

Critical Review:
Effectiveness of functional communication training using augmentative and alternative communication on the challenging behaviour of children with autism

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This critical review examines the effectiveness of functional communication training using augmentative and alternative communication on the challenging behaviour of children with autism. A literature search using computerized databases was completed resulting in 5 articles meeting the inclusion criteria. Study designs include: single subject designs and a systematic review. Overall, the research indicates that functional communication training using augmentative and alternative communication is effective in decreasing challenging behaviour. Recommendations and clinical implications are also discussed.

Introduction

Children with autism spectrum disorders experience delays in social skills, communication and emotional regulation. Often, verbal language is atypical or absent. Many children with autism also exhibit maladaptive or challenging behaviours such as aggression, self-injury and tantrums to communicate. These behaviours provide a challenge to parents, teachers and speech-language pathologists. These behaviours also put many children at risk for social isolation and losing their integrated school placements (Frea et al., 2001). Therefore, it is important to develop functional communication for children exhibiting these challenging behaviours.

Functional communication training (FCT) involves teaching communication responses that are intended to serve the same function as the child's challenging behaviour. FCT involves both the assessment of the function of the challenging behaviour and teaching a more appropriate form that serves the same function. Many FCT studies have involved children who used speech as a primary mode of communication. However, there is an increasing body of literature that has applied FCT to children who use augmentative and alternative communication (AAC) (Mirenda, 1997).

Speech-language pathologists have increasingly turned to AAC devices in order to provide strategies for improving communication (Frea et al., 2001). For children with complex communication needs, AAC devices may decrease the user's response effort, and therefore may increase the likelihood that the challenging behaviour will be replaced with a more appropriate form (Olive et al., 2008). A variety of AAC devices have been used with FCT, including

sign language, Voice Output Communication Aid (VOCA), Picture Exchange Communication System (PECS), Speech Generating Device (SGD) and Natural Aided Language (NAL). These devices give children with autism a method for expressive communication.

The development of intervention strategies to reduce challenging behaviours is a high priority objective in the clinical management of autism spectrum disorders. One avenue for exploration is functional communication training using AAC.

Objectives

The primary objective of this paper is to critically evaluate existing literature regarding the effectiveness of functional communication training using AAC on the challenging behaviours of children with autism.

Methods

Search Strategy

A variety of computerized databases, including PubMed, Scholars Portal, and Medline were searched using the following terms:

(autism) OR (ASD)
AND (challenging behaviour) OR
(problem behaviour)
AND (AAC) OR (augmentative
and alternative communication)
AND (FCT) OR (functional
communication training).

The search was limited to articles written in English between 1990 and 2011.

Selection Criteria

Studies selected for inclusion in this critical review paper were required to investigate the treatment effects of functional communication training using AAC on the challenging behaviour of children with autism. There were no limits set on the demographics of the research participants or outcome measures.

Data Collection

The results of the literature search yielded the following types of articles congruent with the aforementioned selection criteria: single subject design (4), and a systematic review (1).

Results

Single-Subject Designs

Single-subject designs are appropriate methods for testing hypotheses related to autism and challenging behaviours due to the heterogeneous nature of this population. Also, single-subject designs are appropriate to use when attempting to determine treatment effects. Interpretation of the results from this design must be made cautiously because of the small sample size and unique characteristics of the participants.

A study conducted by Franco et al. (2009) used a single-subject design to examine the effects of FCT using an SGD programmed with multiple messages on the challenging behaviours (inappropriate vocalizations) maintained by multiple functions. The participant in this study was a child with autism aged 7 years, 6 months. An ABA, multiple-baseline design across two settings (playground and gymnasium) and over 19 5-minute sessions was used to address the question. It was not stated how participant eligibility or appropriateness for treatment was determined. During baseline sessions, the participant was observed in each setting and the teachers were instructed to interact with the participant as usual. The SGD was not present. The occurrence of challenging behaviours was tallied. Inter-observer agreement (IOA) data was collected by the teachers. Mean IOA during generalization in the gymnasium was 98% and mean IOA during generalization on the playground was 100%. Prior to the intervention stage, the participant was taught to use the SGD using a prompt-fade procedure. The SGD was used to teach the participant to request an item and to use the escape function. Independent use of the SGD was defined as activation of the appropriate message within three seconds of presentation of the device. The criterion for mastery was independent use of the device for five consecutive trials. During the intervention sessions, the SGD was presented to the

participant with no additional prompts. During follow-up sessions, three months post-intervention, maintenance data were collected.

