Review

Joint attention interventions for children with autism spectrum disorder: a systematic review and meta-analysis

Kimberly A. Murza†, Jamie B. Schwartz‡, Debbie L. Hahs-Vaughn§ and Chad Nye¶

†Audiology & Speech Language Sciences, University of Northern Colorado, Greeley, CO, USA
‡Communication Sciences and Disorders, University of Central Florida, Orlando, FL, USA
§Methodology, Measurement, and Analysis, University of Central Florida, Orlando, FL, USA
¶University of Central Florida Center for Autism and Related Disabilities, Orlando, FL, USA

(Received March 2015; accepted September 2015)

Abstract

Background: A core social-communication deficit in children with autism spectrum disorder (ASD) is limited joint attention behaviours—important in the diagnosis of ASD and shown to be a powerful predictor of later language ability. Various interventions have been used to train joint attention skills in children with ASD. However, it is unclear which participant, intervention and interventionist factors yield more positive results.

Aims: The purpose of this systematic review and meta-analysis was to provide a quantitative assessment of the effectiveness of joint attention interventions aimed at improving joint attention abilities in children with ASD.

Methods & Procedures: The researchers searched six databases for studies meeting the inclusion criteria at two levels: title/abstract and full-text stages. Two independent coders completed data extraction using a coding manual and form developed specifically for this research study. Meta-analysis procedures were used to determine the overall effects of several comparisons including treatment type, treatment administrator, intervention characteristics and follow-up.

Main Contribution: Fifteen randomized experimental studies met inclusion criteria. All comparisons resulted in statistically significant effects, though overlapping confidence intervals suggest that none of the comparisons were statistically different from each other. Specifically, treatment administrator, dosage and design (control or comparison, etc.) characteristics of the studies do not appear to produce significantly different effects.

Conclusions & Implications: The results of this meta-analysis provide strong support for explicit joint attention interventions for young children with ASD; however, it remains unclear which children with ASD respond to which type of intervention.

Keywords: autism spectrum disorder, joint attention, intervention, systematic review, meta-analysis.

What this paper adds?

What is already known on the subject?
A core social-communication deficit in children with ASD is limited joint attention behaviours—important in the diagnosis of ASD and shown to be a powerful predictor of later language ability. Various interventions have been used to train joint attention skills in children with ASD. However, it is unclear which participant, intervention and interventionist factors yield more positive results.

What this paper adds?
The results of this meta-analysis provide strong support for explicit joint attention interventions for young children with ASD with most comparisons showing a statistically significant 2/3 standard deviation treatment effect increase for the experimental group compared with the control/comparison group.
Introduction

Autism spectrum disorder (ASD) is characterized by social communicative and social interaction impairments accompanied by restrictive interests and repetitive behaviours (American Psychiatric Association 2013). Though prevalence estimates vary, there is agreement that the incidence of individuals diagnosed with ASD has been rising significantly (e.g. Atladottir et al. 2007, Centers for Disease Control and Prevention (CDC), 2012, 2014, Kogan et al. 2009, Nassar 2009). A systematic review of global prevalence rates estimates the prevalence of autistic disorder at 17 per 10 000 (Elsabbagh et al. 2012) while in the United States the CDC (2014) estimates a prevalence rate of 1 in 68 individuals diagnosed with an ASD. Recently, considerable effort has focused on determining signs of ASD in children under the age of 2 years (Bryson et al. 2007, Charman et al. 1998, 2003, Chawarska et al. 2007, Cox et al. 1999, Gamliel et al. 2007, Landa et al. 2007, Mitchell et al. 2006, Wetherby et al. 2008, Zwaigenbaum et al. 2007). Chawarska et al. (2007) have cited several symptoms present in children younger than 2 years that are indicative of a later diagnosis of ASD: (1) severe to moderate delay of verbal skills, (2) limited response to name, (3) lack of pointing, (4) delayed functional and symbolic play skills, and (5) restricted joint attention skills.

One of the core social-communication deficits in children with ASD is limited joint attention behaviours with social partners (Mundy 1995). The concept of joint attention has been described as the ‘simultaneous engagement of two or more individuals in mental focus on one and the same external thing’ (Baldwin 1995: 132). In typically developing children, joint attention emerges early in infancy and continues to evolve becoming more coordinated and complex between 8 and 18 months of age (Bakeman and Adamson 1984, Corkum and Moore 1995) as the child engages in social interactions with people and objects in their environment. As coordination of joint attention develops, the child gains greater social awareness of the communication partner which is demonstrated by the child shifting their gaze between the social partner and the object or event of interest. A gesture (e.g. pointing) and/or a vocalization(s) or verbalization(s) as well as shared positive affect also may be incorporated into the child’s joint attention acts (Meindl and Cannella-Malone 2011). Children with ASD have particular difficulty engaging in coordinated joint attention acts with social partners, whether responding to the joint attention bids of others or initiating joint attention encounters (Meindl and Cannella-Malone 2011, Mundy and Newell 2007, Schertz and Odom 2004).

Joint attention ability not only is important in the differential diagnosis of ASD but also has been shown to be a powerful predictor of later language ability (Mundy et al. 1990, Charman et al. 2005, Sigman and Ruskin 1999). Because joint attention provides a reference for learning language and how to interact socially, acquisition of these behaviours provides a foundation for learning pivotal skills including language, social communication, pretend play, theory of mind and behaviour (Baron-Cohen 1991, Charman et al. 2003, Delinco- las and Young 2007, Mundy et al. 2007, Murray et al. 2008, Rollins and Snow 1998, Schertz and Odom 2004, Schietecatte et al. 2012, Tomasello et al. 1993, 1996).

Because joint attention is such a critical developmental skill, a number of researchers have designed and tested interventions aimed at improving the ability of children with ASD both to initiate and to respond to joint attention bids. A variety of intervention approaches has been used to train joint attention skills in children with ASD which may be broadly categorized as behavioural or developmental depending on their underlying theoretical framework. Some incorporate a combination of behavioural and developmental approaches. The research to date, regardless of the intervention approach used, suggests improvements in the use of various forms of joint attention (e.g. gaze alternation, use of conventional gestures) with more limited improvements in the ability to initiate joint attention acts (Jones and Carr 2004). However, it is unclear as to which individual or combination of participant, intervention and interventionist factors yield more positive results.

