

Research Article

Review of Single Participant Studies Investigating the Relationship Between the Interests and Social-Communication Behavior of Young Children with Autism Spectrum Disorders

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Abstract

Results from a meta-analysis of studies incorporating the interests of young children with autism spectrum disorders into early intervention practices on the social and communication behavior of the children are described. Studies were identified by electronic searches of multiple data bases and hand searches of all retrieved research reports. Studies were included if they employed single participant designs and the children had an autism spectrum disorder diagnosis and were 6 years of age or younger. The meta-analysis included 14 studies and 30 infants, toddlers, and preschoolers. Results showed that interest-based interventions had positive effects on the children's affective behavior, social responses, joint attention, and language production. Findings also showed that the different ways of incorporating the interests of the children into early intervention practices had similar effects. Implications for assessment and intervention practices are described.

Keywords: Autism; ASD; Personal interests; Situational interests; Early intervention; Social development; Language development

Abbreviation

ASD: Autism Spectrum Disorder

Introduction

Children with Autism Spectrum Disorders (ASD) almost always manifest difficulties with social, communication, and interpersonal relationships [1-3]. This has been attributed, in part, to the limited interests of the children which is believed to interfere with the acquisition of social-communication behavior and competence [4,5]. Although most interventions have focused on decreasing the limited interests of children with ASD while at the same time promoting one or more targeted behavior [6,7], evidence is emerging to suggest that incorporating the interests of children with ASD into interventions with the children might have positive effects and consequences [8]. In one of the first demonstrations of an interest-based intervention with children with autism, Koegel, Dyer, and Bell [9] found that engaging 4 to 13-year-old children with ASD in a child-preferred activities resulted in discernible decreases in social avoidance behavior. In a study by Martin and Farnum [10] of 3 to 16-year-old children with ASD, introducing unfamiliar, novel animals into the children's intervention sessions resulted in more social and less stereotypical behavior compared to the use of noninterest-based materials. Similar results have been reported in other studies, including children with ASD both younger and older than six years of age [11,12].

There have more recently been numerous attempts to investigate the effects of different approaches to incorporating the interests of young children with ASD into interventions afforded these children

[8-15]. The ways in which interests have been used in the interventions, however, has varied considerably. Additionally, close inspection of interest-based intervention studies finds that the types of interests incorporated into interventions with young children with ASD are rarely operationally defined and that different approaches are almost never compared to discern the relative effectiveness of contrasting approaches to interest-based interventions. This was addressed in the meta-analysis described in this paper by using a conceptual framework for differentiating between two types of interests [16,17] and investigating whether different interest-based interventions were related to differences in the social-communication behavior of young children with ASD [18,19].

Krapp, Hidi, and Renninger [20] differentiate between two types of interests (personal and situational) which were used to code and analyze the interest-based interventions in the studies included in the meta-analysis. Personal interests include the intraindividual characteristics of a person that engages him or her in desired, preferred, or enjoyable activities [21]. Young children, for example, demonstrate personal interests in terms of preferences for certain objects, activities, and actions; prolonged attention to and engagement with people, objects, and events; positive affective behavior (e.g., smiling and laughing) while engaged in preferred activities; and by choosing to interact or play with a particular people or objects. Situational interests include the characteristics of a child's social or nonsocial environment that evoke engagement with people or materials. This includes the interestingness of people, objects, activities, etc. that evoke and sustain attention and sustained engagement [22]. The situational interests of young children include,

Table 1: Background Characteristics of the Study Participants.

Study	Sample Size	Chronological Age (months)		Developmental Age (months)		Child Gender		Child Diagnosis	Severity
		Mean	Range	Mean	Range	Male	Female		
Baker [38]	2	67	65-68	47	36-57	2	0	Autism	Moderate
Baker et al. [39]	1	64	-	42		0	1	Autism	Moderate
Carter [40]	2	65	64-66	46	43-50	0	2	Autism	NR (Moderate)
Finnigan & Starr [41]	1	44	-	18	-	0	1	Autism	Severe
Fleming [51]	1	48	-	NR	-	1	0	Autism	NR (Moderate)
Kern et al. [42]	2	40	38-41	NR	-	2	0	Autism	Mild-moderate
L. Koegel et al. [43]	3	52	45-65	18	15-20	2	1	Autism	NR (Moderate)
R. Koegel et al. [45]	4	61	44-72	41	30-53	3	1	Autism	NR (Moderate)
Koegel et al. [46]	3	39	38-41	19	17-21	3	0	Autism	NR (Mild)
Koegel et al. [44]	3	58	51-61	NR	-	3	0	Autism	NR (Mild)
Lorimer et al. [47]	1	60	-	45	-	1	0	Autism	Mild-Moderate
Moes [48]	1	70	-	61	-	1	0	Autism	NR (Mild)
Vismara & Lyons [49]	3	33	26-38	16	14-18	3	0	Autism	NR (Moderate)
Wiggins [50]	3	48	-	NR	-	2	1	Autism Spectrum Disorder	NR (Mild)