During baseline in the gymnasium, engagement was low (range= 0% to 10%) and challenging behaviour was high (M= 88%). After the SGD was introduced, the challenging behaviour decreased (M= 40%) and engagement increased (M= 59%, range= 33% to 68%). During baseline on the playground, engagement was low (M= 2%, range= 0% to 3%) and challenging behaviour was high (M= 94%). During the intervention sessions, after the SGD was introduced the challenging behaviour decreased (M= 28%) and engagement increased (M= 68%, range= 50% to 83%). During follow-up sessions in the gymnasium, challenging behaviours remained low (M=6%) and engagement remained high (M= 73%, range= 63% to 87%). During follow-up sessions on the playground, challenging behaviours also remained low (M= 10%) and engagement remained high (M= 77%, range= 70% to 87%).

The researchers of this study controlled for average months post treatment, the settings and the functions of challenging behaviours. Franco et al. (2009) presented clearly a description of the outcome measures; however, they did not describe specific instructions for teaching a participant to use an SGD with multiple functions. The researchers established an appropriate baseline by including at least three data points in which to measure change. Furthermore, all measures were linked to treatment. In regards to data analysis, the researchers did not complete a statistical analysis of the single-subject data. Ecological validity of the intervention is shown by the maintenance data in the follow-up sessions.

Despite weaknesses in the study, such as a small sample size and no statistical data, there is a moderate level of evidence offered by this study. Based on the findings of this study, the use of FCT with an SGD results in decreased challenging behaviours maintained by multiple functions and increased engagement across settings.

Olive, Lang and Davis (2008) conducted a single-subject design to examine the effects of FCT using a VOCA on the challenging behaviour, requesting and language development of a 4-year-old child with autism. Participant eligibility criteria were not specified. A standardized test battery used to assess language was administered pre and post treatment. All 32 sessions were 5-minutes in length. A frequency count of challenging behaviour and VOCA use was taken during each session. Fidelity of

treatment implementation was measured by: counting the mother's correct and incorrect use of prompting the participant to use the VOCA, implementation of extinction following challenging behaviour, and providing reinforcement for the replacement behaviour. Intervention procedures were implemented correctly on 95.9% of occasions. Training to code behaviours for evaluators occurred until an IOA over 90% was obtained. A pre and post treatment measure of the Behaviour Intervention Rating Scale (BIRS) was used to measure social validity of the intervention by determining the participant's mother's attitudes towards FCT. A functional analysis revealed the participant's behaviour was reinforced by her mother's attention when her mother was away from the play activity.

A multiple-baseline design across four activities and visual analysis were used to analyze the intervention effects. Statistical evidence was not reported, and although this does not allow for comparison to other studies or treatment methods, it is acceptable for this type of study. During baseline, the participant was asked to complete an activity alone while her mother was busy doing chores. The VOCA was present; however, no instructions were provided for its use and its use was not reinforced or acknowledged. Any challenging behaviour was reprimanded by her mother. Prior to the intervention phase, the participant's mother was taught how to implement FCT. Coaching was gradually faded and all coaching ceased during the final 10 sessions of the study. The intervention phase was identical to baseline except that the participant's mother began the activity by sitting next to the participant. Her mother verbally informed the participant that she was leaving and then left the activity. She returned immediately and prompted the participant to push the appropriate button on the VOCA (e.g., "I want you to play with me"). After the participant pushed the button, her mother reinforced the message by repeating the message and rejoining the activity. Prompting was gradually faded.

