

## 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

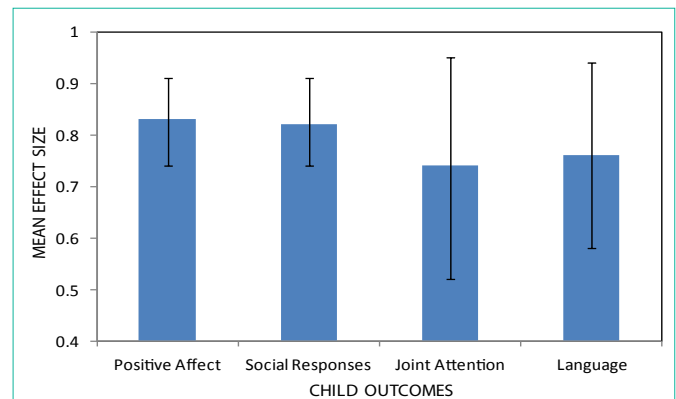
The interest measures used by the investigators were described as narrow, ritualistic, obsessive, circumscribed, preservative, or situational interests. Interests were also described and measured in terms of child preferences (e.g., preferred vs. non-preferred objects) or child choices (e.g., choice 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.

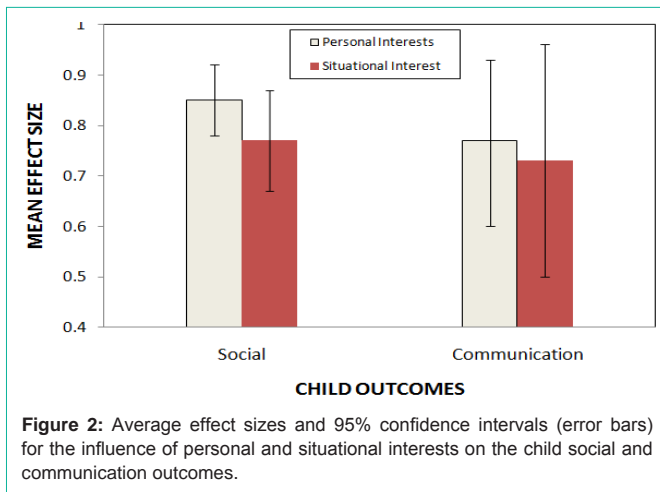
## Results

### Overall effect

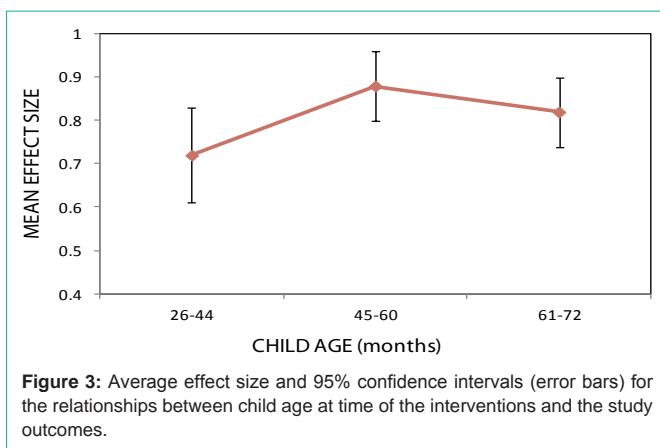
The average effect size for the influence of the interest-based interventions on all outcomes combined was 0.80 (95% CI = 0.75, 0.86,  $t = 29.84$ ,  $df = 54$ ,  $p = .0000$ ). The average size of effect was very large which indicates that the interventions, taken together, were related to changes or 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   |
|-----------------------------|------------------------|---------------------|----------|
| <b>Child Gender</b>         |                        |                     |          |
| Male                        | 42                     | .81                 | .75, .87 |
| Female                      | 13                     | .78                 | .63, .92 |
| <b>Child Severity</b>       |                        |                     |          |
| Mild                        | 26                     | .82                 | .74, .90 |
| Moderate/Severe             | 29                     | .78                 | .71, .86 |
| <b>Intervention Setting</b> |                        |                     |          |
| 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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### References

1. Jones EA, Carr EG. Joint attention in children with autism: Theory and

intervention. *Focus on Autism and Other Developmental Disabilities*. 2004; 19: 13-26.