NOTE. Severity in parentheses indicates that the levels of ASD were estimated from information in the research reports.

but are not limited to, sights and sounds that evoke attention; the characteristics and features of objects, materials, or toys that invite engagement; children’s behavioral responses to salient events; and their responses to violations of expectations.

Purpose of the Study

The purpose of the meta-analysis described in this paper was to determine the effectiveness of interest-based interventions with young children with ASD 2 to 6 years of age. One goal was to integrate available evidence on a novel and promising approach to intervention to determine if interest-based practices are warranted as an intervention for young children with ASD. The second goal was to determine if different ways of incorporating interests into early intervention practices had similar or dissimilar effects. A third goal was to determine the conditions under which the practices were most effective in terms of influencing the social-communication behavior of young children with ASD. The studies in the meta-analysis included only children 6 years of age or younger since recent advances in the early assessment of ASD now make it possible to diagnose the condition long before the behavioral markers associated with the disorder become firmly established [23,24]. This in turn makes it possible to intervene early in the children’s lives to promote social and early communication competence [25,26].

The meta-analysis described in this paper is part of a line of research and practice on the characteristics of interest-based child learning [27,28], the effect of interest-based interventions on the behavior and development of young children with and without disabilities [29-31], and the effects of interest-based interventions on the learning, behavior, and development of young children with ASD [25,32,33]. The meta-analysis focused specifically on social-communication behavior since difficulties in this area interfere with the interactional and language abilities of children with ASD [5,34]. The findings were expected to shed additional light on how

the personal and situational characteristics of microsystems [35] and activity settings [36] contribute to positive outcomes for young children with ASD.

Method

Search strategy

Studies were located using (*autism* OR *autist* OR “*autism spectrum disorder*” OR “*ASD*” OR “*rett syndrome*” OR *asperger* OR “*PDD*”) AND (*interest* OR *excit* OR *motivate* OR *entertain* OR *preference* OR *preferred* OR *favorite* OR “*choice-mak*” OR *pref object*” OR “*preferred object*” OR *preferred-object*”) AND “*treatment* OR *therapy* OR *intervention* OR “*inter therapy*” OR *treat therapy* OR *treat*”) AND *infant* OR *infancy* OR *toddler* OR *preschool*”) as search terms. Both controlled vocabulary and natural language searches were conducted [37]. The search sources included PsychInfo, ERIC, MEDLINE, CINAHL, PROQUEST, Academic Search Premier, Education Research Complete, and Rehabdata. These were supplemented by Google Scholar, Scopus, and Ingenta searches as well as a search of an EndNote Library maintained by our Institute. Hand searches of the reference sections of all retrieved journal articles, book chapters, books, dissertations, and unpublished papers were also examined to locate additional studies. Studies were included if the children had an ASD diagnosis; they were 6 years of age or younger; the studies included intervention and nonintervention (baseline) conditions or contrasts; data for the baseline and intervention phases of the studies were reported (plotted) separately for each study participant; and the effects of interest-based interventions on different aspects of child social-communication behavior were the focus of the investigation.

Search results

Fourteen studies were located that included 30 children diagnosed with ASD that met the inclusion criteria [38-51]. Table 1 includes selected background characteristics of the study participants. The

sample sizes in the studies ranged between 1 and 4 (Median = 3). The mean child age of the participants was 52 months (Range = 26 to 72). The mean developmental age of the children was 32 months (Range = 14 to 61). Twenty-three children were male (77%) and seven children were female (23%). Severity of the children's ASD was reported in five studies and estimated based on information included in the other eight reports. The children were diagnosed with mild (N = 11), moderate (N = 15), mild to moderate (N = 3) or severe (N = 3) ASD. The mean estimated developmental quotient of the children was 61 (Range = 54 to 85) based on information provided in the research reports.

