	16.22
2	2.18	7.54	33.61	2.18	7.54	33.61	4.26	14.70	30.92
3	1.86	6.43	40.05	1.86	6.43	40.05	2.10	7.25	38.17
4	1.45	5.01	45.06	1.45	5.01	45.06	1.99	6.88	45.06

Extraction Method: Principal Component Analysis.

Table 2 below offers relevant data proving that the study tool used here is appropriate for factor analysis. As a consequence of the first exploratory factor analysis, the items of the tool have been classified based on their relationship with the four domains. The factor loads have been categorized by the use of varimax, an orthogonal rotation technique. Therefore, a value of 0.40 is considered the minimum criterion for the item load (Blaikie, 2004). The table also showed the exploratory factor values of the 29 items that were used in this study. Furthermore, Table 2 offers information into factor load values, sorted from high to low. The study reveals that the first factor (listening) includes four items whose factor loads range between 0.40 and 0.64, the second factor (vocabulary) consists of seven items whose factor loads range between 0.47 and 0.54, the third factor (verbal grammar and sentence construction) consists of 14 items whose factor loads range between 0.47 and 0.71, and the fourth factor (questions formulation) consists of four items whose factor loads range between 0.66 and 0.72. All factors attained a suitable factorial validity through items loading for each factor specifically.

Table 2. Rotated Component Matrix

Items	Components			
	Verbal grammar and sentence structure	Vocabulary	Listening	Questions formulation
15	.721			
21	.663			
20	.655			
12	.635			
13	.630			
14	.609			
22	.559			
17	.514			
23	.510			
16	.469			
24	.460			
25	.455			
18	.431			
19	.400			
5		.676		
7		.659		
9		.563		
8		.527		
6		.503		
11		.489		
10		.418		

3	.575
1	.561
4	.508
2	.484
27	.729
28	.719
29	.419
26	.423

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 4 iterations.

In order to emphasize the validity of the measuring tool, the CFA was carried out to assess the measurement model in this four-factor model while retaining the same factor and items. The measurement model was calculated employing various fit indices consisting of the chi-square value (747.612; $p < 0.001$), Root mean square error of approximation (RMSEA) = 0.061, the comparative fit index (CFI) = 0.916, Goodness of fit index (GFI) = 0.939, Tucker-Lewis index (TLI) = 0.909, and Standardized root mean square residuals (SRMR) = 0.060. The parameters for assessing the capability of fit as suggested by Hair et al., (2014) are as follows: TLI and CFI values equivalent to or larger than 0.90, RMSEA values with the upper bound at or less than 0.08, and SRMR values equal to or less than 0.06, and all fit indices values were appropriate to use these instrument factor models for measuring the study aspects As demonstrated in Figure 1 below, all measures within each construct were loaded considerably on that construct. The final questionnaire consisted of 29 items.

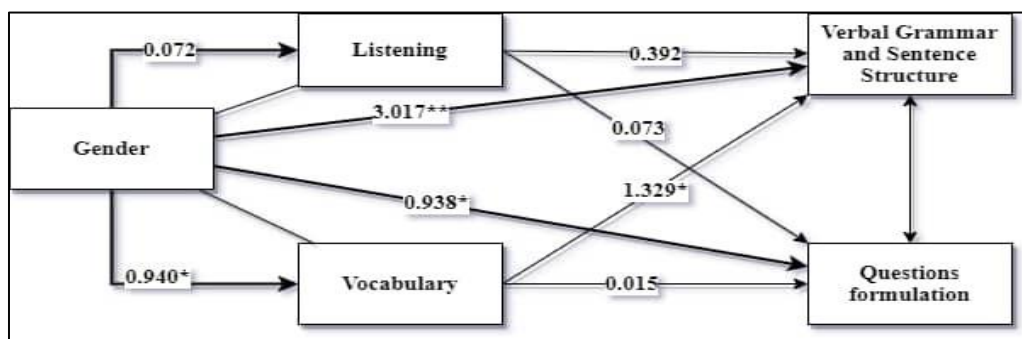


Figure 1. Four-factor model of questionnaire depending on CFA (29-Items)

