Critical Review: Is peer mediated intervention effective in increasing social communication in children with Autism Spectrum Disorder who use Alternative and Augmentative Communication?

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This critical appraisal examined published literature for evidence that peer mediated augmentative and alternative communication (AAC) intervention is successful in increasing the frequency of social communication in non-verbal children with autism spectrum disorder (ASD). An electronic literature search resulted in identification of seven articles which met inclusion criteria. Overall, findings indicate that there is emerging evidence for the efficacy of peer mediated AAC interventions. The clinical significance and limitations of the current research are discussed.

Introduction

Children with ASD have deficits in functional language and social interactions. Up to 25% of children with ASD do not develop functional speech; they predominately use communicative acts for behavioral regulation and show limited use of language for social communication (American Psychiatric Association, 2013). The term AAC encompasses any form of communication intended to supplement or replace oral speech. AAC often consists of a display of picture symbols representing individual words or phrases, which are pointed to or physically exchanged with a conversational partner to convey a message. AAC has been shown to be effective in supporting the communication of children diagnosed with non-verbal ASD, particularly when requesting preferred items and activities. However, to comprehensively address the social communication difficulties seen in children with ASD, AAC interventions must also increase the frequency and duration of other appropriate social interactions. The ability to communicate for a variety of functions may result in increased social and educational opportunities (Logan, Iacono & Trembath, 2016).

In accordance with the Education Act (1990) and Ontario's Equity and Inclusive Education Strategy (2009), Ontario schools thrive to promote inclusive practices. Since 2009, students with intellectual disabilities have gradually increased their presence in general education classrooms for full or part days. Despite the anticipated benefits that inclusion would result in rich communication opportunities, increased social modeling and peer interactions, research has found that students with severe disabilities experience limited peer interactions. AAC users in general education classrooms have been found to primarily communicate with classroom staff, and have relatively few interactions with their typically developing (TD) peers (Chung et al., 2012).

The absence of successful social communication in AAC users is worrisome, especially for individuals with ASD who often require structured and repetitive learning opportunities. Peer mediated strategies address social inclusion by training peers how to model, prompt and reinforce pro-social behaviours. By training TD peers how to communicate with children with ASD, peers are able to model language in natural settings, increasing the likelihood of incidental learning and facilitating the generalization of skills (Haring & Breen 1992).

Objectives

The objective of this paper is to critically evaluate the existing literature on the effectiveness of peer mediated AAC based interventions on increasing social communication of children with ASD. Social communication is defined as any function of communication other than requesting objects.

Methods

Search Strategy

A variety of electronic databases, including CINAHL, PubMed, Psych Info and Scholars Portal, were searched using the following terms:

> autis_ OR ASD OR "autism spectrum disorder" AND "AAC" OR "augmentative communication" OR "alternative communication" OR SGD OR "speech generating device" OR PECS OR "picture exchange communication system"

The reference lists of included studies were checked for additional articles. The search was limited to articles written in English between 1990 and 2017.

Selection Criteria

To meet inclusion, studies must have (a) included at least one child (less than 18 years) with a diagnosis of Autism Spectrum Disorder (b) used an AAC based

intervention (c) included peer mediated intervention (c) at least one outcome measure included a function of communication other than requesting objects and (d) when studies included participants with and without ASD, sufficient data was available to determine the treatment effect for the children with ASD.

Data Collection

Results of the literature search yielded identification of seven single subject, multiple baseline studies.

Results

Multiple Baseline Designs

The multiple baseline across subjects design is a subset of single subject designs. The objective is to measure changes in behaviour due to intervention by comparing them to a baseline measure. Because there can be large variability between individuals with the same diagnosis of ASD as well as between the types of AAC devices prescribed, a multiple baseline design is appropriate, as each participant acts as their own control. The gold standard when analyzing the results of single subject designs is to combine a non-regression measure with visual analysis, however visual analysis alone is still accepted in many peer reviewed journals. Caution must be taken when interpreting the results of single subject designs due to possible selection bias and small sample sizes (Geisler et al., 2009).

Cannella-Malone, Fant and Tullis (2010) investigated whether picture exchange AAC is effective at increasing the frequency of social communication of a six year old child with severe ASD. The participant's three year old TD sister served as the peer facilitator, and was trained to model greetings and use communication temptations to encourage social communication. Sessions occurred over 15 minute play sessions in the participant's home. The frequency of greetings, requests and responses were recorded. Visual analysis of results revealed modest increases in requests for objects and responses to questions. These gains were maintained at a one month follow-up. Greetings initially increased in frequency, then fell to baseline midway through intervention. Appropriate social validity measures were included.