Interest coding

The interest measures used by the investigators were described as narrow, ritualistic, obsessive, circumscribed, preservative, or situational interests. Interests were also described and measured in terms of child preferences (e.g., preferred vs. non-preferred objects) or child choices (e.g., choice vs. no choice). The definitions of personal and situational interests described in the introduction to our paper were used to code type of child interest used in each study and incorporated in the interventions afforded the children. Studies were coded as using personal interests if a child interest assessment was conducted prior to the interventions and the identified interests were used to engage the children in intervention activities to affect changes in child outcomes. Studies were coded as using situational interests if novel or highly salient materials, objects, or actions were incorporated into the interventions to affect changes in child outcomes.

Child outcomes

The social-communication outcomes in the studies included measures of child positive affect, social play, social engagement, social initiations, and imitation which taken together were categorized as child social behavior. These were subdivided into two categories: Positive social behavior (including child affect) and social engagement (sustained play, behavioral initiations, imitation). The outcomes also included child vocalizations, verbalizations, joint attention, and turn taking which were all categorized as child communication behavior. These were subdivided into two categories: Language production and joint attention (including turn taking). A number of investigators assessed the absence of the above behavior as child outcomes which were used as proxy measures of social-communication behavior by reversing the sizes of effect for the relationship between the interventions and outcome measures.

Method of analysis

The intra-individual point-biserial correlation coefficient was used as the effect size of the relationship between the interest-based interventions and the social-communication child outcomes [52,53]. The codes for the baseline data points (= 0) and intervention data points (= 1) of the study were correlated with the dependent measures obtained during both phases of the study to ascertain the effects of the interventions. The average correlation between the interventions and outcome measures for all children combined was used as the estimate for the size of effect between the independent and dependent measures. The 95% Confidence Intervals (CI) for the average sizes of effect were used for substantive interpretation of the findings. A 95% CI not including zero indicates that the average effect size differs significantly from zero at the $p < .05$ level [54]. One-sample t-tests

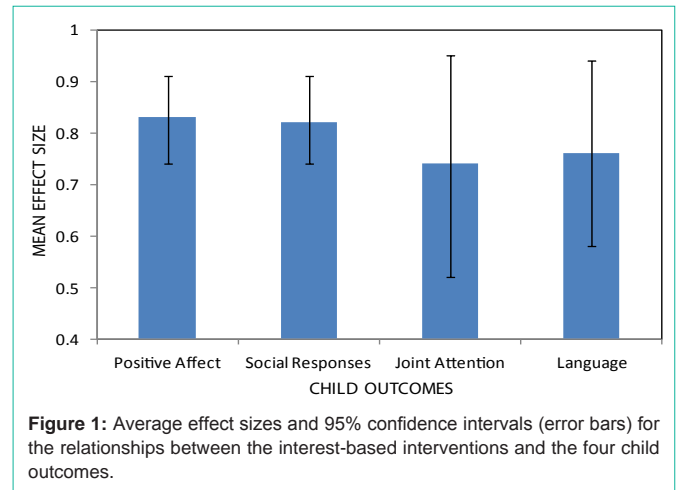


Figure 1: Average effect sizes and 95% confidence intervals (error bars) for the relationships between the interest-based interventions and the four child outcomes.

were used to estimate the strength of the effects of the interest-based interventions on the children's social-communication behavior. An effect size between 0.10 and 0.24 is considered small, an effect size between 0.25 and 0.39 is considered medium, an effect size between 0.40 and 0.79 is considered large, and an effect size of 0.80 or larger is considered very large [55,56]. Comparisons and contrasts for assessing between types of interest-based interventions and between types of child outcomes were estimated by between group t-tests. These analyses, however, need to be interpreted as suggestive rather than confirmatory since the t-tests include a mix of paired and unpaired data. The same is the case for between child age comparisons where an average effect size also includes a mix of independent and nonindependent outcome measures.

Results

Overall effect

The average effect size for the influence of the interest-based interventions on all outcomes combined was 0.80 (95% CI = 0.75, 0.86, $t = 29.84$, $df = 54$, $p = .0000$). The average size of effect was very large which indicates that the interventions, taken together, were related to changes or improvements in the children's social-communication behavior.