In a recent Cochrane systematic review and meta-analysis, Fletcher-Watson et al. (2014) examined the efficacy of theory of mind interventions for individuals of all ages with ASD. The authors’ description of theory of mind interventions included targeted interventions which focused on the precursor skills of theory of mind such as joint attention, imitation and emotion recognition. Studies were excluded from the review if they were determined to be a ‘broad-based intervention’ or were determined not to be theory of mind specific. Although this systematic review and meta-analysis provides a high-quality synthesis of research specific to theory of mind interventions, several studies with an explicit joint attention intervention component were excluded (e.g. Aldred et al. 2004, Carter et al. 2011, Casenhiser et al. 2011, Green et al. 2010, Lawton and Kasari 2012).

White et al. (2011) completed a systematic review of the literature on interventions for children with ASD that assessed joint attention outcomes. In this review, the authors located 27 articles that met their selection criteria including randomized controlled trials (RCTs), quasi-experimental designs and single-subject research designs. Although the authors identified six RCTs, their search was limited in scope. They searched only ERIC, Academic Search Complete and PsycINFO databases and included studies only if they were published in peer-reviewed journals. Excluding unpublished literature
is problematic as an association between positive and significant results and publication exists (Hopewell et al. 2009).

Although the review by White et al. (2011), does provide an excellent source of some of the joint attention intervention research that has been published prior to 2010, it does not make an attempt to quantify statistically the results of the individual studies. That is, the review of the individual studies did not attempt to aggregate the findings in such a manner as to assess the magnitude of the intervention effects. Further, it can be argued that the reason for this lack of aggregation lies in part with the nature of the narrative review which does not provide a mechanism for a quantitative/statistical summary across various design types, namely group and single subject design. While the review by Fletcher-Watson et al. (2014) did meta-analyze results from randomized controlled studies, it provided a broader theory of mind focus and excluded some high-quality research with a joint attention intervention component. Thus, a systematic review and meta-analysis of interventions that assess joint attention interventions and outcomes would not only provide an overall evaluation of the extent and magnitude of the interventions’ effects but also provide direction for further research in the area.

The purpose of this systematic review and meta-analysis is to provide a quantitative assessment of the efficacy of joint attention interventions aimed at improving joint attention abilities in children with ASD. Although some may believe that there is ample research supporting the use of joint attention interventions with children with ASD, a careful look at results across randomized control trials suggest that this conclusion may be premature as many studies demonstrate imprecise and inconsistent effect sizes (i.e. large confidence intervals, confidence intervals crossing zero). Thus, a systematic review and meta-analysis of available high-quality research in the area is warranted.

**Method**

**Criteria for inclusion**

Study inclusion criteria were determined at the outset of this review using accepted methodological standards established for including and combining data from studies that will allow for a generalized conclusion beyond the group or individual under study, namely the RCT (Torgesen and Torgesen 2008). Therefore, in order to maintain the highest level of scientific and methodological rigor, it was determined that only RCTs investigating joint attention interventions for children with ASD would be included in the review.

Studies identified through literature searches were subjected to a two-level review process (specifically, title and abstract stage, full text stage). First, studies were required to meet the following criteria at the title and abstract stage to move to the full text level of inclusion evaluation: (1) treatment appears to include at least one aspect of joint attention training and (2) demonstrates a joint attention outcome(s). Joint attention training and outcomes could include any aspect of sharing of attention with a partner about an object or event of mutual interest (Mundy 1995). Those studies included at the title and abstract stage of evaluation were then critiqued according to the following full text stage inclusion criteria: (1) randomized experimental design, (2) participants were between the ages of 18 months and 8 years old and were diagnosed with ASD, (3) treatment involved instruction in at least one aspect of joint attention (e.g. sharing attention with others, initiating joint attention, gaze alteration, using gesture to direct attention to object/entity/event), and (4) at least one outcome measure of joint attention.

**Study retrieval**

A librarian with expertise in conducting advanced electronic literature searches with knowledge in the subject area was consulted to assist in establishing a search strategy. The following subject and keyword terms were used to guide all searches:

**SUBJECT: autism or ‘childhood disintegrative disorder’ or ‘pervasive developmental disorder not otherwise specified’**

**KEYWORDS: treatment or intervention or model joint attention**

Six electronic databases were identified and searched for this review including ERIC (1966–present); PsycINFO (1887–present); PubMed (1966–present); CINAHL (1982–present); DARE (1960–present); and Cochrane Central Register of Controlled Trials (1898–present). Proquest Dissertations and Theses Full Text (1861–present) is currently indexed in PsycINFO, therefore, a separate search for Proquest was not conducted. Searches were not limited by date. Thus, all databases were searched from the earliest indexed date through to 28 January 2015.

**Study selection**

The first author independently searched each database using the aforementioned search terms. Studies that met the first level review criteria by review of title and/or abstract were advanced to Stage 2, in which the full text was obtained. To be included in the final analysis, each study had to meet each of the four inclusion criteria mentioned previously. Figure 1 presents the study selection flow chart.
Joint attention meta-analysis

Study selection flow chart.

Study coding

The process of data extraction was guided by a coding manual and form, which were developed at the outset by the authors (available upon request). The manual contained operational definitions of the key terms and concepts, descriptions of the review procedures, and study features. The coding for each study was conducted independently by two study authors. Any discrepancy in coding was resolved to consensus through discussion and/or consultation, and when consensus could not be achieved between the two coders, a third author was consulted.

Coding of each study included the following categories: (1) design characteristics (i.e. design type, recruitment procedure, assignment procedure, blinding), (2) participant characteristics (i.e. number of participants in each group, attrition, gender, grade, age, ASD classification, severity, language ability, SES, race/ethnicity, sample source, previous treatment), (3) intervention characteristics (i.e. dosage, type of programme, interventionist, treatment grouping, setting), and (4) outcome characteristics (i.e. type of outcome variable, outcome measure administrator).

Assessment of methodological quality

Each of the included studies was assessed for risk of bias according to guidelines using the Cochrane Collaboration’s Tool for Assessing Risk of Bias (Higgins and Green 2011). This tool evaluates six areas and seven dimensions of bias: (1) selection bias: random sequence generation, treatment allocation; (2) performance bias: blinding of participants and personnel; (3) detection bias: blinding of outcome assessment; (4) attrition bias: incomplete outcome data; (5) reporting bias: selective reporting; and (6) other bias. The first and fourth author independently coded all the included studies and resolved any discrepancy to consensus.