While the resulting increase in communication was modest, the participant was not engaging in any functional communication with peers prior to intervention. As such, any improvements can be interpreted as meaningful. However it should be noted that the only function of communication assessed beyond requesting preferred objects was greeting, which was not maintained throughout intervention. The intervention method for training greetings was highly structured, and did not resemble natural age appropriate behaviour. Further, the authors did not differentiate between prompted and spontaneous communicative acts, all of which limits the external validity of the intervention. Overall, this study has equivocal clinical importance and shows equivocal validity that peer mediated intervention does not increase the frequency of greeting peers.

Chung and Douglas (2015) investigated whether training paraprofessionals to implement a peer intervention package would result in an increased frequency of social communication in three students with severe ASD (age 10-12 years). The paraprofessionals of the participants received 1:1 training (35-50 min) on how to facilitate peer interactions using prompting and modeling of social communication and were provided with speech generating device (SGD) instruction. The frequency of peer initiations and proximity of the student to the TD peers were recorded. The intervention was implemented during a 20 minute block of an integrated class. Visual analysis of results indicated that paraprofessional training resulted in a significant increase of peer initiations and reciprocal interactions and reliably increased the student's proximity to peers. The students with ASD also increased the duration of their presence in the integrated classroom by 62%. Appropriate social validity measures were included.

This study showed evidence that training paraprofessionals to facilitate peer mediated communication with children with ASD results in increased social communication and interactions with classroom peers. This study had a strong research design and naturalistic approach. Paraprofessionals required minimal training and follow-up to successfully deliver intervention. Overall, this study has compelling clinical importance and shows compelling validity that peer mediated intervention is effective in increasing the frequency of initiations and responses to TD peers.

Garrison-Harrell, Kamps and Kravits (1997) investigated the effects of using peer mediated intervention on language and social interaction skills in three students with severe ASD (age 6-7 years). Five TD students were recruited to form a peer network for each student. Peers were trained to use social strategies and communication modeling using paper based AAC over three scheduled play and academic activities. The duration and frequency of social interactions between the student with ASD and their peers were recorded. Visual analysis of results indicated that the frequency and duration of social interactions increased for all participants, with modest generalization between network activities. Appropriate social validity measures were included.

This study showed evidence that utilizing peer networks may be an effective intervention to increase social interactions of children with ASD. The authors included high-status peers in the formation of peer groups, used a combination of structured and unstructured activities based on the target students' preferences and peers were taught a variety of communicative strategies. Overall, this study has compelling clinical importance and shows compelling validity that peer mediated intervention increases the frequency and duration of social interactions.

Kravtis, Kamps, Kemmerer and Potucek (2002) investigated the efficacy of training picture exchange AAC with and without social skills training on increasing the duration of social communication in a 6 year old girl with severe ASD. The participant's mother, classroom teacher and TD peers at home and school served as facilitators. During social skills training TD peers were trained to facilitate turn taking, sharing, extending play turns and asking wh- questions during journal and center activities over 10 minute sample periods. The frequency and duration of social interactions were monitored. Visual analysis of the results indicated that AAC training alone resulted in increases in all variables compared to baseline. The results of AAC combined with social skills training resulted in an additional increase in the duration of social interactions.

Social skills training was an adjunct to this study, added as follow-up sessions. No information was provided regarding who served as peer facilitators at school, whether peers were consistent across sessions, nor the quantity of training provided. Further, the peers only participated in the follow-up sessions, the student's teacher and mother facilitated the initial AAC training. These variables limit the conclusions which can be drawn from the efficacy of the social skills training. As the authors did not provide sufficient information to replicate the peer intervention, this study has equivocal clinical importance and shows equivocal validity that peer intervention will increase the duration of social interactions.

Strasberger and Ferreri (2013) investigated whether a peer mediated intervention is effective in increasing social communication of four nonverbal males with ASD (age 5-12 years). Participants were trained to use a SGD in an analog setting. A TD peer attended one training session to learn how to use the SGD and communicate with the student with ASD. During intervention, the student was given 10 opportunities per session to request preferred objects. The frequency of independent requests for objects and responses to questions were recorded, along with a measure of generalization to another environment. Visual analysis of results indicated that three of four participants met criterion for requesting objects, of which two participants met the criterion for responding to peers, showed generalization of communication skills to a new environment and showed maintenance one month later. Appropriate social validity measures were included.