2. Kabot S, Masi W, Segal M. Advances in the diagnosis and treatment of autism spectrum disorders. *Professional Psychology: Research and Practice*. 2003; 34: 26-33.
3. Lord C, Bishop SL. The autism spectrum: definitions, assessment and diagnoses. *Br J Hosp Med (Lond)*. 2009; 70: 132-135.
4. Baron-Cohen S. Autism: research into causes and intervention. *Pediatr Rehabil*. 2004; 7: 73-78.
5. Mandy WPL, Skuse DH. Research review: What is the association between the social-communication element of autism and repetitive interests, behaviors, and activities? *Journal of Child Psychology and Psychiatry and Allied Disciplines*. 2008; 49: 795-808.
6. Gresham FM, Beebe-Frankenberger ME, MacMillan DL. A selective review of treatments for children with autism: Description and methodological considerations. *School Psychology Review*. 1999; 28: 559-575.
7. Lewis MH, Bodfish JW. Repetitive behavior disorders in autism. *Mental Retardation and Developmental Disabilities Research Reviews*. 1998; 4: 80-89.
8. Boyd BA, Alter PJ, Conroy MA. Using their restricted interests: A novel strategy for increasing the social behaviors of children with autism, in *Beyond Behavior*. 2005; 3-9.
9. Koegel RL, Dyer K, Bell LK. The influence of child-preferred activities on autistic children's social behavior. *J Appl Behav Anal*. 1987; 20: 243-252.
10. Martin F, Farnum J. Animal-assisted therapy for children with pervasive developmental disorders. *West J Nurs Res*. 2002; 24: 657-670.
11. Elefant C, Wigram T. Learning ability in children with Rett syndrome. *Brain Dev*. 2005; 27: 97-101.
12. Sigafos J, Laurie S, Pennell D. Preliminary assessment of choice making among children with Rett syndrome. *Journal of the Association for Persons with Severe Handicaps*. 1995; 20: 175-184.
13. Adamson LB, Deckner DF, Bakeman R. Early interests and joint engagement in typical development, autism, and Down syndrome. *Journal of Autism and Developmental Disorders*. 2010; 40: 665-676.
14. Reinhartsen DB, Garfinkle AN, Wolery M. Engagement with toys in two-year-old children with autism: Teacher selection versus child choice. *Research and Practice for Persons with Severe Disabilities*. 2002; 27: 175-187.
15. Boyd BA, Conroy MA, Mancil GR, Nakao T, Alter PJ. Effects of circumscribed interests on the social behaviors of children with autism spectrum disorders. *J Autism Dev Disord*. 2007; 37: 1550-1561.
16. Renninger KA, Hidi S, Krapp A. The role of interests in learning and development. 1992.
17. Hidi S, Renninger A. The four-phase model of interest development. *Educational Psychologist*. 2006; 41: 111-127.
18. Eckerman CO. Early social-communicative development: Illustrative developmental analyses, in *Developmental Science*. Cairns RB, Elder GH Jr, editors. 1996; 135-167.
19. Saarni C, Mumme DL, Campos JJ. Emotional development: Action, communication, and understanding, in *Handbook of child psychology: Vol. 3. Social, emotional, and personality development*. Damon W, Eisenberg N, editors. 1998; 237-309.
20. Krapp A, Hid S, Renninger K. Interest, learning and development, in the role of interest in learning and development. Renninger K, Hidi S, Krapp A, editors. 1992; 3-25.
21. Renninger KA. Individual interest and its implications for understanding intrinsic motivation, in *Intrinsic and extrinsic motivation: The search for optimal motivation and performance*. Sansone C, Harackiewicz JM, editors. 2000; 373-404.
22. Chen A, Darst PW, Pangrazi RP. An examination of situational interest and its sources. *Br J Educ Psychol*. 2001; 71: 383-400.