Calculating and interpreting effect size

Data were analyzed using Comprehensive Meta-Analysis (CMA) software version 2.2.064 (Borenstein et al. 2005). The random effect model was used for the effect size point estimate. Effect size was calculated as the standardized mean difference correcting for small sample size bias (Hedges’ g), and these values were bounded by 95% confidence intervals. Cohen’s (1988) conventions for interpreting effect size were followed (i.e. 0 < g < .30 = small; .30 < g < .80 = moderate; g > .80 = large). The sample size in each study was accounted for by weighting the effect size by the inverse of the variance, allowing studies with greater numbers of participants to account for proportionally more of the effect.

Results

Summary of included studies

As seen in table 1, 16 studies met the inclusion criteria. Twelve of the 16 included studies were original studies and were included in the meta-analyses. Two other studies were included in follow-up analyses only (Kaale et al. 2014, Kasari et al. 2008). The remaining two studies that met inclusion criteria (Casenhiser et al. 2011, Gulsrud et al. 2014) were deemed inappropriate to include in the meta-analyses. The outcome measure used in the Casenhiser et al. (2011) study consisted of a Likert-style rating of joint attention ability which was determined to be incompatible with the joint attention frequency counts and duration of joint attention engagement measurements used in the other studies meeting inclusion criteria. Gulsrud et al. (2014), a follow-up to Kasari et al. (2006), was not deemed appropriate for the follow-up analyses given the length of time between post and follow-up was not comparable with the other follow-up studies (i.e. 5-year follow-up). Thus, Casenhiser et al. (2011) and Gulsrud et al. (2014) are not included in any of the meta-analyses described below. However a brief summary of the Casenhiser et al. (2011) and Gulsrud et al. (2014) studies is provided below in the joint attention versus control section and follow-up sections, respectively.

In addition, the participants in Kasari et al. (2008) were those reported in Kasari et al. (2006), thus for purposes of the meta-analysis, Kasari et al. (2008) was treated as a new study only for the follow-up analyses of the 2006 study. Non-follow-up results (i.e. pre and post) from Kasari et al. (2008) were reported in Kasari et al. (2006) and thus were not included again in the meta-analysis. Similarly, the participants in Kaale et al.
(2014) were those reported in Kaale et al. (2012), thus for purposes of the meta-analysis, Kaale et al. (2014) was treated as a new study only for the follow-up analyses.

The ages of children participating in the 12 original studies ranged from 11 to 152 months with an average age of 55 months. For the 11 studies that reported the average age of children in the joint attention intervention group, the mean age was 38.22 months (standard deviation (SD) = 5.82 of 10 reporting studies); the control group mean age was 37.59 (SD = 4.29 of 10 reporting studies); the comparison group mean age was 39.41 (based on eight reporting studies) (SD = 4.29 of 10 reporting studies);

The joint attention outcomes measured across studies were diverse and ranged from early developing joint attention to more complex joint attention. The joint attention outcomes included in the studies were coordinated joint attention, joint attention to symbolic play, joint attention in symbols, and joint reference. The joint attention outcomes used in the meta-analysis were joint attention to a partner about an object or event of mutual interest.

Two categories of intervention types were used in the 12 original meta-analyzed studies; eight studies implemented a combined behavioural and developmental approach (labelled discrete trial plus social interactive approach) (i.e. Goods et al. 2013, Gulsdot et al. 2007, Kaale et al. 2012, Kasari et al. 2006, 2010, 2014, Landza et al. 2011, Lawton and Kasari 2012) and four used a developmental approach (labelled social interactive approach) only (i.e. Aldred et al. 2004, Carter et al. 2011, Green et al. 2010, Schertz et al. 2013). Although treatment details differed, it should be noted that each of the included studies used explicit joint attention instruction in their treatment approach.

All the studies in this review included the following intervention characteristics: individualized goals, developmental progression of treatment targets and a progression of treatment targets based on a child’s performance. Though each of the studies included these treatment attributes, the degree of individualization ranged from initial assessment and target selection to continual monitoring of progress and adjustment of a programme based on a child’s needs. A general description of the intervention programmes identified in the included studies is presented in table 2.

The joint attention outcomes measured across studies were diverse and ranged from early developing joint attention behaviours such as eye gaze to an object during joint referencing acts to more complex joint attention behaviours such as child initiated coordinated joint