Given the above analysis, the value of Cronbach’s alpha has been calculated based on the four-factor model for developing the study tool. The Cronbach’s alpha (α) for each factor was calculated as follows: listening = 0.748, vocabulary = 0.775, verbal grammar and sentence construction = 0.849, verbal grammar = 0.855 and questions formulation = 0.750. Concerning Composite Reliability, the following scores were recorded: listening = 0.811, vocabulary = 0.781, verbal grammar and sentence construction = 0.823, and questions formulation = 0.779 as presented in Table 3 below. All of the values mentioned above are suitable and acceptable ratios for this questionnaire because they are higher than 0.70 (Hair et al., 2014). These results are also in sequence with the findings of Tavakol & Dennick (2011). Consequently, the average variance extracted (AVE) is higher than 0.50, which is indicative of good convergent validity (Hair et al., 2014).

Table 3. The psychometric properties of the questionnaire domains

No.	Domains	No. of Items	Cronbach's Alpha (α)	Composite Reliability(CR)	AVE
1.	Listening	4	0.748	0.811	0.651
2.	Vocabulary	7	0.775	0.781	0.613
3.	Verbal grammar and sentence structure	14	0.849	0.823	0.539
4.	Questions formulation	4	0.750	0.779	0.547

AVE: the average variance extracte

4. Results

Table 4 below illustrates the descriptive statistics of different study tool domains after the investigation of the validation and the computation among the four domains/factors with regard to the gender variable (male and female). The statistical analysis reveals statistically significant differences between all domains and gender except for the listening domain, which showed no significant differences. These significant differences were in favour of females. The analysis also shows that the level of difficulty observed in the four investigated language development domains of male autistic children was higher than that of females.

Table 4. Descriptive statistics of questionnaire’s domains

Domains	Gender	N	M	SD	t	df	p	95% CI for Mean Difference	
								Lower	Upper
Listening	M	106	12.858	2.984	1.364	213	0.174	-0.260	1.426
	F	109	12.275	3.274					
Vocabulary	M	106	9.783	2.815	3.115**	213	0.002	0.412	1.833
	F	109	8.661	2.462					
Verbal grammar and sentence structure	M	106	32.094	8.661	3.652***	213	< .001	1.812	6.064
	F	109	28.156	7.096					
Questions formulations	M	106	9.660	2.924	2.330*	213	0.021	0.143	1.710
	F	109	8.734	2.905					

Note : * p < .05, ** p < .01, *** p < .00..

Table 5 below explains the correlation among the study variables. It shows that all the correlations were significant except the correlation between listening-question formulation and vocabulary-question formulation domains. The correlation coefficient measures the correlation strength. It ranges from -1.00 (negative) to +1.00 (positive). A correlation coefficient of zero points towards no correlation. In the current study, the correlation coefficient of bilingual children implies a positive correlation between all factors/domains, even between the ones that have no statistically significant correlation. The table also shows:

Table 5. Correlations matrix among all variables

Domains	1	2	3	4
Listening	—			
Vocabulary	0.287*	—		
Verbal grammar and sentence structure	0.322**	0.270*	—	
Questions formulation	0.151	0.081	0.248*	—

* p < .05, ** p < .01.

To examine the direct and indirect relations between gender variable and questionnaire domains, SEM was employed. Table 6 below shows that gender directly affects the domains of vocabulary, verbal grammar and sentence structures, and questions formulation. In listening, both autistic bilingual groups were found to have the same level of difficulty. No direct statistically significant differences were observed in this domain according to the estimate value.

