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Embodied Cognition in Morphosyntactic Processing and Severity of Autism

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Dr. Huma Batool (Corresponding Author)
Assistant Professor, Air University Islamabad, Pakistan.
Email: huma.batool@mail.au.edu.pk

Dr. Sadia Irshad
Assistant Professor, Air University Islamabad, Pakistan.

Museerah Nisar
MPhil Scholar, Air University Islamabad, Pakistan.

Abstract

Autism affects a child's linguistic abilities; however, it is the severity or mildness of the symptoms that determine the effects on the child's communication skills. Foregrounding theory of cognitive semantics that accounts for embodied cognition in a collective case study six children were interviewed. Three of them show symptoms of mild to moderate autism and three severe autisms. We analyzed the data focusing on morphosyntactic patterns and embodied cognition. The nouns and verbs were frequent, however, children with mild autism used them at a higher frequency than children with severe autism. Children with severe autism avoided the use of adverbs and adjectives. Syntactically the language of children with severe autism was simpler than that of children with mild autism. The findings of the study suggest that there is a difference in the morphosyntactic patterns of children with severe and mild autism, which is a direct result of their varied embodiment.

Keywords: ASD, severe autism, mild autism, morphosyntactic processing, embodiment

1. Introduction

Autism spectrum disorder (ASD) comprises disorders that are characterized by impairments in social interactions as well as language and communication (Eigsti et al., 2011). Children diagnosed with autism suffer from some kind of language impairment which creates it difficult for them to interact in social scenarios and communicate effectively (Wilkinson, 1998). The language in the case of autistic children is used for instrumental rather than social purposes (Tager-Flusberg, 1996). The conversations with children suffering from ASD show their poor pragmatic abilities (Baltaxe & D'Angiola, 1992; Fine et al., 1994) in addition to the fact that they are verbally less receptive, resulting in a lack of response (Calderón, 2007). Because of these language impairments, it can become difficult for these children to socialize with other people, especially in situations where language is involved.

Not a lot of studies can be found conducted on expressive communication and language development primarily because of the difficulties that are encountered in studying such aspects of language in autistic children (Tager-Flusberg, 2007; Chiang & Lin, 2008; Foudon et al.,2007). It is because of such language impairments that many children fail to achieve their language milestones, which is also the reason that they are diagnosed in the first place (Dahlgren & Gillberg, 1989).

It is important to note that not all children suffering from autism have the same symptoms, which is precisely why autism is known as a spectrum disorder. Children suffering from ASD experience variability in their verbal skills (Tager-Flusberg et al.,2005). Many studies have reported that language delays are not observed in all autistic participants, which means that language development in autistic children can demonstrate variability (Small & Hickok, 2016). While some autistic children can show severe symptoms, others may only have mild to moderate symptoms. This also means that the language impairment these children go through must also vary with respect to every child and his/her severity of symptoms. Individuals that fall at the other end of the spectrum and have high functioning autism (also known as mild autism), can find it easier to learn written language as compared to spoken language (Jolliffe et al.,1992). Because of these variations in symptoms, it can be assumed that based on the mildness or severity of the disorder, these children also have different experiences when it comes to language production.

Owing to a lack of adequate language development, autistic children's language is affected in terms of pragmatics, semantics, morphology, and syntax (Rondal, 2007). There are serious limitations experienced by autistic children in making use of language structures (Mulas et al., 2006). Along with that, it has been noted that autistic children experience difficulties with pronouns and the use of short and simple syntactic structures, as well as omission or lack of use of prepositions and

conjunctions. According to Bartolucci's, children with autism tend to produce fewer grammatical morphemes (Eigsti et al.,2007). Children suffering from autism also face problems producing connectors such as "in " or "on", and as a result, these linking words are often used in the wrong way or are completely omitted (Wing, 1996).

Children with autism produce language with a more rigid grammatical structure consisting of a reduced set of syntactic structures as compared to normal children (Shapiro**,** 1977; Shapiro & Kapit, 1978). Eigsti et al., (2007) analyzed the language of children with autism and found that their language was syntactically less complex. Many authors have also noted that children with autism have difficulty with conjunctions, prepositions, and pronouns (Churchill, 1972; Ricks & Wing, 1975). Bartolucci et al. (1980) studied children with ASD that were around the age of 10. They compared children suffering from ASD with children with normal development and found that autistic children were more likely to defer from obligatory morphemes (Bartolucci, et al.,1980). Considering this, we argue that an individual's cognitive abilities help or hinder language processing and its development. Therefore, language structure and what it refers to contribute to the language process and production. We propose that individuals with mild and severe autism struggle at different levels to establish a link between the structure and embodiment of the language.

