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Can Signing Help You Speak? Assessing the Effectiveness of Sign Language as An Augmentative and Alternative Means of Communication for Autistic Children

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Abstract:

This paper explores the effectiveness of sign language as a method of augmentative and alternative communication (AAC) for children with autism, focusing on the potential of sign language to aid language acquisition and improve social interaction. The modality of sign language, as well as its linguistic value, allows it to be used in AAC. presenting both signed and spoken language (simultaneous communication) further enhances the assistance of autonomous articulation for autistic children. However, the evidence mostly comes from case studies and the results are not uniform. The effectiveness of sign language compared to other AAC is controversial. Combining sign language with other AAC to further enhance vocalisations in autistic children may be a promising field.

Keywords: Autism Spectrum Disorder, Augmentative and Alternative Communication, Sign Language

1. Introduction

One of the two core diagnostic criteria for autism spectrum disorder is persistent deficits in social communication and social interaction across multiple contexts (DSM-5; APA, 2013), while language impairments in children with autism are one of the major causes of social difficulties (Churchill,1978). Autistic children may experience delayed language acquisition, inappropriate use of language, or deficits in higher language functioning. Additionally, some low-functioning autism (LFA) can be completely mute or exhibit only minimal vocalizations (Bonvillian et al., 1981). For these children with severe language retardation, viable means of communication are essential to bridge the gap between them and normal children.

Augmentative and Alternative Communication Systems (AAC) can enhance verbal behaviour by supplementing limited speech (augmentation) or as a primary method of communication (alternation; Lorah et al., 2015). AAC is widely used to enhance the communication skills of autistic individuals (Ganz et al., 2012). AAC is usually divided into two categories, aided AAC, where one uses a device to aid communication, which includes the Picture Exchange Communication System (PECS) as well as the Speech Generating Device (SGD), while unaided AAC, where one does not communicate through any

device but uses their own body to aid their communication (e.g., sign language, posture; Aydin & Diken, 2020). The impact of autism on language is pervasive, and although it affects the use of sign language, it is less affected than spoken language, especially in LFA (Boucher, 2003). This article attempts to review what has already been written to explore the reasons why sign language remains relatively intact and can even be used to aid communication in autism and to assess its effectiveness as AAC.

2. Sign Language Occupies a Different Modality

Sign language and spoken language occupy two different modalities, which leads to the unique position of sign language in educating autism. For children with autism, visual information may have a higher salience compared to auditory information. Autistic children, especially mute children, are more aware of visual information when both visual and auditory information are presented simultaneously (Yoder & Layton, 1988). A case study reported a child who appeared to be mimicking words spoken by an adult, but only imitated the lip movements and ignored the accompanying sounds (Lovaas et al., 1971). For some LFA children, especially those who are completely mute, verbal teaching alone may not yield the desired results, in which case the unique advantage of sign language, i.e., visual saliency, may present a promising outcome.

Sign language and spoken language occupy two different modalities enabling both to be presented at the same time, thus further assisting children with autism to acquire language. Sign language and verbal language can be taught simultaneously. Instead of exceeding the processing limit of autistic children, the two inputs might function in a redundant way (Schaeffer et al., 1977), sign language can act as a cue for forgotten verbal language and vice versa. Sign language can help children to better understand the components of a sentence by indicating where words start and end, thus being able to distinguish better the words (Yamada et al., 1979). Moreover, words with similar pronunciations in spoken language can be distinguished by sign language when presented simultaneously. Therefore, this cross-modal language learning approach may provide additional accommodations for children with autism.

3. The Linguistic Value of Signing

As a well-established language system, the linguistic value of sign language can benefit children with autism. Autistic children often have difficulty in grasping abstract concepts and other complex language skills (Rutter, 1978). However, sign language learning in autism appears to have a high upper limit due to syntactic complexity (Carr, 1979). Creedon (1973) has successfully enabled children with autism to master imperative, interrogative, declarative, and compound sentences using sign language training, which in part proved that grammatically complex sentences can be acquired by autism through sign language. Sign language offers autistic children the opportunity to acquire more complex language skills, which in turn enables them to better indicate their needs and be more engaged in social interaction.