23. Barbaro J, Dissanayake C. Autism spectrum disorders in infancy and toddlerhood: A review of the evidence on early signs, early identification tools, and early diagnosis. *Journal of Developmental and Behavioral Pediatrics*. 2009; 30: 447-459.
24. Rogers SJ. Diagnosis of autism before the age of 3. *International Review of Research in Mental Retardation*. 2000; 23: 1-31.
25. Dunst CJ. Interest-based learning as an intervention practice for very young children with autism, in *Treatment strategies: Pediatrics*. Holcraft R, editor. 2011; 34-39.
26. Wallace KS, Rogers SJ. Intervening in infancy: implications for autism spectrum disorders. *J Child Psychol Psychiatry*. 2010; 51: 1300-1320.
27. Dunst CJ, Raab M. Interest-based child participation in everyday learning activities, in *Encyclopedia of the sciences of learning*. Seel NM, editor. 2012; 1621-1623.
28. Dunst CJ, Herter S, Shields H. Interest-based natural learning opportunities, in *Natural environments and inclusion*. Sandall S, Ostrosky M, editors. 2000; 37-48.
29. Dunst CJ, Tara Jones, Molly Johnson, Melinda Rabb, Deborah W. Hamby. Role of children's interests in early literacy and Language development. *CELL reviews*. 2011; 4: 1-18.
30. Dunst CJ, Bruder MB, Trivette CM, Hamby D, Raab M, McLean M. Characteristics and consequences of everyday natural learning opportunities. *Topics in Early Childhood Special Education*. 2001; 21: 68-92.
31. Swanson J, Raab M, Dunst CJ. Strengthening family capacity to provide young children everyday natural learning opportunities. *Journal of Early Childhood Research*. 2011; 9: 66-80.
32. Dunst CJ, Trivette CM, Masiello T. Exploratory investigation of the effects of interest-based learning on the development of young children with autism. *Autism: The International Journal of Research and Practice*. 2011; 15: 295-305.
33. Dunst CJ, Trivette CM, Masiello T. Influence of the interests of children with autism on everyday learning opportunities. *Psychological Reports*. 2010; 107: 281-288.
34. Kuenssberg R, McKenzie K, Jones J. The association between the social and communication elements of autism, and repetitive/restrictive behaviours and activities: A review of the literature. *Research in Developmental Disabilities*. 2011; 32: 2183-2192.
35. Bronfenbrenner U. Ecological systems theory, in *Six theories of child development: Revised formulations and current issues*. Vasta R, editor. 1992; 187-248.
36. Farver JAM. Activity setting analysis: A model for examining the role of culture in development, in *Children's engagement in the world: Sociocultural perspectives*. Göncü A, editor. 1999; 99-127.
37. Lucas SM, Cutspec PA. The role and process of literature searching in the preparation of a research synthesis. 2007.
38. Baker MJ. Incorporating the thematic ritualistic behaviors of children with autism into games: Increasing social play interactions with siblings. *Journal of Positive Behavior Interventions*. 2000; 2: 66-84.
39. Baker MJ, Koegel RL, Koegel LK. Increasing the social behavior of young children with autism using their obsessive behaviors. *Journal of the Association for Persons with Severe Handicaps*. 1998; 23: 300-308.
40. Carter CM. Using choice with game play to increase Language skills and interactive behaviors in children with autism. *Journal of Positive Behavior Interventions*. 2001; 3: 131-151.
41. Finnigan E, Starr E. Increasing social responsiveness in a child with autism. A comparison of music and non-music interventions. *Autism*. 2010; 14: 321-348.
42. Kern P, Wolery M, Aldridge D. Use of songs to promote independence in morning greeting routines for young children with autism. *J Autism Dev Disord*. 2007; 37: 1264-1271.
43. Koegel LK, Camarata SM, Valdez-Menchaca M, Koegel RL. Setting generalization of question-asking by children with autism. *Am J Ment Retard*. 1998; 102: 346-357.
44. Koegel LK, Singh AK, Koegel RL. Improving motivation for academics in children with autism. *Journal of Autism and Developmental Disorders*. 2010; 40: 1057-1066.
45. Koegel RL, Camarata S, Koegel LK, Ben-Tall A, Smith AE. Increasing speech intelligibility in children with autism. *J Autism Dev Disord*. 1998; 28: 241-251.