2. Literature Review

2.1 Cognitive Semantics and Semantic Deficit

Autism has been studied from the perspective of three major cognitive theories: theory of mind deficit, executive functioning disorder, and weak central coherence theory. Cognitive semantics is a non-objectivist and non-generative theory in cognitive linguistics that rejects the view that language can be studied independently of the mind and body. In her work on Language and Conceptualization in Autism, Naqvi (2017) tried to establish a relationship between conceptualization, embodiment, and language in the realm of Cognitive Semantics. Naqvi proposed that autism must be studied from the perspective of embodiment (the theory of embodied processing) to resolve the issues of uniqueness, something the previous theories were unable to accomplish (Naqvi, 2017). Studying this embodied processing account of language use in autistic children, the researcher gives a brief understanding of which body sense is responsible for making the sense of environment difficult for these children.

According to the theory of embodied cognition, different experiences lead to the variable embodiment as everyone constructs his/her own meaning (Evans & Green, 2006). It is our sensory experiences that form our conceptual structures which can then be represented in our language. This mind and body coordination during linguistic and non-linguistic processing can be seen as embodied processing which formulates the

embodied concepts (Naqvi, 2017). The current study uses the theory of embodied processing from cognitive semantics as its framework in order to investigate how the embodiment of autistic children structures their knowledge and how it is further mirrored in their language.

People interact with their environment and construct knowledge in the light of their experiences (Naqvi, 2017). According to Evans and Greens (2006), people can only talk about things they are able to perceive and conceive, something that directly derives from embodied experience. They concluded that for children with autism, their sensory-perceptual experiences have a direct role in determining their unique embodiment. Lakoff (1987) has highlighted human experience as something that is molded through the nature of our bodies which plays a part in constructing that experience in the first place. However, these experiences are unique in people with autism because the way their bodies interact with the world and construct physical realities is unique (Kanner 1943). Kanner (1943) calls it an 'extreme autistic loneliness' that tends to ignore anything that comes to the child from his/her surroundings. Keeping in mind the theory of embodiment, this varied sensory-perceptual processing in people with autism naturally plays a role in influencing their embodiment which in turn affects their everyday activities as well as their language. The studies highlighting the unique embodiment of autistic children prove that their language is bound to be different from children with typical development (Evans & Green, 2006; Naqvi, 2017). Most of the recorded studies have examined the pragmatic deficits and language competence while comparatively lesser studies have focused on the semantic deficits and even lesser on morphosyntactic development.

2.2 Severity in Autism and Morphosyntactic Processing

As autism refers to challenges with repetitive behavior, social skills, speech, and non-verbal communication skills, it is the severity of repetitive behavior in children with autism that shows the severity in autism itself (Kim & Lord, 2010). Baker et al. (2008) also concluded that there is a positive correlation between severe autistic symptoms and severe sensory processing problems. That warrants the assumption that the severity is autistic symptoms also has a link with the children's language abilities. According to Sarah Dooley Centre for Autism (2019), children with severe autism tend to repeat words and phrases, a phenomenon known as echolalia. Such children also utter words that do not fit the context. However, the current study does not focus on the context in which the words are spoken (semantics), but rather the morphology of the language.

Morphemes are the smallest meaningful units in a language that can also combine to create different sets of words. Linguists have examined how children with autism acquired the grammatical morphemes "in" and found no differences between the

results obtained from children with autism and typical control children (Fein & Waterhouse, 1979; Howlin, 1984). Other studies had a slightly different take on the subject as they found that children with autism were less likely to produce morphemes including articles (Bartolucci, 1982; Bartolucci et al., 1980; Bartolucci & Albers, 1974). A study investigating morphosyntactic development in young children with autism found clear signs of syntactic deficits (Eigsti et al., 2007).

According to Dalgleish (1975), syntactic deficits in autism are somehow related to the inability of the patient to properly learn the rules for ordering stimuli. A study done with 3-year-old autistic children found that the children that had more severe symptoms did not spend as much time watching relevant information in simple movies as compared to the children with less severe autism (Groen et al., 2012). Corroborating to this, Bavin et al., (2014) have tried to relate the severity of autism with the children's language processing. It was concluded that the severity of ASD had a negative impact on children's educational outcomes as the severe symptoms had implications for how well the autistic children understand the syntactically complex language (Bavin et al., 2014).