Type of intervention comparisons

Figure 1 shows the relationship between the types of interests incorporated into the children's interventions and both the social and communication child outcomes. All four average sizes of effect differed significantly from zero where the average effect sizes were large to very large, $t_s = 7.56$ to 24.78 , $df = 7$ to 23 , $p_s = .0000$. Incorporating either type of child interest into the interventions had positive effects on both types of child outcomes. Moreover, either type of intervention, regardless of the child outcome, was similarly effective in terms of affecting changes or improvements in the children's social-communication behavior. There were no between type of intervention (personal vs. situational interests) differences for either child social behavior, $t = 1.35$, $df = 34$, $p = .1869$, or child communication behavior, $t = 1.26$, $df = 32$, $p = .2156$. There were also no differences for the effects of personal interest-based interventions on child social behavior compared to child communication behavior, $t = 1.26$, $df = 32$, $p = .2156$, and there were no differences for situational

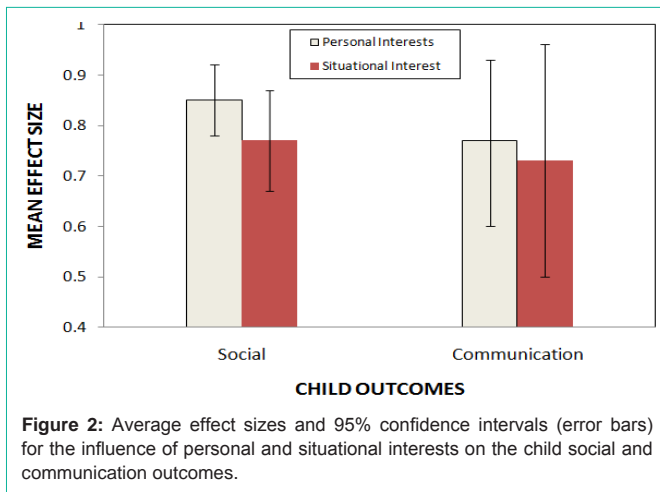


Figure 2: Average effect sizes and 95% confidence intervals (error bars) for the influence of personal and situational interests on the child social and communication outcomes.

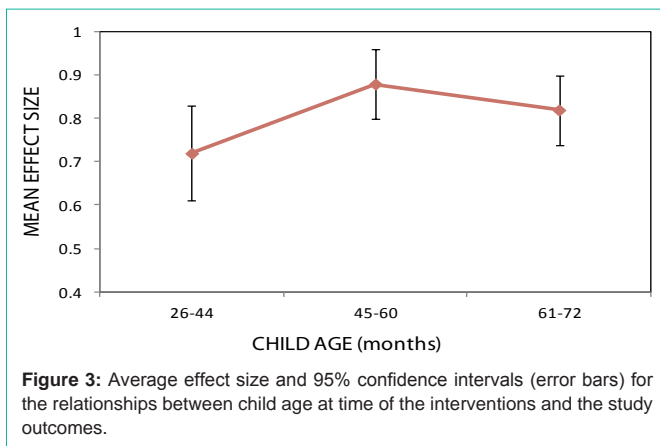


Figure 3: Average effect size and 95% confidence intervals (error bars) for the relationships between child age at time of the interventions and the study outcomes.

interest-based interventions on child social behavior compared to child communication behavior, $t = 0.25, df = 16, p = .8042$.

Figure 2 shows the relationships between the interest-based interventions and the four subcategories of outcomes constituting the focus of investigation. The results show that the interventions were significantly related to all of the outcome measures as evidenced by confidence intervals not including zero. The sizes of effects for the four child outcomes were large to very large, $t_s = 8.14$ to $21.15, df_s = 7$ to $21, p_s = .0000$. This set of findings, taken together, indicated that incorporating the interests of young children with ASD into early intervention practices had positive effects on different aspects of the children’s social-communication behavior.

Child age comparisons

Whether or not the interest-based interventions were similarly effective for children who differed in their chronological ages was evaluated by a tripartite split of child age and by calculating the average effect sizes for the relationships between child age groupings and the child outcome measures. The results are shown in Figure 3. The sizes of effect for the relationship between interest-based learning opportunities and child outcomes were large to very large, $t_s = 13.70$ to $23.95, df_s = 12$ to $22, p_s = .0000$. The results showed that the interventions were effective regardless of child age but were more effective for children who were 45 months of age or older compared to children 26 to 44 months of age, $t = 2.39, df = 50, p = .0205$.

