Critical Review: What Influence does Applied Behavior Analysis Intervention have on Language and Communication Development in Children with Autism Spectrum Disorder?

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This critical review examines the evidence regarding Applied Behavior Analysis as it relates to language and communication development in young children with autism spectrum disorder. The research includes single –subject, between groups, case study and case control study designs. Overall, the examined research in this review provides tentative evidence to support ABA treatment. Recommendations for future research and clinical practice are provided.

Introduction

Autism is a disorder "characterized by severe social, communicative and cognitive deficits" (Zanchor, Ben-Itzchak, Rabinovich & Lahat, 2007). Recent prevalence estimates have been reported as 20–40 cases per 10,000 births (Fombonne, 2003) and as high as 100 per 10,000 live births for the broader autism spectrum (Baird, 2006). With or without intervention the core deficits of ASD can result in long-term detrimental effects for children who carry the diagnosis.

Applied Behavior Analysis (ABA) is a treatment approach that has gained popularity and credibility over the years and has some of the best-documented outcomes in comparison to other methods (Jacobson, 2000). The approach, which is based on scientific principles of behavior, aims to remediate the core social and communication deficits by using systematic, step-by-step teaching of prompts and reinforcements and later practicing skills in more unstructured situations (Zanchor et al, 2007). To date however, few empirical studies aimed solely at documenting the effectiveness of ABA therapy on the language and communication of children with autism spectrum disorder exists (Hilton, 2005).

Because communication and language delays and deficits are observed in children with autism spectrum disorder, Speech-Language Pathologists have an important role in guiding the treatment of these children and their families. These decisions should be guided by the strengths and weaknesses of inventions, particularly with respect to communication development (Richard, 2000). However, there currently exists a need for further information regarding effective treatment outcomes on the language of children with ASD to help guide clinical decision-making (Hilton, 2005).

Objectives

The primary objective of this paper is to critically evaluate existing literature on how Applied Behavior Analysis (ABA) intervention influences language and communication development in children with autism spectrum disorder (ASD). The secondary objectives are to provide future research recommendations, as well as supplement the existing knowledge of ABA intervention, in order to guide the clinical practice for Speech-Language Pathologists who work with children with autism.

Methods

Search Strategy: Articles related to the topic of interest were found using the computerized databases SCOPUS and EMBASE. Keywords used for the database search were as follows:

> (autism AND "ABA" AND language) as well as (autism* and "applied behavior analysis" and language).

The search was limited to those articles written in English.

Selection Criteria: Studies selected for inclusion in this critical review were those that directly cited "Applied Behavior Analysis" as an intervention method. Articles that used treatment interventions comprised of individual ABA principles (i.e. discrete trial training, incidental teaching, intensive behavior treatment) were not included in this review because of its limited scope and it's primary objective of examining ABA outcomes with respect to language and communication.

Data Collection: Results of the literature search yielded four articles congruent with the aforementioned selection criteria. The studies

employed the following designs: single –subject (1), nonrandomized clinical trial [between groups] (1), case study (1) and case control study (1).

Results

<u>Single-Subject Studies</u>

Single-subject studies afford researchers the chance to learn more about active interventions and subsequently generate new ideas for treatment. However, limited number of participants in these studies greatly reduces ability to generalize treatment outcomes to other non-participant cases.

Hilton and Seal (2007) conducted a single-subject project on monozygotic twin boys aged 2;4 diagnosed with autism and presenting with severe speech and language delays. One twin received ABA directed sessions consisting of five activities presented as single, simple-step, discrete tasks while the clinician signed the noun. The second twin received a Developmental Individual-Difference Relationship (DIR) approach, which allowed the child to participate in sessions through self-directed activity while the clinician commented on the child's choice with concurrent signing and prompting.

Pre- and post-testing was completed using the Communication Symbolic Communication Scales (CSBS). At the onset of treatment, CSBS scored indicated a difference among the participants, which raises cautions about the homogeneity of subjects and how reliably treatment outcomes can be compared. Post-intervention evaluation showed slight gains in composite scores for the ABA child and slight losses for the DIR, with the ABA child demonstrating greater (in particularly for gestural and vocal communication as well as social-affective signaling) overall improvement following intervention. These findings are suggestive, however the use of the CSBS to conclude causal relations should be done with caution, which indicates a potential limitation of the chosen measurement tool.