The linguistic value of sign language also has the potential to promote social skills in autism. In sign language, expressions are considered one of the important linguistic components. Signers usually look into each other's eyes when communicating (Elliott & Jacobs, 2013), whereas avoidance of eye contact is one of the common phenomena in autism (Madipakkam et al., 2017). Learning sign language may therefore provide some assistance in eye contact in autistic children, thereby improving their social skills. Denmark et al. (2014) have indicated that even though not as much as normal signers, autistic signers are still significantly dependent on expressions for recognition of sign language. Thus, the value of sign language instruction for autism may go beyond simple language skills and shed light on other areas of deficiency in autism.

Although sign language seems to have a promising potential for teaching autism, there are many obstacles to teaching sign language alone. Sign language is used in very limited environments (Aydin & Diken, 2020), and very few people in everyday life can understand and use sign language to communicate with them. Sign language demands a high level of fine motor imitation skills, which may be challenging for individuals with autism who have developmental disabilities to learn systematically (Seal & Bonvillian, 1997; Lorah et al., 2015). The effectiveness of sign language has also been much debated in terms of teaching outcomes (Brady & Smouse, 1978; Kurt, 2011). Therefore, to retain the unique benefits of sign language, the teaching methods of sign language in autism should be reconsidered.

4. Teaching Signed Speech to Autistic Children

To better exploit the advantages of the visual modality of sign language, Signed Speech (also known as Simultaneous Communication or Total Communication) is widely used in speech therapy for autism (Schaeffer et al., 1977). Unlike sign language, the grammar and sequence of this method are identical to spoken language (e.g. Signed Exact English; Bonvillian et al. 1981), except that the cor-

responding sign is produced simultaneously with speech, thus allowing sign language and spoken language to be presented at the same time. In therapy, children learn sign production and verbal imitation independently and are then taught to communicate using sign language. Once they can communicate independently in sign language, the children are taught to combine sign language and spoken language, and slowly fade out of sign language in favor of spoken language. This approach promotes spontaneous speech to a great extent (Schaeffer et al., 1977).

Creedon (1973) first taught signed speech to 21 non-verbal autistic children, who eventually mastered 100-300 signs over three years. By the end of the instruction, half of the children began to make sounds and approximate verbal words while signing, and three of the students were able to utter simple words accurately and spontaneously. In addition to language development, these children showed a reduction in stereotypical and self-stimulatory behaviours, revealing the benefits of signed speech teaching. Nevertheless, this experiment was more of a case study and lacked rigorous statistical evidence, making it difficult to assess its specific contribution to non-verbal children with autism. Overall, this groundbreaking study sheds light on the use of signed speech in teaching autism. Signed speech instruction yields better results than the use of sign language or spoken language alone, especially in enabling non-verbal children with autism to speak spontaneously. Brady and Smouse (1978) used a Latin square design and trend line analysis to compare the effectiveness of spoken language, sign language, and signed speech, respectively, for teaching a boy with autism, and demonstrated that simultaneous communication was significantly more effective than the other two. Kurt (2011) combined Discrete Trial Teaching (DTT) with simultaneous communication and found that combining the two was more effective than teaching verbally using DTT alone. More surprisingly, Valentino and Shillingsburg (2011) found that when exposed to simultaneous communication, autistic children could benefit from it and acquire mands, tacts, and intraverbals without direct teaching. Despite the small sample size of these studies, they do reveal the potential of signed speech in helping non-verbal autistic children to speak.