Table 2: Average Effect Sizes and 95% Confidence Intervals (CI) for the Relationships Between Child Characteristics and Intervention Setting on the Study Outcomes.

Moderators	Number of Effect Sizes	Average Effect Size	95% CI
Child Gender			
Male	42	.81	.75, .87
Female	13	.78	.63, .92
Child Severity			
Mild	26	.82	.74, .90
Moderate/Severe	29	.78	.71, .86
Intervention Setting			
Home/Community	11	.88	.78, .97
Classroom	19	.80	.69, .91
Clinic	25	.77	.69, .85

Moderator comparisons

The extent to which the relationships between the interventions and the child outcomes were moderated by child gender, severity of child ASD, or intervention setting are shown in Table 2. All of the average sizes of effect were very large, $t_s = 11.60$ to $28.05, df_s = 10$ to $41, p_s = .0000$, and none of between moderator contrasts were significantly different. Consequently, neither child gender nor severity of the children’s ASD differentially influenced the effects of the interventions on the study outcomes. Also, the interventions were similarly effective regardless of the settings where the interventions were implemented.

Discussion

Results from the meta-analysis showed that incorporating the interests of young children with ASD into early intervention practices had positive effects on the children’s social-communication behavior. The findings add to the knowledge base with regards to the role and importance of interest-based learning opportunities for children with and without disabilities [5,25,27,29,57,58]. According to Bronfenbrenner [35], interests can function as either a personal or environmental factor shaping and influencing child engagement in interactions with other people and materials that in turn affect child behavior and development. Therefore, incorporating either type of interest into interventions with young children with ASD [25] would seem warranted as a practice for positively influencing child behavioral competence in general [32,59] and social-communication behavior more specifically [8,60].

Implications for practice

A number of different models and approaches have been proposed for incorporating either or both the personal or situational interests of young children with ASD into interventions for improving child functioning [8,25,49,61,62]. There are also available different assessment tools and strategies for identifying the personal and situational interests of young children with ASD [63,64].

Dunst [25] proposed a model and set of practices for identifying the personal interests of young children with ASD and using those interests to engage the children in everyday learning activities providing children opportunities to practice existing skills, acquire new competencies, and develop a sense of mastery as a result of

engagement in interest-based learning opportunities. The main focus of interventions is to promote and strengthen parents' or practitioners' capacity to increase the number, frequency, and variety of child involvement in development-instigating interest-based activities where parents or practitioners use naturalistic teaching procedures [65] to support existing child competence as well as promote acquisition of more developmentally advanced behavior.

Boyd et al. [8] describes an approach to incorporating the interests of young children with ASD into early intervention practices that focuses on the use of either personal or situational interests as the foundations for interest-based child learning. The model includes methods for identifying both types of interests, identifying behavioral objectives (including but not limited to social-communicative competencies), and procedures for embedding the children's interests into either or both formal and informal learning activities and opportunities.

The method most often used for incorporating situational interests into learning opportunities for young children with ASD is child choice making among different materials, toys, or activities [14,40]. This approach typically involves the presentation of a number of different objects or activities to a child that have either or both preferred features or salient characteristics where a child has the opportunity to choose preferred toys, materials, or activities.

There are a number of assessment tools and procedures for identifying the interests of infants, toddlers, and preschoolers, including young children with ASD and other kinds of disabilities [59,66-71]. Any of these should prove useful for identifying a child's interests and promoting increased child participation in interest-based learning activities to affect changes and improvements in children's social-communication competence. The reader is referred to Dunst, Jones et al. [29] and Raab and Dunst [57] for descriptions of practices that incorporate the interest of young children into formal and informal learning opportunities and activities which include different kinds of interest assessment methods and procedures.

Implications for research

Future research is warranted to determine if incorporating the interests of children with ASD into early intervention practices is more effective than interventions focused on decreasing the interests of these children. Research is also needed to compare the relative effectiveness of interest-based interventions compared to other types of intervention practices. Knowledge would also be advanced by evaluating whether personal vs. situational interest-based interventions are differentially effective. All three types of investigations would contribute to an understanding of the conditions under which early intervention practices with young children with ASD positively influence social-communication behavior.

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