In light of all these studies, it becomes pertinent to ask questions regarding the morphosyntactic structure of autistic children and how it varies in children with severe autism and mild to moderate autism. Not much work has been done to tackle this question, especially comparatively through the lens of morpho-syntactic analysis and embodiment. The present research is an attempt to study the lexical content of autistic children in terms of their use of linguistic items with specific reference to a visual embodiment and proprioceptive embodiment. Exploring how autistic children use adjectives and grammatical items like prepositions, adverbs, conjunctions, etc., and how it relates to their embodiment. This can give valuable insights in terms of their embodied linguistic processing.

This paper aims to observe the type of words in morphosyntactic classes and syntactic structures that children with mild and severe autism use. In addition to that, the study also hopes to compare the data of severe and mild autistic children by linking it with embodiment to see whether the severity has anything to do with morphosyntactic development or not.

3. Research Methodology

3.1 Participants

The participants for the study comprised 13 diagnosed cases of Autism Resource Center, Westridge, Rawalpindi. The children were further delimited to verbal children with autism, as the focus of the study was the language. Six children were taken, three

of whom were diagnosed with severe autism while the other three with mild to moderate autism. The selected children aged between middle and late childhood (6-13 years).

3.2 Data collection

Discourse on two real-life events of all 13 children with autism was video recorded. The 6 children were interviewed using a semi-structured interview design, and interview sessions were later transcribed for the detailed analysis.

3.3 Morphosyntactic Analysis

For the morphosyntactic analysis, the transcribed data was put in the FLEX software. Through the software, the words were broken down into morphemes and classified into the respective word classes. The software helped the researchers look at the frequently used words classes, personal pronouns, and inflections of verbs along with syntactic structure including simple and complex sentences. This sheds light on the recurrent patterns of syntactic structures and word classes found in autistic children's language.

The morphosyntactic patterns of both groups of children with severe and mild to moderate autism were then compared to observe if there is a connection between the severity of symptoms and the linguistic patterns. In order to do this, the data from mild autistic children and severe autistic children were put in a visual form with the help of bar charts. The comparison of class categories, morphological processes, and syntactic structures of children with severe and mild autism gave a clear idea of the differences between the two groups.

4. Data Analysis

In the current study, we analyzed the data in terms of morphology and syntax. Collected data was put in tabular form and charts to draw a comparison between severe and mild autistic children. Out of all the data, echolalia, or mimicking, was omitted. The same was done with responses that were unrelated to the conversation. It is widely believed that autistic children can sometimes get fixated on certain sentence structures. This can be witnessed when the child repeats the question of the interviewer. In a few instances, instead of giving a response/answer that was related to the question, few children started to recite poems/songs or uttered sentence structures that seemed to have been picked from the environment. Such sentences were omitted because they do not represent the language ability of autistic children. The purpose of the study is not to see if autistic children are able to pronounce morphemes or

articulate structures, but rather if they can communicate by uttering certain morphemes and sentence structures on their own.

In order to compare the data of severe and mild autistic children, the numbers of class categories, morphological processes, and types of sentence structures found in the data were not compared rather their percentages were taken into account. The percentage of nouns found in the language of severe autistic children was compared with the percentage of nouns found in the language of mild autistic children in order to generalize the occurrences in a better way. There is a certain imbalance concerning the length of the conversation or words/sentences uttered by mild and severe autistic children, and therefore, calculating just the number of occurrences would generate an inaccurate result. By calculating the mean percentage in both cases respectively, the researcher hoped to overcome this error.

4.1 Results

The percentage of used nouns, verbs, pronouns, adverbs, prepositions, and adjectives was more in mild autistic children than in severe autistic children (see figure 1). The difference between the occurrences of pronouns and prepositions in children with severe and mild autism was not significant. However, several of these words were repeated multiple times showing the children's fixation. As it can be seen in figure 1, in the case of both severe and mild autistic children, the use of nouns and verbs is considerably higher than pronouns, adverbs, adjectives, and prepositions.