---

<table>
<thead>
<tr>
<th>Study</th>
<th>Tx n</th>
<th>Cnt n</th>
<th>Cmp n</th>
<th>Hedges g</th>
<th>CI LL</th>
<th>CI UL</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldred et al. (2004)</td>
<td>14</td>
<td>14</td>
<td>n.a.</td>
<td>.276</td>
<td>-.447</td>
<td>.999</td>
<td>.455</td>
</tr>
<tr>
<td>Carter et al. (2011)</td>
<td>28</td>
<td>23</td>
<td>n.a.</td>
<td>.220</td>
<td>-.325</td>
<td>.765</td>
<td>.429</td>
</tr>
<tr>
<td>Casenhuset et al. (2011)</td>
<td>25</td>
<td>26</td>
<td>n.a.</td>
<td>1.028</td>
<td>.452</td>
<td>1.604</td>
<td>.000</td>
</tr>
<tr>
<td>Goods et al. (2013)</td>
<td>5</td>
<td>6</td>
<td>n.a.</td>
<td>.657</td>
<td>-.464</td>
<td>1.778</td>
<td>.251</td>
</tr>
<tr>
<td>Green et al. (2010)</td>
<td>77</td>
<td>75</td>
<td>n.a.</td>
<td>.719</td>
<td>.392</td>
<td>1.045</td>
<td>.000</td>
</tr>
<tr>
<td>Gulsdot et al. (2014)</td>
<td>14</td>
<td>14</td>
<td>11</td>
<td>1.218</td>
<td>.413</td>
<td>2.023</td>
<td>.003</td>
</tr>
<tr>
<td>Gulsdot et al. (2007)</td>
<td>17</td>
<td>n.a.</td>
<td>18</td>
<td>.672</td>
<td>.006</td>
<td>1.339</td>
<td>.048</td>
</tr>
<tr>
<td>Kaale et al. (2014)</td>
<td>34</td>
<td>27</td>
<td>n.a.</td>
<td>.394</td>
<td>-.103</td>
<td>.515</td>
<td>.192</td>
</tr>
<tr>
<td>Kasari et al. (2012)</td>
<td>34</td>
<td>27</td>
<td>n.a.</td>
<td>.305</td>
<td>-.200</td>
<td>.809</td>
<td>.237</td>
</tr>
<tr>
<td>Kasari et al. (2014)</td>
<td>59</td>
<td>n.a.</td>
<td>48</td>
<td>.095</td>
<td>-.295</td>
<td>.484</td>
<td>.634</td>
</tr>
<tr>
<td>Kasari et al. (2006)</td>
<td>20</td>
<td>17</td>
<td>21</td>
<td>.535</td>
<td>-.100</td>
<td>1.170</td>
<td>.099</td>
</tr>
<tr>
<td>Kasari et al. (2008)</td>
<td>20</td>
<td>17</td>
<td>21</td>
<td>.703</td>
<td>.063</td>
<td>1.344</td>
<td>.031</td>
</tr>
<tr>
<td>Kasari et al. (2010)</td>
<td>19</td>
<td>19</td>
<td>n.a.</td>
<td>1.136</td>
<td>.417</td>
<td>1.855</td>
<td>.002</td>
</tr>
<tr>
<td>Landa et al. (2011)</td>
<td>24</td>
<td>n.a.</td>
<td>24</td>
<td>.341</td>
<td>-.220</td>
<td>.902</td>
<td>.234</td>
</tr>
<tr>
<td>Lawton and Kasari (2012)</td>
<td>9</td>
<td>7</td>
<td>n.a.</td>
<td>1.593</td>
<td>.490</td>
<td>2.696</td>
<td>.005</td>
</tr>
<tr>
<td>Schertz et al. (2013)</td>
<td>11</td>
<td>12</td>
<td>n.a.</td>
<td>1.153</td>
<td>.289</td>
<td>2.016</td>
<td>.009</td>
</tr>
</tbody>
</table>

Notes: Tx, treatment group; Cnt, control group; Cmp, comparison group; LL, lower limit; UL, upper limit.

*Excluded from meta-analyses.

*Included for follow-up analyses only.
<table>
<thead>
<tr>
<th>Study</th>
<th>Tx n</th>
<th>Cnt (Cmp) n</th>
<th>Mean age (months) at start</th>
<th>Type of Tx</th>
<th>Tx variation</th>
<th>Tx administrator</th>
<th>Outcome measure type</th>
<th>Tx dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldred et al. (2004)</td>
<td>14</td>
<td>14</td>
<td></td>
<td>Social interaction</td>
<td>Workshop training to facilitate parent–child exchange for 6 months TX followed by 6 months of less frequent sessions</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>30 min/day, in home over 6 months</td>
</tr>
<tr>
<td>Carter et al. (2011)</td>
<td>28</td>
<td>23</td>
<td></td>
<td>Social interaction</td>
<td>HMTW programme; eight group sessions and three video sessions of modelling and training for parent–child interaction</td>
<td>Parent</td>
<td>Structured assessment</td>
<td>30 min/day, over 11 weeks</td>
</tr>
<tr>
<td>Casenhiser et al. (2011)</td>
<td>25</td>
<td>26</td>
<td></td>
<td>Social interaction</td>
<td>MEHRI programme; one Tx session 1×/week; parents interact with child 3 h/day</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>Fifty-two 120-min clinic sessions; three hundred and sixty-five 180-min home sessions over 1 year</td>
</tr>
<tr>
<td>Goods et al. (2013)</td>
<td>5</td>
<td>6</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>JASPER programme</td>
<td>Graduate student</td>
<td>Both</td>
<td>Two 30-min sessions over 12 weeks</td>
</tr>
<tr>
<td>Green et al. (2010)</td>
<td>77</td>
<td>75</td>
<td></td>
<td>Social interaction</td>
<td>PACT programme to facilitate parent–child exchange; Tx first 6 months/2×/month clinic sessions then 6 months of 1×/month in clinic</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>120-min clinic; suggested 30 min/day in home; 48 clinic sessions for the first 6 months; 18 booster sessions for the second 6 months, over one year</td>
</tr>
<tr>
<td>Gulsrud et al. (2007)</td>
<td>17</td>
<td>(18)</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Replication of Kasari et al. (2006)</td>
<td>Not reported</td>
<td>Video-taped interaction</td>
<td></td>
</tr>
<tr>
<td>Gulsrud et al. (2014)a</td>
<td>15</td>
<td>11 (14)</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Follow-up study to Kasari et al. (2006)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaale et al. (2012)</td>
<td>34</td>
<td>27</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Based on Kasari et al. (2006) plus typical preschool programmes 5×/week</td>
<td>Teacher</td>
<td>Both</td>
<td>Forty 20-min sessions over 8 weeks</td>
</tr>
<tr>
<td>Kaale et al. (2014)a</td>
<td>34</td>
<td>27</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Follow-up study to Kaale et al. (2012)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Tx n</th>
<th>Cnt (Cmp) n</th>
<th>Mean age (months) at start</th>
<th>Type of Tx</th>
<th>Tx variation</th>
<th>Tx administrator</th>
<th>Outcome measure type</th>
<th>Tx dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kasari et al. (2006)</td>
<td>20</td>
<td>17 (21)</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>10 parent training modules; parent–child-interventionist</td>
<td>Graduate student</td>
<td>Both</td>
<td>Fifteen to eighteen 50-min sessions over 5–6 weeks</td>
</tr>
<tr>
<td>Kasari et al. (2008)</td>
<td>20</td>
<td>17 (21)</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Follow-up study to Kasari et al. (2006)</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>Twenty-four 30-min sessions over 8 weeks</td>
</tr>
<tr>
<td>Kasari et al. (2010)</td>
<td>19</td>
<td>19</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>10 parent training modules; parent–child-interventionist</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>Twenty-four 30-min sessions over 8 weeks</td>
</tr>
<tr>
<td>Kasari et al. (2014)</td>
<td>52</td>
<td>60</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Tx1-CMM: caregiver trained with child using JASPER approach of 1 h Tx 2×/week, Tx2-CEM: caregiver training without child involved in JASPER training of 2 h/week group sessions</td>
<td>Parent</td>
<td>Both</td>
<td>Twelve 60-min sessions over 12 weeks</td>
</tr>
<tr>
<td>Landa et al. (2011)</td>
<td>24</td>
<td>(24)</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>AEPS programme in clinic 4×/week</td>
<td>Not reported</td>
<td>Structured assessment</td>
<td>One hundred and four 150-min sessions over 6 months</td>
</tr>
<tr>
<td>Lawton and Kasari</td>
<td>9</td>
<td>7</td>
<td></td>
<td>Discrete trial plus social interaction</td>
<td>Based on Kasari et al. (2006) and manualized for teacher use 5 days/week in school</td>
<td>Teacher</td>
<td>Structured assessment</td>
<td>Thirty 24-min sessions over 6 weeks</td>
</tr>
<tr>
<td>Schertz et al. (2013)</td>
<td>11</td>
<td>12</td>
<td></td>
<td>Social interaction</td>
<td>JAML programme; weekly home based Tx</td>
<td>Parent</td>
<td>Video-taped interaction</td>
<td>Fifteen clinician-led home-based sessions; parents asked to use the strategies daily; length of clinician-led sessions not reported; suggested 30 min parent–child Tx daily</td>
</tr>
</tbody>
</table>