The present study shows some evidence that peer mediated intervention may be effective in increasing the frequency of communicative acts in children with ASD. However the social function of communication included in the current study, answering 'What is your name?', has limited social value in a natural environment. Further, only communicative acts using AAC were accepted, discounting socially appropriate verbal and gestural responses, which decreases the external validity of this study. Overall, this study has equivocal clinical importance and shows equivocal validity that peer mediated intervention increases meaningful social communication in children with ASD.

Trembath, Baladin, Togher and Stancliffe (2009) investigated whether a peer-mediated naturalistic approach to teaching AAC was effective in improving social communication in three pre-school aged children with non-verbal ASD (age 3-5 years). Investigators trained two teacher nominated peers (age 3-5 years) to implement naturalistic teaching techniques with and without speech generative devices during 10-minute play activities. The frequency of communicative acts was recorded, as well as generalization of skills to another activity. Statistical analysis of results revealed that naturalistic teaching resulted in significantly more communicative acts compared to baseline. Naturalistic teaching combined with a SGD had a larger effect size compared to naturalistic teaching alone, however the degree to which the increases were maintained throughout intervention varied between participants. Generalization probes showed a slight increase in communicative acts compared to baseline.

The participants in the current study had no previous experience with AAC, and were given devices with identical vocabulary, increasing comparison between participants. The intervention was naturalistic and utilized simple instructions. Gold standard statistical analysis and study design allowed intervention data to be objectively compared to baseline data in order to support the intervention effect. A limitation of the current study is that all AAC training was delivered by peers and that peers were only taught one strategy of how to communicate with the children with ASD. Overall this study has compelling clinical importance

and shows compelling validity that children as young as three can be taught strategies to increase the frequency of social communication in preschoolers with ASD.

Trottier, Kamp and Mirenda (2011) investigated whether peer mediated instruction to teach AAC is effective in increasing the frequency of social communication in two 11 year old males with non-verbal ASD. Both students were currently using a SGD to make requests, but not for social communication. Three TD peers (age 11-12 years) were selected to be trained to model and prompt social communication using the SGD during 7-13 minute play sessions consisting of social game routines in an analog setting. The frequency of spontaneous and prompted communicative acts was recorded. Statistical analysis of results revealed a fair to high level of change in spontaneous communicative acts and a high level of change for prompted communicative acts. Appropriate social validity measures were included.

The strengths of the current study include controlling for the participants' competency using AAC, differentiating between spontaneous and prompted communicative acts, as well as including a measure of the social appropriateness of the communication. The TD peers were able to deliver the intervention with minimal prompting from the investigators. Gold standard statistical analysis and study design allowed intervention data to be objectively compared to baseline data in order to support the intervention effect. However, as intervention activities were highly structured, the external validity is limited. Overall this study has compelling clinical importance and shows suggestive validity that peer mediated AAC instruction results in increased frequency of social communication in children with ASD.

Discussion

This review analyzed seven studies to determine the efficacy of using peer mediated AAC interventions to improve social communication in children with ASD. In all of the studies, the participants and intervention settings were clearly and operationally defined. Although the studies yielded varying levels of validity and clinical importance, the overall results suggest that there is emerging evidence that peer mediated AAC intervention may be effective.

Without additional support, children with ASD are unlikely to engage in successful interactions with their TD peers. This is evident in the baseline measures of all seven studies, which show a low frequency and short duration of communicative acts prior to intervention. Kravatis and colleagues (2002) and Trembath and colleagues (2009) both found evidence to support that peer facilitation combined with AAC intervention is more effective than either intervention alone. These findings suggest that an effective intervention for non-verbal children with ASD must not only increase the frequency of communicative acts, but must also focus on training TD peers how to recognize and respond to the communication attempts made by children with ASD in order to lead to successful social interactions.

Five of the studies included surveys from TD peers, classroom staff, and parents to support the social validity of the interventions. While surveys are generally considered weak evidence in supporting the effectiveness of an intervention, in this case the surveys related specifically to whether the conversational partners found the social interactions with the children with ASD to be successful and meaningful, providing an appropriate measure to the social validity of the interventions. Overall, the social validity measures indicated that peers enjoyed participating and helping the student with ASD communicate (Chung & Douglas, 2015; Trottier et al., 2011), that the social standing of each child with ASD increased both within and outside the assembled peer groups (Chung & Douglas, 2015; Garrison-Harrell et al., 1997), and that school staff and parents generally found the interventions to be helpful and effective (Canella-Malone et al., 2010; Chung & Douglas, 2015; Strasberger & Ferreri, 2013). These results support that a peer mediated approach may lead to meaningful change in social communication.