The short duration of the study raises question with respect to the treatment's ability to evoke change and exemplify the full benefit of ABA therapy. Nonetheless, this study's simplified ABA and DIR approach focuses on communication outcomes which speaks directly to the nature of this review and as such indicates that whatever findings presented here, however limited, contributes suggestive evidence and consideration for guiding clinical practice on ABA. Additionally, this study's comparison of two approaches contributes evidence that is equivocal and begins to develop an understanding of how ABA treatment stacks up to other treatment modalities with regards to communication outcomes.

<u>Nonrandomized Clinical Trial (Between Groups)</u>

In nonrandomized clinical trials, participants are not randomly assigned to a treatment group but rather are assigned to an intervention group based on specific factors outlined by researchers. These treatment groups are then compared, however the ability to generalize findings are constrained by factors that limited randomization of subjects.

Zachor, Ben-Itzchak, Rabinovich & Lahat (2007) conducted a between-group study of children 3-years of age and younger who met DSM-IV criteria for Autism Spectrum Disorder. Two intervention approaches, each one year in length, were conducted: an Eclectic Developmental (ED) group (n=18) and an ABA treatment group (n=19). The ED treatment was comprised of various approaches (mainly The Treatment and Education of Autistic and Related Communication Handicapped Children, DIR and ABA). In contrast, the second approach relied solely on ABA principles (including discrete trial training, naturalistic and incidental teaching) in 1-on-1-treatment with a behavior therapist for 35 hours a week.

Prior to intervention, participants were closely matched for age, severity and cognitive level so that no significant differences (other than country of residence) were evident between groups. Baseline measurement was gathered via the Autistic Diagnostic Observation Schedule (ADOS), cognitive testing and the Autistic Diagnostic Interview (ADI) and follow up included four composite scores of the ADOS. A one-way MANOVA completed on the baseline ADOS scores revealed no significant differences (p= 0.359) between groups. Following intervention, a 2 x 2 MANOVA was completed that yielded a significant time-effect (p < 0.01) as well as 'time x intervention' differences (p < .05). Application of a univariate ANOVA to each separate domain indicated significant language and communication differences between the ABA and ED group (p < .01), in favor of the ABA group. This statistical measure was appropriate to highlight the different group effects on the skill of interest, mainly language and communication. Based on these findings, this study contributes a suggestive evidence for ABA's positive effect on the topic of interest, which should be interpreted with caution with respect to clinical practice.

An asset of this study is it's comparison of ABA and ED approaches. Comparative findings are limited based on the disparity of direct treatment time received by both groups. The intensive nature of the ABA treatment in contrast to the ED group potentially sways data in favor of ABA treatment. As well, inclusion of ABA principles in the ED approach may further influence treatment outcomes and threaten internal validity. Despite these inherent weaknesses a relatively large sample size and special care to matching subjects ensures homogeneity of groups and while this comparison does not directly speak to the purpose of this critical review, it provides a layer of equivocal evidence in support of ABA treatment over the ED approach.

Case Studies

Case studies provide researchers a chance to closely examine disorders with mixed characteristic sets or those that are comprised of individual cases such as in autism spectrum disorder. However, external validity of such research findings is limited in generalization to the greater disorder population.

Green, Brennan and Fein (2002) conducted a comprehensive case study of a young girl "at risk for autism spectrum" (Green et al, 2002) who presented with social and communication skill regression at the age of 12 months. A three-year intensive ABA program was conducted for 25-36 hours a week in various settings. Standardized testing completed prior and following treatment, as well as informal measures of target and non-target behaviour was conducted. At five years of age the participant was functioning age-appropriately in receptive and expressive language, as well as on communication and socialization and so no longer met criteria for autism classification.

A major weakness of this study is the absence of an official diagnosis in the young participant, which is acknowledged and refuted by the author. The author argues that a number of experienced, seasoned professionals agreed on the child's risk for developing autism in addition to an existing family history of the disorder making the diagnosis reliable and valid.