Implementation of FCT with the VOCA resulted in a decrease in challenging behaviour across all four activities (to zero or near zero levels), demonstrating generalization. This intervention also resulted in an increase in requesting and an increase in correct pronoun use (possibly as a result of self-modeling with the VOCA). The social validity data obtained from the BIRS revealed the mother's perception of the intervention as acceptable and effective.

The analysis and methods of this study are described clearly and in sufficient detail, which allows for

replication. The researchers established an appropriate baseline by including at least three data points across each setting, allowing the researchers to measure change. This study has several limitations that should be considered when interpreting results. These limitations include: lack of statistical analysis, involving only one participant (limiting generalizability to other children), coders were not blinded to the purpose of the study (limiting the findings of the decreased pronoun reversals), and there was no experimental control for the observed changes in correct pronoun use or for standardized assessment results. Therefore, the changes in language observed may not be attributed to the intervention. However, the reduction in challenging behaviour and the increase in requesting is linked to treatment.

The level of evidence offered by this study is high due to the appropriateness of the study design, the measures used and the analysis completed. This study revealed that FCT combined with a VOCA was effective for decreasing challenging behaviour, increasing attention requesting, and possibly increasing correct pronoun use. In addition, the results of this study reveal that a VOCA used with FCT is effective for reducing the challenging behaviour of children who may not be considered candidates for AAC because they have spoken language.

A study conducted by Frea, Arnold and Vittimberga (2001) investigated the effects of picture exchange on the aggressive behaviour of a 4-year-old child with autism who was at risk of losing his integrated school placement. The participant selection criteria were not included in this study. Employing a multiple-baseline, single-subject design, the participant was taught to use PECS in two settings. The number of occurrences of challenging behaviours and the number of picture communication responses were calculated in each setting. Ten-minute sessions were conducted in each setting during each day. It was not clear how many days occurred during the baseline phase or the intervention phase.

During baseline, the participant was allowed to play and interact with his peers. No instructions were given and the picture symbols were kept in view and in reach throughout the sessions. Aggressive behaviour was stopped by the experimenter. Following baseline, two one-hour training sessions were conducted to teach the participant phase 1-3 of PECS. The intervention sessions were identical to the baseline sessions except for an initial verbal prompt to make a request. Once a request was made, no

further prompts were given. IOA was 94% for challenging behaviour and 100% for picture communication responses.

The results of this study revealed that aggressive behaviour decreased across settings when PECS was introduced to play activities and was no longer occurring after six days. The number of occurrences of picture communication was found to increase across settings. These results further support the need for communication to be considered a primary goal for children with challenging behaviour.

The researchers established an appropriated baseline by including at least five data points. Limitations of this study were noted, including: a small sample size and lack of experimental precision. Several variables were not tightly controlled, which included: increased engagement with the teacher during the intervention phase and the amount of time the participant was allowed to consume the requested item was different in each session. These variables may have had an effect on the number of aggressive behaviours. The treatment proceedings are clearly described in a way that is easily understood and allows for replication of the study. The outcome measure of decreased aggressive behaviour is directly related to the research question and the treatment method. Therefore, it is considered an appropriate measure. The researchers used visual interpretations of graphs for analysis. Statistical evidence was not reported, which is acceptable for this type of study.

Despite weaknesses in this study, such as a small sample size and no statistical data, there is a moderate level of evidence provided which lends support for the effectiveness of FCT using PECS for decreasing challenging behaviour of children with autism.

Cafiero (2001) conducted a single-subject, AB design study with a 13-year-old participant with autism. This study was conducted to examine the effectiveness of natural aided language in the classroom on challenging behaviour. During the baseline condition, prior to the natural aided language intervention, the participant used a picture-based reinforcer choice board. No language input was provided by communication partners. During the first two weeks of the intervention phase, the school staff was trained in natural aided language. Intervention involved modeling and using natural aided language with the picture board in conversation with the participant. Event recordings of the participant's communicative interactions (initiations and vocabulary) occurred daily. It was not clear how many days occurred during the baseline phase or the intervention phase.