Notes: *Follow-up study.
AEPS, Assessment, Evaluation and Programming System for Infants and Children; CEM, Caregiver Education Model; CMM, Caregiver Mediated Model; HMTW, Hanen More Than Words; JAML, Joint Attention Mediated Learning; JASPER, Joint Attention Symbolic Play Engagement and Regulation; MEHRI, Milton and Ethel Harris Research Initiative; PACT, Preschool Autism Communication Trial.
Joint attention meta-analysis

attention paired with shared positive affect. Joint attention outcomes included, but were not limited to: shared attention, joint attention with gaze shift, coordinated joint attention with shared affect, child initiated joint attention, conventional gestures (showing, pointing, giving), and child responding to joint attention acts. All the joint attention outcomes reported across studies fell within the continuum of the development of joint attention. Note that no outcomes related to parent/caregiver joint attention initiations or responses were included in the analyses; only child outcomes were included.

The study outcome measures used in the included studies were divided into two broad categories: structured—i.e. Communication and Symbolic Behavior Scales—Developmental Profile (CSBS-DP; Wetherby and Prizant 2002); and Early Social-Communication Scales (ESCS; Mundy et al. 1996)— and coded video-taped interactions. A meta-analysis was run to determine whether a difference existed in effect sizes between these two outcome measure categories. Effect sizes were found to be positive and significant for both outcome measure categories (structured assessments: Hedges $g = .421$, 95% CI [.014, .828]; video-taped interactions: Hedges $g = .763$, 95% CI [.492, 1.034]).

The joint attention outcomes were also able to be divided into one of two types: proto-declarative joint attention initiations and joint attention responses. Effect sizes were found to be positive and significant for each of these categories (joint attention initiations: Hedges $g = .469$, 95% CI [.258, .679]; joint attention responses: Hedges $g = .933$, 95% CI [.457, 1.409]). Again, these outcome types were determined to be conceptually compatible enough to come in subsequent analyses.

Overall treatment effect: joint attention versus control group

The first analysis included only those studies in which the joint attention intervention was compared with a non-treated control group. This analysis provided the opportunity to determine the efficacy of the intervention (specifically joint attention) on joint attention outcomes relative to children who received no treatment. Nine studies implementing a joint attention treatment versus control design were aggregated for treatment effect (table 4). A random effects analysis of these studies yielded a positive significant effect (Hedges $g = .660$, 95% CI [.395, .925], $p < .001$). These findings suggest that the average joint attention treated child with ASD saw an improvement in joint attention outcomes of approximately 2/3 SD when compared with the average non-treated child with ASD.

Sensitivity analysis, via the one-study-removed procedure, was conducted to determine the potential impact of any one of the studies on the combined treatment effect. The one-study-removed sensitivity analysis computes total effect size, 95% confidence interval and observed probability relative to the average effect size of the studies that remain in the calculation. The results suggest minimal movement on the effect. For example, removal of the Schertz et al. (2013) study decreased Hedges $g$ the greatest (from .660 to .605) and removal of Carter et al. (2011) increased Hedges $g$ the most (from .660 to .726).

Data analysis

The data analysis for the study involved examination of type of treatment design (i.e. joint attention versus control; joint attention versus Symbolic play; joint attention 1 versus joint attention 2), treatment administrator (i.e. parent versus non-parent), intervention type (i.e. discrete trial training plus social interactive versus social interactive only) and follow-up. Due to the limited number of original studies included for meta-analysis, type of intervention characteristics (i.e. discrete trial training plus social interactive approach versus social interactive approach only) were unable to be meta-analyzed in meaningful ways beyond what is described above. Table 4 presents the effect sizes, confidence interval for the effect, and observed probability values.

Assessment of methodological quality

As described above, the risk of bias for each included study ($n = 16$) was analyzed by two independent coders using high, low and unable to determine guidelines (Higgins and Green 2011). A comparison of the initial independent coding of the first and fourth authors revealed 97% agreement for all areas of assessment. Resolution of the coding discrepancies was reached without a third party review. Table 3 shows the outcomes of this assessment. Overall, there was a low risk of bias across studies with a majority of the ratings (60%) falling within this judgment category. Only 7% of the judg-

ments were classified as high-risk primarily due to a greater than 20% attrition rate without a description of how missing data was accounted for in the analysis or a lack of outcome assessment blinding. Thirty-three percent of the possible ratings were designated as ‘unclear risk of bias’ in the areas of randomization, allocation concealment and blinding procedures.
Table 3. Assessment of methodological quality

<table>
<thead>
<tr>
<th>Study</th>
<th>Random sequence generation</th>
<th>Allocation concealment</th>
<th>Performance bias</th>
<th>Detection bias</th>
<th>Attrition bias</th>
<th>Reporting bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldred et al. (2004)</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>U</td>
<td>L</td>
</tr>
<tr>
<td>Carter et al. (2011)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Casenhiser et al. (2011)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Goods et al. (2013)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Green et al. (2010)</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Gulsrud et al. (2014)</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Gulsrud et al. (2007)</td>
<td>U</td>
<td>U</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Kaale et al. (2014)</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Kaale et al. (2012)</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Kasari et al. (2014)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Kasari et al. (2006)</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Kasari et al. (2008)</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Kasari et al. (2010)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Landa et al. (2011)</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Lawton and Kasari (2012)</td>
<td>L</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Schertz et al. (2013)</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>L</td>
<td>U</td>
<td>L</td>
</tr>
</tbody>
</table>

Notes: ‘Follow-up studies.’
U, unclear risk of bias; L, low risk of bias; H, high risk of bias.