46. Koegel RL, Vernon TW, Koegel LK. Improving social initiations in young children with autism using reinforcers with embedded social interactions. *Journal of Autism and Developmental Disorders*. 2009; 39: 1240-1251.
47. Lorimer PA, Simpson RL, Myles BL, Ganz JB. The use of social stories as a preventative behavioral intervention in a home setting with a child with autism. *Journal of Positive Behavior Interventions*. 2002; 4: 53-60.
48. Moes DR. Integrating choice-making opportunities within teacher-assigned academic tasks to facilitate the performance of children with autism. *Journal of the Association for Persons with Severe Handicaps*. 1998. 23: 319-328.
49. Vismara LA, Lyons GL. Using perseverative interests to elicit joint attention behaviors in young children with autism: Theoretical and clinical implications for understanding motivation. *Journal of Positive Behavior Interventions*. 2007; 9: 214-228.
50. Wiggins SL. Training parents of children with autism spectrum disorder to systematically assess and use their child's highly preferred items to both cue and reinforce desired behavior responses in community settings. 2009.
51. Fleming CV. Analysis of the effects of choice making on toy play. 2008.
52. Dunst CJ. A simple effect size indicator for the meta-analysis of single participant design study findings. 2012.
53. Marsh RW. The use of serial correlation in the analysis of data from interrupted time series trials with single subjects in educational research. *Educational Psychology*. 1982; 2: 317-320.
54. Rosenthal R. Parametric measures of effect size, in the *handbook of research synthesis*. Cooper H, Hedges LV, editors. 1994; 231-244.
55. Dunst CJ, Hamby DW. Guide for calculating and interpreting effect sizes and confidence intervals in intellectual and developmental disabilities research studies. *Journal of Intellectual and Developmental Disability*. 2012; 37: 89-99.
56. Lipsey MW, Wilson DB. *Practical meta-analysis*. 2001.
57. Raab M, Dunst CJ. Influence of child interests on variations in child behavior and functioning. 2007.
58. Schraw G, Lehman S. Situational interest: A review of the literature and directions for future research. *Educational Psychology Review*. 2001; 13: 23-52.
59. Swanson J, Raab MR, Roper N, Dunst CJ. Promoting young children's participation in interest-based everyday learning activities. *CASE tools*. 2006; 2: 1-22.
60. Trivette CM, Dunst CJ. Consequences of interest-based learning on the social-affective behavior of young children with autism. *Life Span and Disability*. 2011; 14: 101-110.
61. Adams LW. Incorporating narrow interests into the school tasks of children with autism (Doctoral dissertation, University of North Carolina, Chapel Hill, 1998). *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 2000; 60: 4872.
62. Mancil GR, Pearl CE. Restricted interests as motivators: Improving academic engagement and outcomes of children on the autism spectrum. *Teaching Exceptional Children Plus*. 2011; 4: 1-15.
63. Dunst CJ, Raab M. Checklist and guidelines for identifying young children's interests. *Everyday Child Language Learning Tools*. 2013; 3: 1-7.
64. Dunst CJ, Raab M. Identifying interest-based everyday activities for infants, toddlers, and preschoolers. *Everyday Child Language Learning Tools*. 2013; 2: 1-15.

65. Dunst CJ, Raab M, Trivette CM. Characteristics of naturalistic language intervention strategies. *Journal of Speech-Language Pathology and Applied Behavior Analysis*. 2011; 5: 8-16.
66. Dunst CJ, Roberts K, Snyder D. Spotting my child's very special interests: A workbook for parents. 2004.
67. King G. Children's Assessment of Participation and Enjoyment. 2004.
68. Moss J. Child preference indicators: A guide for planning. 2006.
69. Raab M, Dunst CJ. Promoting parent and practitioner identification of interest-based everyday child learning opportunities. *CASE tools*. 2006; 2: 1-19.
70. Rugg ME, Stoneman Z. Take a Look at Me portfolio: A strengths-based self-discovery tool. 2004.
71. Stangel G. Children's interest areas and their assessment. 1970: Paper presented at the annual convention of the Western Psychological Association.