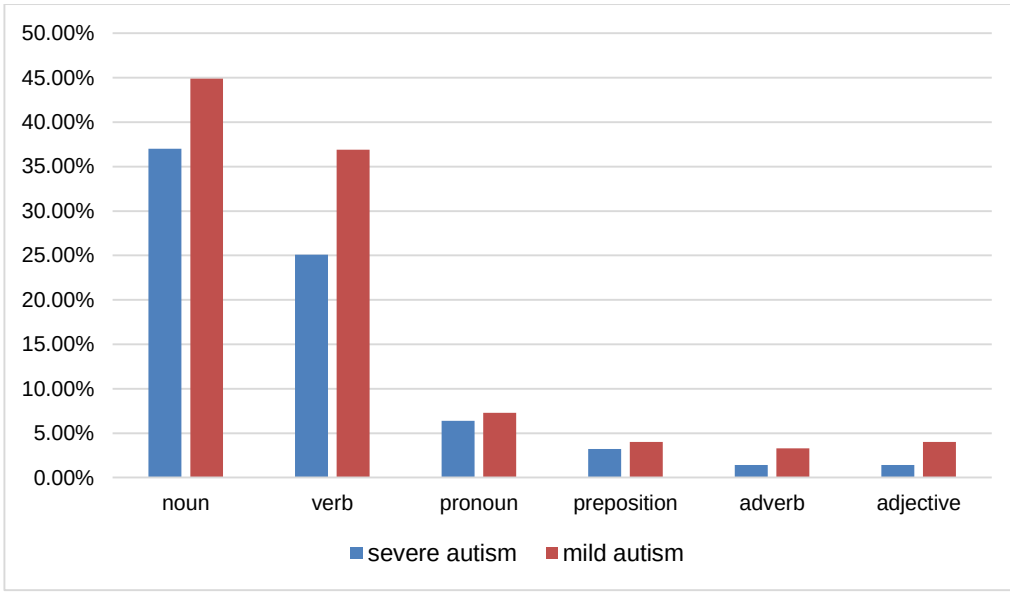

Figure 1: Frequency of word categories used by severe and mild autistic children

Less grammatically correct morphemes were found in the language of children with severe autism as compared to the ones with mild autism. Inflection was the most common morphological process found in the language of the children (see figure 2). While severe autistic children used more inflections as compared to mild autistic children, the results for derivation were the opposite. The derivation process of morpheme structuring was used more by mild autistic children as compared to severe autistic children.

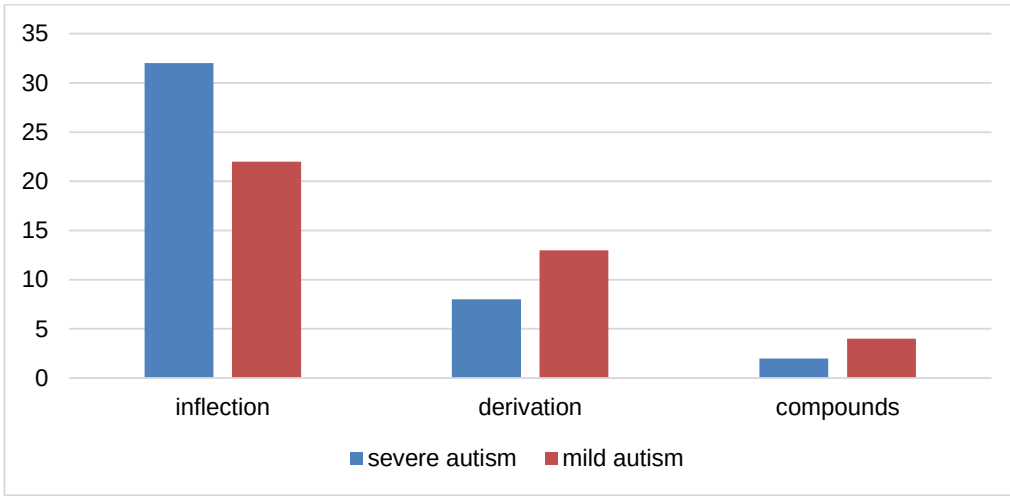

Figure 2: Frequency of morphological processes in autistic children's language

This study analyzed the syntactic structures by noting down the various kinds of sentence structures that were used. It was observed that the children used one-word sentences, two-word sentences, three-word sentences, four-word sentences, and five-word sentences (see figure 3). Sentences that consisted of more than five words were considered complex sentences. While variations of these sentence structures were found in the data, only one complex sentence (sentence with two clauses) was found in data collected from one of the children with mild autism.