Table 4. Summary of analyses

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Overall Hedges g</th>
<th>95% Confidence interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint attention versus control group</td>
<td>.660</td>
<td>.395, .925</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Joint attention versus symbolic play</td>
<td>.527</td>
<td>.077, .978</td>
<td>.022</td>
</tr>
<tr>
<td>Joint attention 1 versus joint attention 2</td>
<td>.187</td>
<td>-.192, .566</td>
<td>.334</td>
</tr>
<tr>
<td>Kasari et al. (2014)</td>
<td>.466</td>
<td>-.099, 1.030</td>
<td>.106</td>
</tr>
<tr>
<td>Landa et al. (2011)</td>
<td>.678</td>
<td>.313, 1.043</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Joint attention versus control group; treatment administered by parent</td>
<td>.654</td>
<td>.184, 1.124</td>
<td>.006</td>
</tr>
<tr>
<td>Joint attention versus control group; treatment administered by non-parent</td>
<td>.762</td>
<td>.337, 1.187</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Joint attention versus control group; discrete trial training plus social interactive approach</td>
<td>.589</td>
<td>.194, .983</td>
<td>.003</td>
</tr>
<tr>
<td>Joint attention versus control group; social interactive approach only</td>
<td>.349</td>
<td>.042, .657</td>
<td>.026</td>
</tr>
<tr>
<td>Follow-up studies (all comparisons)</td>
<td>.560</td>
<td>.198, .923</td>
<td>.002</td>
</tr>
</tbody>
</table>

As previously mentioned, an additional study (Casenhiser et al. 2011) compared a joint attention treatment group versus a control group but was not included in this meta-analysis. Casenhiser et al. (2011) was excluded because the method of analysis of joint attention ability used a Likert-type scale which was determined to be incompatible with the joint attention frequency counts and duration of joint attention engagement included in the other studies. However, the Casenhiser et al. study does report the results of a joint attention-focused intervention, the Milton and Ethel Harris Research Initiative (MEHRI) programme based on a Developmental Individualized Relationships-based (DIR) intervention. Participants were randomly assigned to the treatment (n = 25) or control (n = 26) group. Therapists met with the children and caregivers for 2 h each week for 1 year. In addition, therapists met with caregivers every 8 weeks to review video-taped interactions of caregivers and their child and to discuss progress. Results of the rating scale measure (a modified version of the Child Behavior Rating Scale: Kim and Mahoney 2004, Mahoney and Perales 2003) indicated a positive and significant effect (Hedges g = 1.028, 95% CI [.452, 1.604], p < .001).

Joint attention versus symbolic play

An analysis of joint attention treatment versus symbolic play intervention provided the opportunity to make a comparison of different treatments resulting in a treatment 1- versus treatment 2-type of examination. Two studies were reviewed (Gulsrud et al. 2007, Kasari...
et al. 2006). In both the treatment administrator was a non-parent. These studies included a joint attention treatment approach versus a symbolic play treatment comparison but were not delimited in any other way. An analysis of these studies yielded an overall Hedges g effect of .527, 95% CI [.077, .978], p = .022. These findings suggest that the average joint attention treatment child with ASD saw an improvement in joint attention outcomes over .5 SD when compared with the average child with ASD treated with symbolic play. Sensitivity analyses were not appropriate due to the inclusion of only two studies.

Joint attention 1 versus joint attention 2

This examination included only those studies in which a joint attention intervention was compared with another joint attention treatment. Two studies were reviewed (Kasari et al. 2014, Landa et al. 2011). The Kasari and Lawton study compared two caregiver interventions that targeted joint attention. The first intervention included a hands-on approach in which trained interventionists coached the parents on how to interact with their child, with the child present. The comparison intervention also included a caregiver training approach but parents attended group education sessions without their child present. The Landa et al. study used a curriculum to target joint attention (AEPS; Bricker 2002) in both treatment conditions but one of the treatment groups received many more interventionist contrived opportunities to engage in joint attention tasks.

While both studies include two interventions with a joint attention component, the nature of the interventions was deemed to be too different to combine meta-analytically. Therefore, individual study results are discussed here. Results of the Kasari et al. (2014) study yielded an overall effect of Hedges g = .187, 95% CI [−.192, .566.], p = .334. Findings from the Landa et al. study yielded an overall effect of Hedges g = .466, 95% CI [−.099, 1.030], p = .106. The overall effect was found to be positive for both studies. However, given the large confidence intervals which cross zero, it is not clear that providing more interventionist contrived opportunities in therapy leads to a significant increase in joint attention outcomes compared with an intervention which provided less interventionist contrived opportunities.

Joint attention versus control group: treatment administered by non-parent

Analyses were also conducted to assess the effects associated with non-parent treatment administrators (e.g. clinicians, researchers, teachers). This examination included only four studies in which a joint attention intervention was compared with a non-treated control group and delimited to include only non-parent treatment administrators (Goods et al. 2013, Kaale et al. 2012, Kasari et al. 2006, Lawton and Kasari 2012). An analysis of these studies yielded an overall Hedges g effect of .654, 95% CI [.184, 1.124], p = .006. The results provide evidence that joint attention interventions implemented by a non-parent have average improvements in joint attention outcomes for treated children with ASD of about 2/3 SD when compared with the average non-treated child with ASD.

The one-study-removed sensitivity analysis suggests that the Hedges g effect decreases by about 13% when Schertz et al. (2013) or Kasari et al. (2010) are removed (from .678 to .589) and increases about 18% when Carter et al. (2011) is removed (from .678 to .799). In both analyses, the treatment effect remained significantly positive.