Table 6. The direct effect of gender on the questionnaire's domains

Direct effects					95% Confidence Interval		
Variables		Estimate	Std. Error	z-value	p	Lower	Upper
Gender	→ Listening	0.072	0.424	0.169	0.866	-0.903	0.760
Gender	→ Vocabulary	0.940*	0.367	2.283	0.022	-1.558	-0.119
Gender	→ Verbal grammar and sentence structure	3.017**	1.031	2.926	0.003	-5.038	-0.996
Gender	→ Question	0.938*	0.401	2.089	0.037	-1.623	-0.052

Note: * p < .05, ** p < .01, *** p < .001.

Table 7 reveals the existence of an indirect effect between gender and other remaining domains. This indirect effect was deemed to be statistically significant between gender and the way used by autistic children construct sentences through the domain of vocabulary. Due to the importance of vocabulary and listening domains in the language development process as well as their direct impact on other language aspects (Al-khresheh, 2020), it is necessary to mention here that the listening and vocabulary domains were used as mediators among the gender and the remaining domains to check the indirect effects.

Table 7. The indirect effect of gender on the questionnaire's domains

				Indirect effects				95% Confidence Interval	
Variables				Estimate	Std. Error	z-value	p	Lower	Upper
Gender	→	Listening	→ Verbal grammar and sentence structure	0.392	0.302	1.297	0.195	-0.985	0.201
Gender	→	Vocabulary	→ Verbal grammar and sentence structure	1.329*	0.280	1.897	0.054	-1.079	0.020
Gender	→	Listening	→ Questions formulation	0.073	0.066	1.117	0.264	-0.202	0.055
Gender	→	Vocabulary	→ Questions formulation	0.015	0.087	0.176	0.860	-0.186	0.155

Note: * $p < .05$.

5. Discussion

What impact does gender have on bilingual children with ASD with regards to their language development process?

This study discovered that gender had a tangible impact on the language development process of autistic children who lived in a bilingual environment. Gender was deemed to have a statistically significant impact on four different linguistic domains. Apart from the domain of listening, gender was deemed directly impact the different domains of vocabulary, sentences, grammar and questions. Gender was also found to have indirect effects, statistically significant in sentence construction through vocabulary domains. Additionally, a significant correlation was also discovered between different linguistic investigated domains, except for the question-listening, and vocabulary-question domains. The results revealed that females were relatively better off than their counterparts, meaning that the difficulty level was higher for male participants with ASD who were raised in bilingual environments compared to female participants. However, an exception was observed in the listening domain where both male and female autistic participants with ASD were found to have the same difficulty when it came to listening. No statistically significant differences were observed in this domain.

In light of the findings stated above, it is to be noted that several studies had already confirmed that the language development process in males and females varied widely, irrespective of which linguistic environment they were raised in. However, these findings have to be reassessed to account for differences when children are exposed to multiple languages. The situation becomes more complicated if these children had ASD.

Possible explanations for the gender linguistic difference can be because gender has been long known to have a major impact on the language development process. In general, females can acquire language skills faster than males, although the latter do catch up by the time they reach middle adulthood. Gender affects the way young children acquire language skills, with females acquiring greater proficiency faster than males. Females also possess better verbal skills and outperform males on different verbal aspects at any given age. Females also possess a larger vocabulary and acquire language skills faster than their male counterparts during the initial years of their life. While females tend to have a vocabulary of at least 95 words by the age of 16 months, males only have a vocabulary estimated at 25 words at that point. The same pattern can be observed in other languages as well. Males also tend to use word combinations around three months after their female counterparts. The differences between the

performances of both genders appear early as well. While females primarily use language to refer to their emotional relationships, males use it for describing events and objects. On average, females pick up reading skills faster than boys. However, both genders catch up to the other by middle school. However, females have been observed to consistently perform slightly better than males when it comes to tests that measure verbal performance and understanding. These facts, which have been acknowledged by some important studies discussed early in this study (Ozçalışkan & Goldin-Meadow, 2010; Marjanovič-Umek & Fekonja-Peklaj, 2017; Frota et al., 2016; Carpenter et al., 1998), are a good support of the main findings of this study.