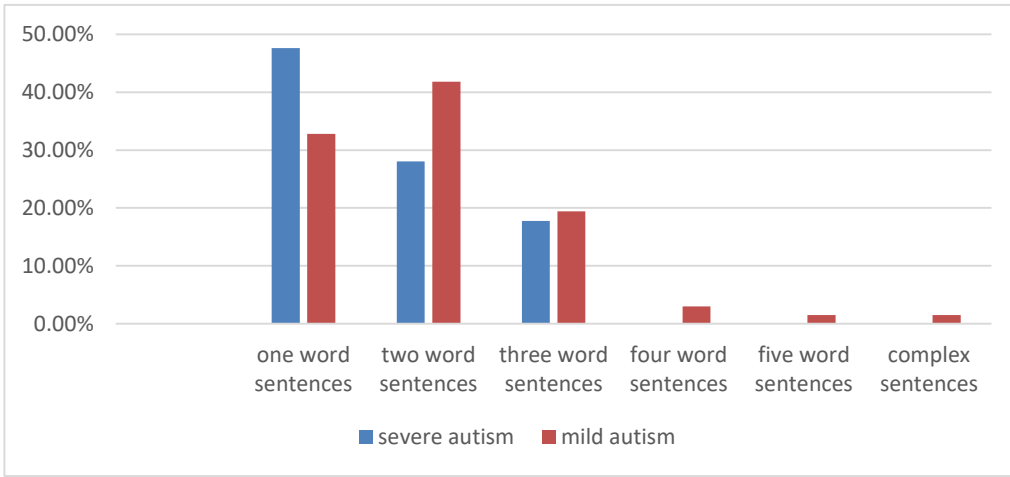

Figure 3: Syntactic structures used by children with severe and mild autism

Most of the sentence structures identified were simple. A few complex sentences were found in cases of children with severe autism however they were a result of the songs or poems that the children recited. The ratio of one-word sentences/utterances was greater in children with severe autism as compared to children with mild autism (see figure 3). Other than that, two-word sentences, three-word sentences, and four-word sentences were used more frequently by children with mild autism. The percentage of occurrence of three-word sentences in children with severe and mild autism was found to be almost the same. Five-word sentences and seven-word sentences were complex and were only found in children with mild autism. Simple present tense was used by all the children.

In both severe and mild autistic children, most of the one-word sentences consisted of a single noun. In children with severe autism, the most common two-word sentences consisted of the N-Prep structure. The most common three-word sentence was of V-V-V structure, and the most commonly found four-word sentence consists of the N-N-V-V structure.

In children with mild autism, the most common two-word sentence had the N-N structure. The most common three-word sentences were of the N-N-N structure, while there were only 2 four-word sentences, one with N-N-V-V structure and another with V-V-V-N structure. One five-word sentence with N-N-V-V-V structure was found in the language of children with mild autism.

In table 1, the most commonly used sentence structures in children with severe and mild autism are given along with the number of times they have been used.

Table 1: Use of Varied Sentence Structure by Autistic Children

Sentence structures	**Children with severe autism**		**Children with mild autism**	
	Frequently used sentences	Number of sentences found	Frequently used sentences	Number of sentences found
One -word sentences	N	46	N	22
Two-word sentences	N-Prep	8	N-N	8
Three-word sentences	N-V-V	7	N-N-N	3
Four-word sentences	N-N-V-V	4	V-V-V-N N-N-V-V	1 of each
Five-word sentences	-	-	N-N-V-V-V	1

After comparing the data, the dissimilar results point towards an obvious contrast between the language of severe autistic children and mild autistic children. Apart from a few exceptions, everything from morphosyntactic classes to the syntactic structure of sentences is found in a greater percentage in children with mild autism. The occurrence of nouns and inflectional morphemes show a variation in the result as they are used in a comparatively greater number by children with severe autism.

5. Discussion

The current study aimed at doing a morphosyntactic analysis of the language used by autistic children and how the data was impacted because of the severity and mildness of symptoms. The data showed that all of the children had difficulty producing words like prepositions while the connectors were not found at all. The nouns were used more frequently as compared to pronouns, showing the children's obvious preference. The most commonly used words were nouns and most of them were related to names of people and animals. No determiners were used by any of the children. The lack of articles found in the analysis corresponds to Bartolucci's findings that also showed that autistic children produced fewer articles (Eigsti et al.,2007). The most commonly used preposition was *main* (in). Present tense has been used by all of these children. Third-person singular, first-person singular, first-person plural, and second-person plural were used while third-person singular is more frequently used.

The comparatively less percentage of some of the word categories found in severe autistic children shows that a lot of their responses were mimicking or singing rehearsed songs/poems. The low occurrence of conjunctions shows the low occurrence of complex sentences (sentences with more than one clause) as well. This again points to the fact that children with severe autism used sentences with simpler syntactic structures as compared to children with mild autism.