Reliability of the joint data collection was determined informally. Results of the study revealed an increase in communication (language board vocabulary) in multiple environments. Mean baseline levels of challenging behaviour remained stable over time, regardless of the reinforcers used (bolting: M= 8 occurrences/day; tantrum: M= 4 occurrences/day). After the intervention phase, the challenging behaviour decreased (bolting: M= 3 occurrences/day; tantrum: M= 2 occurrences/day). This study suggests that managing behaviour through visual negotiation (e.g. giving a verbal and visual reason for a denial to a request) may be an effective strategy.

The results of this study need to be interpreted with caution as it is an isolated classroom based study. The effectiveness of this intervention needs a more methodical study with more clearly defined descriptions of behaviours and intervention procedures. The researchers of this study did not control for the therapy setting, session durations, or the functions of challenging behaviours. The participant selection criteria for the study were not included. The gains in positive behaviours were an unexpected benefit of this intervention. The behavioural improvements may not be directly linked to treatment. The school staff's new perception of the participant may have influenced the content of the curriculum as well as their more positive attitude toward the participant. As a result, the staff may have worked more diligently with the participant. In regard to data analysis, the researchers did not complete a statistical analysis of the single-subject data. Informal tallies were used to measure the mean incidences of behaviours per day.

Evidence from this study was judged to be equivocal based on the lack of multiple-baseline design, a small sample size, low reliability of data collection, and a lack of statistical analysis. Based on the findings of this study, the use of natural aided language results in a decrease in challenging behaviours, an increase in vocabulary and improved language processing.

Systematic Review

Systematic reviews are useful for summarizing primary research evidence and are considered suitable methods to use when attempting to determine the effectiveness, feasibility and appropriateness of interventions related to autism and challenging behaviour.

Miranda (1997) conducted a systematic review of the empirical evidence demonstrating the effectiveness of FCT using AAC. This review also identifies the need for further research. The 21 studies reviewed

included FCT/AAC interventions for 52 participants. Miranda provided a detailed description of the participants, including gender, diagnosis, communication skills, and a description of the challenging behaviours exhibited. The author also gave a detailed description of the assessment strategies and settings used in the studies included in this review. The results suggested that the assessment strategies summarized in this review could potentially be used in a variety of environments. The results of the assessment processes used with the 52 participants revealed that the most common functions of behaviour were escape (56% of participants) and attention/tangibly motivated behaviours (31% each). This review also provided a detailed description of the variety of AAC devices used across the 52 participants. The most commonly used technique was manual signing (37% of participants). A variety of instructional techniques were used in the FCT/AAC studies reviewed. The choices of techniques used depended on the focus of each particular study. These techniques included strategies to teach new communicative behaviours, consequences for challenging behaviours, and teaching schedules and settings (e.g., the studies suggested that FCT/AAC instruction should be implemented throughout the day in a natural setting).

The results of this review revealed that FCT/AAC interventions resulted in an immediate decrease in the frequency of challenging behaviour for 85% of the participants. Generalization measures were evident for less than 25% of the participants. Miranda hypothesized that this may be due to the fact that the purpose of many studies included in this review was to explore a specific aspect of the FCT/AAC intervention and not generalization. Follow-up data was provided for 46% of the participants in this review. These data revealed the frequency of challenging behaviour remained low for all but two of these participants. According to the research reviewed, Miranda determined that both generalization and maintenance of new communicative behaviours can be improved by providing instruction in natural settings, distributing practice trials, and selecting FCT/AAC behaviours that are efficient, acceptable, and recognizable by others.

Miranda clearly describes the inclusion criteria as well as the search strategy used to identify the studies in this review. The focus of this review was on the individual participants of each study and the strategies used. There was no statistical analysis completed. Despite this weakness, the level of evidence is high, given the high validity and clinical

relevance. This review determines that FCT/AAC interventions should be the first considered for those who engage in challenging behaviours.