Dunst et al. (2011) reviewed 33 studies including 216 children to explore the impact of simultaneous communication interventions on speech production in preschoolers with different types of disabilities, including autism. Regardless of the type of sign language, the type of disability the child has, and the interventions, simultaneous communication facilitates the child's spontaneous verbal expression. In both single-participant studies and group design studies, the differences between instruction using Signed English and control (baseline or sign language and spoken language presented separately) were greater than the differences between ASL and control. A possible explanation for this is that children using Signed English were better able to correspond sign language to spoken language, whereas the syntactic differences between ASL and English can lead to difficulties in correspondence. It is worth noting that the mean effect sizes of the single-participant studies were generally larger than the group design studies, which may indicate that one-to-one or even many-to-one simultaneous communication instruction is more beneficial for children with disabilities, but it also suggests the potency of confirmation bias, as case studies with such small sample sizes are more likely to be selectively reported (Button et al., 2013). Overall, simultaneous communication teaching was generally and significantly helpful to children with disabilities compared to controls. Although the teaching of signed speech may be better for children with nonverbal autism than the use of sign language or spoken language alone, this approach is also fraught with controversy. Nonverbal autistic children may be affected by the salience of sign language, resulting in the neglect of accompanying spoken language (sign over selectivity; Carr, 1979), and being able to use sign language successfully but still be nonverbal. Yoder and Layton (1988) compared the effects of four methods, spoken language and signed language alone, simultaneous communication, and alternating sign language and spoken language, on the verbal abilities of 60 children with autism. They found that the teaching outcomes were only related to pre-treatment verbal ability. More importantly, individuals with autism end up acquiring limited communication skills compared to the amount of time and practice spent on simultaneous communication (Aydin & Diken, 2020). Thus, while simultaneous communication may appear to achieve the goal of helping children with autism acquire sign language and transform it into spontaneous verbal language, the true magnitude of its effect is unknown.

5. Sign Language and Other AAC

Instead of unaided AAC like sign language, aided AAC is often used for language learning in autistic children as well, the relative effectiveness of sign language compared to other AAC methods remains a contentious topic. Tincani (2004) compared the teaching effectiveness of PECS and sign language for two autistic children and showed that each child benefited from one of these forms, but that sign language teaching stimulated spontaneous speech in both. Another study demonstrated that although PECS leads to more mands acquisition, sign language instruction induces more autonomous vocalizations (Barlow

et al., 2013). Ganz (2015) reviewed the effectiveness of various AAC interventions for autistic children and found that sign language was less effective than aided AAC, however, this article failed to consider the role of simultaneous communication in facilitating speech. In terms of preference, sign language does not seem to be favoured by autistic children compared to interventions that include devices such as PECS and SGA (). To summarise, sign language seems to be less preferred and less effective than aided AAC, however, the unique contribution to promoting autonomous vocalization should not be overlooked.

A single AAC system may not be able to fully assist autistic children (Tincani, 2004), and combining sign language with other AAC systems is a viable option to better utilise the unique benefits of teaching sign language. Children with autism seem to be more interested when communication therapy is designed with robotic components (Robins et al., 2006). Axelsson et al. (2019) designed a robot for teaching sign language to autism and it received sufficient attention and imitation. Pezzuoli et al. (2020) designed gloves capable of interpreting sign language and applied them to enhance communication in autistic signers, which could serve those affected by the sign over selectivity. In summary, by combining sign language with other AAC systems and utilising technology, the communication effectiveness and engagement of children with autism can be significantly enhanced.

6. Conclusion and Future Perspectives

This article reviews the effectiveness of sign language as an AAC for language learning in autistic children. The learning of sign language is easier for non-verbal autistic children as it occupies a different modality from spoken language. Children with autism benefit more when verbal and sign language are presented simultaneously, and show the most striking improvement in autonomous vocalisations. However, most of the articles supporting it are based on case studies and therefore lack systematic evidence to rule out the interference of confirmation bias. The effects of sign language are also relatively limited compared to other AACs, but the promotion of spontaneous vocalisation is very promising.

Future research could offer a systematic review of how simultaneous communication helps autistic children to sign and speak, and explore the mechanisms of the bolster on spontaneous vocalisation. Methods of teaching autistic children through a combination of sign language and other AAC and their effectiveness also deserve further attention and research.

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