However, the most visible differences between both genders regarding their language development abilities can be observed in children with ASD. Children with ASD tend to suffer from an abnormally high rate of language disorders. Studies conducted on other primates show that gender differences in language development and communication abilities may result from different social tendencies, which trace their fundamental origins to our evolutionary and biological heritage. Recently it was revealed that females with ASD use gestures that are distinct from males with ASD, despite both males and females facing similar social communication struggles. It is believed that females modify their behaviour effectively to mask their weaknesses, thus preventing professionals from diagnosing their language development delay issues on time. These claims have also been acknowledged by (Rynkiewicz et al., 2016; Marjanovič-Umek & Fekonja-Peklaj, 2017).

There is also another explanation to account for these genders linguistic differences that are based on gender socialisation. New studies on infant and developing children reveal that interaction styles, parental perceptions, and play practices differ systematically based on the gender of the child. Infant girls typically hear more language, enjoy more opportunities to engage in emotional-social interaction, and receive more direct eye contact than infant male boys (Cheslack-Postava & Jordan-Young, 2012). These differences in caregiving styles that are traceable to gender affect children for at least 2 – 3 years before an ASD diagnosis can be made. As a result, young girls may feel pressurised to fall in line with ‘female’ expectations, including pragmatic competence and other aspects (Daniels & Mandell, 2014; Anderson et al., 2013).

Although McCarthy (1953 cited in Adani & Capanec, 2019) observed that most gender differences rarely appear to be statistically significant, careful observers can easily understand the consistency with which all these differences pop up in different investigative studies led by different authors who employ different techniques to interview different subjects across a wide range of geographical populations. Many significant differences were observed between males and females who were bilingual across different linguistic domains. Additionally, the effects were found to benefit females more than males, although the differences were also theorised to decrease.

Bilingualism and its effects on language development in children with ASD assume greater importance since children with ASD display impaired language functioning and acquisition skills, even if they have only been exposed to one language (Hambly & Fombonne, 2012).

This study’s findings are also in line with Adani and Capanec (2019) conclusions, which stated that language disorders were more prevalent in males than females. Rynkiewicz et al. (2016) also arrived at the same conclusion, stating that verbal autistic females produced noticeable and vibrant gestures that were distinct from their male counterparts, thus meaning that females with ASD possessed greater linguistic competence compared to males with ASD. Erickson et al. (2012) also arrived at similar findings as it stated that females with ASD possess higher IQ scores on average compared to boys with ASD. Girls with ASD and higher IQ scores had better language proficiency, which allowed them to advance better when it came to language skill development and communication, compared to the male population.

Additionally, it must also be noted that most studies conducted into the differences between male and female autistic children have either been flawed or too limited. There is no definitive information regarding these differences, especially whether they are real or only a product of camouflaging techniques.

6. Limitations and Recommendations

There are two primary limitations of this study. First, this study followed a cross-sectional research design instead of an empirical study with a longitudinal research design, which could have provided more reliable information since the observer would then maintain direct contact with children with ASD. Language development progress can also be assessed with greater accuracy more frequently. Caregivers may not have objective opinions, unlike outside observers or specialists. Secondly, the linguistic upbringing of these children with ASD is also a major limitation. Since this study did not cover monolingualism, it is highly recommended that another study be conducted, which compares the impact gender has on the language development process.

7. Conclusion

The present study analysed the impact of gender on bilingual children with ASD regarding their language development process. The results revealed that gender significantly impacts different linguistic domains such as question formulation, grammatical structure, and sentence construction, vocabulary. Females were found to perform better on these parameters compared to their male counterparts. Both bilingual females and males with autism experienced the same difficulty when it came to listening skills. This study also discovered a significant correlation between these linguistic investigated domains except when it came to the correlation between vocabulary-question, and listening-question domains. These findings contribute to a better understanding of how gender impacts the language development process of bilingual autistic children.

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