Discussion

Children with autism spectrum disorders represent a heterogeneous population; therefore, skill profiles may vary from child to child. As a result, this is a difficult population to study. Despite this, the literature is suggestive that functional communication training using AAC is an effective treatment for decreasing the challenging behaviour of children with autism. The studies reveal that this intervention is effective for both verbal and nonverbal children. The studies reviewed showed that a variety of AAC devices can be effective for decreasing challenging behaviours. The selection of a device should be based on the individual's needs. The study by Franco et al. revealed that FCT using an SGD resulted in generalization across two different settings and maintenance of results after intervention. In addition to decreasing challenging behaviour, this intervention resulted in an increase in engagement across two settings. This study was the first to reveal that an SGD can be used for multiple functions of challenging behaviour.

The study by Olive et al. revealed the effectiveness of a parent implemented intervention consisting of FCT using a VOCA for decreasing challenging behaviour, increasing requesting and possibly increasing correct pronoun use, as well as improvements of language and social skills. Social validity data revealed a parent's perception of the intervention as acceptable and effective. The participant in this study also revealed both stimulus and response generalization. The study by Frea et al. revealed the effectiveness of PECS for decreasing challenging behaviours in the classroom and increasing picture communication. Therefore, increasing opportunities to make choices has been proven to be successful in decreasing challenging behaviours. In addition to improved language processing, increased vocabulary and creating a more effective learning environment, the study by Cafiero revealed that NAL resulted in decreased challenging behaviour. The systematic review conducted by Miranda revealed that FCT using AAC was effective in reducing challenging behaviours.

Despite some weaknesses of the studies reviewed, including a small sample size, a lack of information regarding statistical analysis and a lack of participant eligibility criteria, the results indicate that FCT using

AAC is an effective intervention strategy in the clinical management of autism spectrum disorders.

Future research considerations:

It is recommended that further research be conducted to provide additional information regarding the impact of FCT/AAC interventions on challenging behavior. In future studies of challenging behaviour interventions, the following recommendations should be considered to strengthen the level of evidence:

- a) Future research studies should involve more than one participant and include participants of different ages, cultural backgrounds, and severity of autism.
- b) Future studies should examine the effects of FCT using AAC on individuals other than those with developmental disabilities, including adults with degenerative illnesses, traumatic brain injuries and individuals with sensory-motivated behaviours.
- c) Researchers should utilize both statistical analyses and visual interpretations of graphed results to compensate for limitations of both types of analysis.
- d) Studies should investigate the procedures for selecting FCT/AAC techniques that improve response recognisability as well as the techniques for instruction and for responding to challenging behaviour that occurs during instruction.
- e) Studies should investigate the impact of teaching generic messages versus specific messages on speed of acquisition, caregiver responsiveness, generalization across settings and communication partners, and maintenance.
- f) Future research should develop outcome measures in addition “to the effect of intervention on challenging behaviour”. These may include: the effect on language and social skills, the effect on vocabulary development, the effect on peer interactions, the effect on participation in integrated activities, and participant quality-of-life measures.

Conclusion

The development of intervention strategies to manage challenging behaviours is a high priority in the management of autism spectrum disorders. The

evidence of intervention targeting this area is compelling. The literature is suggestive that functional communication training using AAC results in a decrease in the challenging behaviours of children with autism. These results support the need for communication to be considered a primary goal for children with challenging behaviour.

Clinical Implications

Behaviours serve a communication function and are, therefore, an important area of concern for a speech-language pathologist. Children with autism often exhibit maladaptive or challenging behaviours to communicate. SLPs need to be prepared to address challenging behaviours. The articles in this review provided a moderate level of evidence as well as important findings for which to direct future research. Based on the findings of this review, FCT using AAC can be applied to clinical practice and should be one of the first interventions used for children with autism who exhibit challenging behaviour.

While the current critical review did not identify one effective teaching strategy or AAC device for all challenging behaviour, clinicians must consider the heterogeneity of the disorder. Therefore, an individualized intervention approach must be used. Speech-language pathologists must familiarize themselves with the assessment and intervention strategies of FCT using AAC in order to achieve more positive outcomes. Based on the potential impact of challenging behaviour on quality of life, it is imperative to continue studying treatment effectiveness, generalization and maintenance.

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