Joint attention versus control group: discrete trial training plus social interactive approach

There were five studies that examined the effects of interventions which combined a behavioural, discrete trial training (Lovaas 1987) approach with a developmental social interactive approach. All the included studies was compared with a non-treated control group with the parent as the treatment administrator (Aldred et al. 2004, Carter et al. 2011, Green et al. 2010, Kasari et al. 2010, Schertz et al. 2013). An analysis of these studies yielded an overall effect of Hedges g = .678, 95% CI [.313, 1.043], p < .001. These findings suggest that, for interventions in which the parent is the treatment administrator, the average joint attention treated child with ASD saw an improvement in joint attention outcomes approximately 2/3 SD when compared with the average non-treated child with ASD.

The one-study-removed sensitivity analysis suggests that the Hedges g effect decreases by about 29% when Schertz et al. (2013) or Kasari et al. (2010) are removed, at which point Hedge’s g was no longer statistically significant (p = .56).
with this type of treatment compared with a control group were based on the Kasari et al. (2006) intervention programme. Five studies were aggregated (Goods et al. 2013, Kaale et al. 2012, Kasari et al. 2006, 2010, Lawton and Kasari 2012). An analysis of these studies yielded an overall positive and significant effect with Hedges $g = .762$, 95% CI [.337, 1.187], $p < .001$. The results provide evidence that joint attention interventions with a combined behavioural and social interactive approach have average improvements in joint attention outcomes for treated children with ASD of more than $2/3$ SD when compared with the average non-treated or comparison treated child with ASD.

The one-study-removed sensitivity analysis suggests that the Hedges $g$ effect decreases by about 18% when Lawton and Kasari (2012) is removed (from .762 to .625) and increases approximately 25% when Kaale et al. (2012) is removed (from .762 to .949) while still yielding a significantly positive treatment effect.

Joint attention versus control group: social interactive approach studies

Studies with interventions that used a social interactive approach to intervention were also examined (Aldred et al. 2004, Carter et al. 2011, Green et al. 2010, Schertz et al. 2013). These data revealed an overall Hedges $g$ effect of $.589$, 95% CI [.194, .983], $p = .003$. The results provide evidence that joint attention interventions with a social interactive approach have moderate improvements in joint outcomes for treated children with ASD approaching $2/3$ SD when compared with the average non-treated or comparison treated child with ASD.

The one-study-removed sensitivity analysis suggests that the Hedges $g$ effect decreases by about 12% when Schertz et al. (2013) is removed (from .589 to .556) and increases approximately 22% when Carter et al. (2011) is removed (from .589 to .721).

Follow-up (all comparisons)

Five studies that included follow-up data were also examined (Kaale et al. 2014, Kasari et al. 2008, 2014, Landa et al. 2011, Schertz et al. 2013). Follow-up data were collected at 4 and 8 weeks (Schertz et al. 2013), 3 months (Kasari et al. 2014), 6 months (Landa et al. 2011), and 6 and 12 months (Kaale et al. 2014, Kasari et al. 2008). An analysis of the follow-up data yielded an overall Hedges $g$ effect of .349, 95% CI [.042, .657], $p = .026$. The results provide evidence that follow-up of joint attention interventions results in a statistically significant effect suggesting that there is some lasting impact of the intervention after the treatment concludes.

The one-study-removed sensitivity analysis suggests that the Hedges $g$ effect decreases the most (about 28%) when Schertz et al. (2013) is removed (from .349 to .251) and increases the most (by about 36%) when Kasari et al. (2014) is removed (from .349 to .475).

As previously mentioned, an additional study (Gulsrud et al. 2014) provided follow-up data to the Gulsrud et al. (2007) study but was not included in this meta-analysis. Gulsrud et al. (2014) was excluded because the length of time between post-test and follow-up assessment was considerably longer (5 years) than all other follow-up data (4 weeks to 12 months). However, a 5-year follow-up of a joint attention intervention is important information to report here. The researchers followed 40 participants originally diagnosed with ASD from the original Gulsrud et al. (2007) study. Joint attention outcomes were assessed at follow-up using an adaptation of the ESCS for older children, the Joint Attention Measure from the ESCS (JAMES; Jahromi et al. 2009). A general linear mixed modelling approach was used to examine trajectories of the participants over time. Results showed the Joint Attention treatment group to have a significantly faster growth rate than the symbolic play comparison group in coordinated joint looking ($p < .01$) and in showing ($p < .01$). The joint attention treatment group also was found to demonstrate a significantly faster growth rate when compared with the control group in coordinated joint looking ($p < .01$) and in showing ($p < .01$). The symbolic play and control groups did not differ significantly in growth rate in either coordinated joint looking ($p = .83$) or showing ($p = .15$). Group assignment also did not impact growth rate of the joint attention outcome of pointing ($p = .90$).

Joint attention versus control group: follow-up

This examination included those studies in which a joint attention intervention was compared with a non-treated control group and included a follow-up measurement of the dependent variable at some point beyond the immediate post treatment analysis. Three studies were examined (Kaale et al. 2014, Kasari et al. 2008, Schertz et al. 2013). Follow-up data were collected at 4 and 8 weeks (Schertz et al. 2013), and 6 and 12 months (Kaale et al. 2014, Kasari et al. 2008). An analysis of the follow-ups yielded an overall Hedges $g$ effect of .560, 95% CI [.198, .923], $p = .002$. The results provide evidence that interventions have average follow-up improvements in the outcome for joint attention treated children with ASD of over $.5$ SD when compared with the average non-treated child with ASD.

The one-study-removed sensitivity analysis suggests that the Hedges $g$ effect remains somewhat similar when Kasari et al. (2008) is removed (from .560 to .590), decreases when Schertz et al. (2013) is removed (from
which the authors carried out these tasks. When the randomization and assignment concealment process was reported, the details included in the study were judged to be 'unclear' in their randomization and allocation concealment process. The unclear category indicates that while the randomization and assignment process was reported, the details included in the studies did not allow for the determination of the rigor by which the authors carried out these tasks.

The results of each of the analyses conducted, as indicated in table 4, were positive and significant yielding moderate effects ranging from .345 to .719 suggesting that explicit joint attention interventions improve initiation of or responding to joint attention bids. However, it is important that the reader consider the results of these analyses in light of several limitations of the included individual studies including: (1) inadequate reporting of study characteristics in included studies, (2) participant attrition, (3) dosage, and (4) limited number of studies with follow-up data. Each of these limitations as well as implications for researchers and practitioners will be discussed below.