This extensive case study relied on comprehensive observation data measuring target and non-target skills (not directly related to communication), as well as standardized testing of language and communication (mainly the Preschool Language Scale and Vineland Adaptive Behavior Scale) at the onset and completion of intervention. Replication of continuous improvement across

various targeted skills by independent evaluators supports ABA's effectiveness in this study. This does not supplement the use of a control subject, which was not feasible due to ethical considerations, however it improves the reliability for attributing changes to the treatment provided. Absence of statistical analysis is common in case study design however it places limitations of interpretation of findings. Post-intervention data suggests support for ABA treatment with respect to language and communication, however study limitations imply caution should be taken in interpreting these findings in clinical practice.

Case-Control Studies

Case-control studies are appropriate research designs for rare disorders or those that are comprised of diverse characteristics. While autism is not rare, its broad spectrum allows for a number of different features and cases in individuals with the disorder.

Hilton (2005) conducted a six-week case-control study documenting changes in communication skills of children (n=10) diagnosed with autism or Pervasive Developmental Disorder (PDD-NOS) aged 2;9 to 9;10. The two treatment groups, DIR and ABA were chosen following random assignment and careful subject matching for language functioning. The CSBS and Mac-Arthur Bates Communicative Developmental Inventories (CDI) were used to obtain baseline and post-intervention testing. Additionally, four clinical goals (increase verbal production, turn-taking skills, child initiated interactions, and receptive language) were documented daily.

Results indicated a mix of gains and losses on CSBS scores. The ABA group showed an increase in gestures with vocalizations, gaze shifts and language comprehension while the DIR group showed increases in repair strategies and episodes of negative effects. A 2 x 2 comparison revealed no overall statistically significant differences in scores on the CSBS for communication outcomes in the two groups, as well as on the CDI. Progress in clinical skills was analyzed via a MANOVA, which indicated two significantly different outcomes for the ABA group in receptive language (p = .023) and verbal production (p = .046) goals, where improvements were indicated for both.

Within Subjects Analysis was completed using the MANOVA results. Results revealed no overall significant difference between pre- and post-test administration of the CSBS for communication or language scores. However, the following statistically significant findings were noted:

Communication function cluster- Decreases in skills for both approaches (p= .030).
Communicative means-gestural cluster- Increases in both groups (p=.037). No significant difference between groups.
Reciprocity cluster- Decreases in respondent acts for both groups (p=.008).

The researcher employed several strategies to ensure a balanced, unbiased result including rotation and consistency of treatment facilitator as well as equal duration and intensity of the two approaches, thus improving internal validity. As previously discussed, caution must be taken to conclude causal relations on the CSBS and so inclusion of clinical skill progress introduces an additional measurement tool that improves internal validity of the study. While no differences were evident before and after treatment on the CSBS, the positive outcomes seen in ABA's clinical goals provides a suggestive level of evidence for effectiveness in clinical practice. Additionally, this study's comparison of ABA and DIR treatment provides a stepping-stone for further research with respect to the different approaches of treatment for children with autism.

Discussions

The studies discussed above indicate a mix of support in favor of ABA approach on the language and communication development of children with autism spectrum disorder. This seems inherent given the diverse implementation strategies ABA approach uses as well as the broad skill range of language and communication skills for children's on the spectrum. The breadth of outcome measures and weak research design of studies investigated here limits external validity in several cases. However, an overall suggestive level of evidence has been provided in a majority of cases, which tentatively promotes an ABA approach for positive influence on language in children with autism.

Given the limitations of the existing literature presented, future research that utilizes a more standard method of ABA implemented will help to foster somewhat of a "gold standard", hence leading to more consistent and reliable findings and increased confidence in the research. Additionally, research that narrows focus on exploring ABA intervention and is directed towards the outcomes of children with autism with regards to diverse aspects of language and communication functioning is indicated.

Clinical Implications

Despite limitations of the presented research the evidence in this critical review serves to provide tentative support for the positive influences of ABA intervention on language and communication of children with autism. It is recommended that clinicians make cautious interpretation of these findings in order to guide clinical practice.

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