In Urdu, verbs sometimes have to be inflected for tense even for present tense, which is why instances of infections were found in these autistic children's speech. However, the verbs were inflected for present tense only, which is similar to the finding that concluded that verbal inflection for past tense is not commonly found in children with autism (Tager-Flusberg, 2004; Seung, 2007; Manookin, 2004). While the ratio of inflections was more in the language of children with severe autism, it must be noted that most of these infections were found in words that were repeated by the children. These words were used again and again throughout the conversation. The most common inflectional words in severe autistic children were verbs *kerta (does)* and *karati (make someone do)*, both of which were found six times. It is also pertinent to keep in mind that a bulk of these inflectional morphemes were found in only one child with severe autism, which could be a result of his unique embodiment. In the case of derivation, the most common noun found was a *teacher* and was repeated three times. The derivational morphemes found were not complex but were those lexical items that are common nouns in the children's immediate environment.

While the children preferred to use nouns instead of pronouns, there were still occurrences of pronouns in their use of language. The frequency was comparatively higher in children with mild autism as compared to children with severe autism which shows that severe autistic children prefer to omit pronouns or use nouns. The most common pronouns were third-person singular. Four instances of pronouns were found in the children with mild autism while children with severe autism did not use first-person pronouns at all. This could show how children could sometimes dissociate themselves from the social environment. The most commonly used pronouns in severe autistic children were he and her. In mild autistic children, *I* was used more often. Pronouns like he and she are used as compensation for the difficulty in using the pronoun *I*. Through the results, it can be seen that the children with severe autism had difficulty in saying *I*, and therefore, chose third-person singular pronouns instead.

Some sentence structures were repeated that showed the child's fixation on certain structures and words. For example, the verb *kerta* (does) is used seven times within sentences with the same structure and meaning. This shows the child's fixation on such structures. Some of the words have also been picked up by the child from the interviewer. Instead of answering in the first person singular, one of the children with severe autism answered in the third person singular a few times.

In severe autistic children, one-word sentences dominated the conversation, while in mild autistic children, two-word sentences were mostly used. Most of the one-word sentences in both severe and mild autism consisted of nouns. According to Bavin et al. (2014), the severity of autistic symptoms can have implications on how well the children can understand the syntactically complex language. This explains why children with severe autism may also encounter difficulty in producing complex syntactic structures and that the process of comprehension and production is directly linked.

Children with severe autism have limited linguistic abilities as compared to children with mild autism. A lot of words were repeated in the data, which also corresponds to insights provided by the Sarah Dooley Center for Autism (2019). This was seen clearly in the result of the analyzed data as many words were used in a lesser percentage as compared to mild autistic children. A major reason behind this was that echolalia was not added to the data, as mentioned in the analysis section. This reduced the number of nouns, verbs, pronouns, etc., and as can be seen in the charts, their frequency was comparatively low.

6. Conclusion

The children's embodiment could also give an insight into the way they use their language. The impact of a varied visual embodiment can be studied through the use of nouns. While in both groups of children, nouns were used the most, the difference lies in the percentage in which they occurred. The overall lesser use of morphological classes by children with severe autism could be a direct result of their embodiment. Another difference lies in the nouns that were used. While children with mild autism used proper nouns as well as common nouns, children with severe autism mostly used proper nouns including the names of people and places. It suggests that children with mild autistic symptoms may be better at noticing and remembering the details in their surroundings. Whereas children with severe autism may only remember important information such as their teacher's name and the places they have visited.

The more frequent use of verbs by children with mild autism warrants their better proprioceptive embedment as they were able to use action verbs as well as linking verbs. For children with severe autism, it seems that using verbs was more challenging due to which they resorted to the use of nouns when they could. For example, in some cases, instead of explaining the action of jumping on a trampoline, the child would instead choose to use the noun trampoline, which signals that s/he jumps on it. The hesitation to use verbs along with the preference of action verbs over linking verbs shows children with severe autism may have poor body awareness.

In conclusion, the major finding is that the severe or mild symptoms in children with autism have a definite impact on the way they use language. Children with severe autism have certain impairments in their language when looked at from the point of view of morphosyntactic processing. The embodiment of children with severe autism is different from that of children with mild autism and that is manifested in their use of certain linguistic choices. The language of severe autistic children was much simpler than the mild autistic children, elucidating that their somewhat impaired visual embodiment and proprioceptive embodiment do not allow them to process and communicate information in the same manner.

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