Children with ASD often exhibit disruptive behaviour, placing constraints on the time they can functionally participate in an inclusive classroom. However, removal from an inclusive classroom further limits their exposure to natural models of age appropriate social communication (Chung et al., 2012). Two studies (Garrison-Harrell et al., 1997; Trottier et al., 2011) included a measure of the social appropriateness of the participant's behaviour. Overall, they found that intervention resulted in a decrease of disruptive behaviour, and a slight increase in appropriate social behaviour beyond intervention tasks. These findings provide suggestive evidence that meaningful interactions with TD peers improves not only the quantity and duration of interactions, but also the quality of the interactions.

Intervention was shown to be effective in both structured (Canella-Malone et al., 2010; Garrison-Harrell et al, 1997; Kravatis et al., 2002; Strasberger & Ferreri, 2011; Trottier et al., 2011) and natural environments (Chung & Douglas, 2011; Garrison-Harrell et al, 1997; Trembath et al., 2009). Further, Trottier and colleagues (2011) replicated the

intervention approach used by Trembath and colleagues (2009), demonstrating that the same intervention is effective in both environments. Combined, these studies provide further support that teaching social strategies to TD peers can be effective in both push-in and pull-out models of speech-language pathology (SLP) intervention.

Many of the interventions outlined required an acceptable amount of training and resources in order to be implemented within a school setting where there is an SLP and paraprofessional support (Chung & Douglas, 2015; Strasberger & Ferreri, 2015; Trembath et al., 2009; Trottier et al., 2011). Additionally, Chung & Douglas (2015) demonstrated that paraprofessionals could successfully facilitate a peer mediated intervention after a single training session, reducing the amount of direct SLP involvement required to adequately support the communication of a child with ASD. These findings are significant as most school board SLPs have large caseloads, limiting the time available to deliver therapy to individual students.

Limitations

Only two of seven studies (Trembath et al., 2009; Trottier et al., 2011) met the gold standard of statistical analysis. As the majority of the studies lacked objective statistics, the confidence in which overall conclusions can be made are limited.

The relative lack of generalization probes is another limitation within this body of research. It is well known that individuals with ASD have difficulty transferring learned skills to new environments (Haring & Breen 1992). Training TD peers to support the social communication of the child with ASD is a clever way around this challenge. Classmates in primary schools remain consistent from day to day, and are able to model appropriate social communication in a variety of environments (ex. library, snack time, art class). It is therefore important to know whether relatively young TD peers are able to continue to use the communication strategies they were taught beyond the intervention setting. Only two studies (Trembath et al., 2009; Strasberger & Ferreri, 2013) included a measure of generalization to assess carry-over of treatment effect in another environment, which provided weak evidence that peers continued to use their strategies in other contexts.

There is a potential confound within the operational definition of a social interaction in two of the studies which may underestimate the efficacy of the interventions (Garrison-Harrell et al., 1997; Trottier et al, 2011). In these studies, an interaction was defined as ending after 5 seconds without a response from any communicative partner involved in the interaction. However, within a single on-going interaction there may be several exchanges of conversational turns. Because the coding system used in these studies was unable to record the quantity and complexity within an on-going interaction it limits the conclusions which can be drawn about the improvements in social communication found in these studies.

Finally, the goal of this paper was to assess the literature for evidence that peer intervention supports the social communication development of children with ASD. Social communication was defined as any function of communication other than requesting objects. Most of the studies included in this review counted the frequency of all communicative acts, and did not dissociate between requesting preferred objects (behavioural regulation) and social communication. As such, it was not possible to determine with confidence that the interventions were in fact resulting in improved social communication, when looking only at that frequency and duration of communicative acts. However, when considering the intervention results together with the social validity measures there is suggestive evidence that there is a meaningful change in social communication as a result of intervention. It is important that future studies tally the functions of communication alongside the frequency of interactions in order to address this significant limitation.

Clinical Implications

Despite the limitations within each of the studies, the overall evidence provides emerging evidence to support the efficacy of peer mediated intervention in supporting social communication development of children with ASD who use AAC to communicate. Further, there is weak evidence to support that paraprofessionals can be trained to facilitate peer intervention with minimal support from an SLP. Peer mediated intervention may therefore be appropriate to implement in schools with SLP and paraprofessional support, with children diagnosed with ASD who attend an inclusive classroom for at least part days. Because of the potential interaction between social communication development and positive, quality interactions with TD peers, it is essential to continue studying treatment effectiveness, generalization and maintenance.

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