Discussion

The purpose of this study was to determine the efficacy of joint attention interventions on the joint attention ability of children diagnosed with ASD. A total of 16 studies were identified as meeting study inclusion criteria but only 14 studies were meta-analyzed. Two studies (Casenhiser et al. 2011, Gulsrud et al. 2014) were excluded from the meta-analysis due to an incompatible outcome measure and the inconsistent comparison of follow-up relative to the follow-up time periods in the other included studies respectively. The methodological quality of the included studies was generally judged to be acceptable despite the finding that most of the studies were judged to be ‘unclear’ in their randomization and allocation concealment process. The unclear category indicates that while the randomization and assignment process was reported, the details included in the studies did not allow for the determination of the rigor by which the authors carried out these tasks.

Participant attrition


Summary of analyses

Table 4 presents a summary of the analyses conducted. All comparisons, including those conducted as follow-ups, resulted in a statistically significant effect, with the largest effects evidenced for discrete trial training plus social interactive approach followed by joint attention treatments that were administered by a parent. However, the overlapping confidence intervals suggest that none of the comparisons were statistically different from each other (Schenker and Gentleman 2001). This implies that the interventions are similar in terms of efficacy with one type of intervention not significantly more efficacious than another. Specifically, treatment administrator, dosage, and design (control or comparison, etc.) characteristics of the studies do not appear to produce significantly different effects due to the overlapping confidence intervals.

Inadequate reporting

Perhaps the most limiting factor was the lack of critical participant and intervention details reported in the individual studies. For example, only three studies reported information about participants’ communication or language ability at the start of the study and only one study provided participants’ severity rating (e.g. specific autism diagnostic observation schedule (ADOS) scores). As described in the background section of this review, there are different behaviours (e.g. gaze shifts between person and object; showing or pointing gestures; initiation of or responding to joint attention bids) within the construct of joint attention that are expected to be achieved at different points developmentally. With the wide age ranges included in this review (i.e. 15–71 months) and the heterogeneous nature of ASD, it is not unreasonable to expect explicit instruction in certain joint attention behaviours to be more appropriate for certain children than others. Although each study reported that a child-specific developmental progression of targets was used, it is impossible to comment on which approach would be best for children at different stages of joint attention ability based on the current evidence base.

It is also difficult to determine which intervention or intervention component(s) result in better outcomes. Beyond the broad comparison of interventions combining a behavioural with a developmental approach and a solely developmental approach, studies were unable to be grouped and analyzed in meaningful ways. Though 10 of the 14 studies did provide adequate information regarding dosage (i.e. length of the treatment programme, number of sessions per week, and length of individual sessions), the parent-implemented interventions, in particular, lacked detail. Although the majority of the parent-implemented programmes included recommendations to the parents regarding how often and for how long they should work with their children (e.g. 30 min daily), none provided information regarding the parents’ adherence to these suggestions. Yet, it is important to note that all but one of the included studies provided some measure of treatment fidelity beyond dosage recommendations (i.e. adherence to treatment protocol). This is particularly encouraging as it provides a measure of confidence that the prescribed treatment programme was carried out as designed.
Kimberly A. Murza et al.

DAMS method for delivering joint attention interventions with children with ASD, though not included in the meta-analysis, provide an important and significant contribution. Several themes emerged that have implications for researchers interested in investigating joint attention interventions for children with ASD as well as for speech–language practitioners who work with these children. First, it behoves researchers to describe better the treatment programme under investigation to encourage replication of intervention approach. Though some of the included studies described their intervention programmes extremely well, it would be very difficult to replicate the interventions described in the majority of the studies. In particular, what are the key components of the intervention? Which aspects of joint attention are explicitly addressed? How is the child encouraged to respond? Answers to these questions would certainly help researchers and practitioners replicate the joint attention interventions described in the included studies.

The results of this meta-analysis provide strong support for explicit joint attention interventions for young children with ASD; however, it remains unclear which children (e.g. severity, language ability, age, cognitive ability) with ASD respond to which type of intervention. With the heterogeneity of ASD, participant characteristics such as severity rating, communication and language ability, and cognitive ability would be beneficial to include in future studies so that practitioners might have a better understanding of whether a particular intervention is appropriate for their client. Finally, perhaps the most critical next steps for researchers, in particular, relates to treatment efficiency. With the minimal treatment intensity of 12 h seen in one of the included studies, investigating minimal treatment intensity to determine the extent to which positive and significant effects are evidenced is needed. With the rising costs of therapeutic services and demands placed on parents in some of the included studies, questions related to dosage should be explored further.

Limited follow-up

Five studies (Kaale et al. 2014, Kasari et al. 2008, 2014, Landa et al. 2011, Schertz et al. 2013) investigated the maintenance effect of intervention upon completion of the programme. Although the effect size based on these five follow-up studies was small and significant, it is difficult to draw conclusions about the long-term effects of joint attention treatment with this population due to the small number of included studies and the varied range of follow-up data collection times (6 weeks to 12 months). The results of the 5-year follow-up to Kasari et al. (2006) (Gulsrud et al. 2014), though not included in the meta-analysis, provide an important and significant contribution.

Dosage

The intervention dosage across studies was extremely varied (i.e. 12–1196 h). This was primarily due to the inclusion of parent-implemented interventions in which the researchers requested that parents deliver the intervention quite frequently over several months to a year in some cases. However, none of the studies that included a recommended parent-implemented intervention incorporating learned strategies kept data on whether parents adhered to that recommendation. Thus, the actual dosage for the parent-implemented studies is unknown and therefore this variable could not be meta-analyzed. Considering the range of treatment intensity estimated across included studies (12–1196 h) it is important for researchers to provide a detailed account of actual intervention dosage in future studies. Currently, the most efficient method for delivering joint attention interventions with this population remains unclear.

Acknowledgements

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References


Joint attention meta-analysis


CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC), 2012, Prevalence of Autism Spectrum Disorders: Autism and Developmental Disabilities Monitoring Network, 14 Sites, United States, 2008, Surveillance Summaries No. 61, March (CDC), Atlanta, GA.


