Journal of Early Intervention
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Journal of Early Intervention 2012 34: 82
DOI: 10.1177/1053815112453766

The online version of this article can be found at:
http://jei.sagepub.com/content/34/2/82

Published by:
SAGE
http://www.sagepublications.com

On behalf of:
DEC
Division for Early Childhood of the Council for Exceptional Children

Journal of Early Intervention
Volume 34 Number 2
June 2012 82-103

10.1177/1053815112453766
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Play and Communication in Children With Autism Spectrum Disorder

A Framework for Early Intervention

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The association between object play and intentional communication was examined in children with autism spectrum disorder (ASD). Meta-analysis of concurrent and longitudinal correlational studies revealed significant associations between object play and intentional communication in young children with ASD. One well-conducted and internally valid, randomized, controlled trial suggests a bidirectional causal relationship between object play and intentional communication. Further experiments are needed to replicate these findings and test a play-as-stronger-cause hypothesis. Findings of the review have implications for development and implementation of effective interventions for young children with ASD when communication is the target and play serves as the context for intervention strategies. One model for conceptualization of treatment is proposed.

Keywords: *autism spectrum disorder, play, communication, early intervention, meta-analysis*

Engagement in object play and communication occupies much of a child's time early in development. Yet, the strength and degree of evidence for, and direction of the causality of, the association between object play and communication remains difficult to ascertain. Understanding the nature of such an association has potential implications for providing effective intervention to young children with disabilities, including children with autism spectrum disorders (ASD). Meta-analytic and narrative techniques are needed to summarize the empirical evidence of an association between play and communication in young children with ASD. In addition, a theoretical framework is needed for both the changing and mutual influence of play and communication in early childhood, as well as a model for conceptualizing intervention involving play and communication in children with ASD.

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Theories of Play and Communication in Early Development

According to Piaget, during the first 2 years of life, children predominantly demonstrate "practice play," which involves exploration and discovery of the characteristics and functional uses of objects. Children eventually increase engagement in symbolic play (SP) activities as they approach their second birthday, requiring a shift toward increasingly abstracted actions and intentions (i.e., symbolization; Rubin, Fein, & Vandenberg, 1983). Similar to Piaget, Lev Vygotsky emphasized object substitution in his conceptualization of SP. Vygotsky "viewed play as creating the child's 'zone of proximal development' (that is, the highest level of performance of which the child is capable)" (Rubin et al., 1983, p. 709). Vygotsky viewed SP, and more specifically object substitution, as a preliminary step in understanding the symbolic structure of a sign to its referent (Fein, 1979). Reflected in both theories is the significance of the emergence of symbolic capacity during the 2nd year of development. The ability to substitute one object for another in SP parallels the eventual use of symbols (e.g., words) to represent objects and events in communicative exchanges with others.

During the first 2 years of life, the development of language is a complex interactive process requiring the support of early routines and familiar contexts to support a child's processing of social and communicative information (Bruner, 1983). These routines teach the child how to engage socially with an adult, and early turn-taking exchanges provide a rudimentary format for later back-and-forth communicative exchanges. These familiar routines and exchanges, during which children learn the early functions of language (i.e., social interaction, requesting, and declaring), often involve playful interactions with objects. Accordingly, children acquire language so they can express their internal states and thoughts to others, as well as share in others' expression of thoughts, during these early social interactions involving objects (Bloom, 1993). In this way, acquisition is driven by intentionality—children's desires, beliefs, and feelings. Both Bruner and Bloom emphasize the important role of objects in motivating the child's early communicative attempts, as well as the context in which these early exchanges occur—the familiar routines, games, and play of child and caregiver. Indeed, as children's play themes become more abstract (i.e., symbolic in nature), a need for the use of language to include and inform play partners may increase, leading children to use more language during such complex play interactions.

Language learning occurs when the child is compelled to express to others his or her intentional states, which comprise the child's desires, wants, and thoughts around *objects* and events in the external environment. Central to children's communication with others is their ability to direct their attention to the object of interest *and* to their communicative partner. The first instances of coordinated attention often occur because adults insert objects into their familiar interactive games and routines (Adamson & Chance, 1998; Bruner, 1983). Objects and toys that spark children's interest become the impetus for them to communicate meaningfully to their interactive partner. Within this framework, we can see how children who are interested in many objects and toys are provided with more opportunities to engage in coordinated attention to object and person, and are also provided more varied linguistic information regarding their diverse interests (Yoder & McDuffie, 2006). This notion becomes particularly salient for intervention planning for individuals with deficient play skills and delayed communication skills, such as children with ASD.

Object Play and Intentional Communication in Children With ASD

Children with ASD have been found to demonstrate reduced instances of, and differences in, the way they display their exploratory play (Williams, 2003), nonsymbolic play (NSP; Stone, Lemanek, Fishel, Fernandez, & Altemeier, 1990; Williams, Reddy, & Costall, 2001), and SP (Sigman & Ungerer, 1984; Wetherby, Watt, Morgan, & Shumway, 2007) as compared with typically developing children and children with other developmental disabilities. Although an underlying reason for the deficit in play abilities has not been agreed on among researchers, it is clear the undifferentiated exploration of objects, and the functional and symbolic engagement with objects, is disrupted for many young children with ASD.

In addition to impairments in object play, children with ASD demonstrate differences in nonverbal communication and expressive language (EL) development compared with children with typical development and children with other developmental disabilities (e.g., Mundy, Sigman, & Kasari, 1990; Wetherby et al., 2004). Differences include fewer coordinated attention acts, especially in initiations of joint attention (JA; i.e., those used for the declarative function; Mundy, Sigman, Ungerer, & Sherman, 1986; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Wetherby et al., 2007). These findings point to aspects of communication (i.e., gaze-related communication, nonverbal intentional communication [NVIC] for the declarative function, and conventional communication) that may be particularly difficult for children with ASD.

Implications for Play and Communication Deficits in Children With ASD

Although the nature and extent of play and communication deficits vary across children with ASD, it is clear they have implications for later functioning for individuals diagnosed with the disorder. It has been found that development of EL predicts positive long-term outcomes in individuals with ASD (Howlin, Goode, Hutton, & Rutter, 2004; Lord, Risi, & Pickles, 2004). In addition, many early intervention strategies occur within the context of play (e.g., Dawson et al., 2010). It seems logical, therefore, that children who are better able to participate in play routines may have greater access to the strategies employed by early interventionists. An understanding of the strength, degree of evidence for a causal relationship of, and direction of the causal influence for, the association between object play and intentional communication may lead to more effective intervention strategies, thus improving developmental and learning outcomes of individuals with ASD.

Research Questions

Examination of the association between object play and intentional communication has direct implications for early intervention and optimization of outcomes for individuals diagnosed with ASD. EL remains an important goal of early intervention and educational programming for children with ASD, and early NVIC behaviors such as coordinating attention to object and person have been found to predict later language abilities within this population (e.g., Mundy et al., 1990). In addition, much intervention work occurs within the context of play routines, and some interventions target play skills directly (Yoder & McDuffie, 2006). However, if it can be demonstrated that play skills are related to intentional

communication, and that changes in play skills can lead to changes in intentional communication, this could highlight the importance of including and treating both object play and communication goals simultaneously in treatment sessions. Therefore, the current review addresses the following questions:

Research Question 1: Is there a positive association between object play and intentional communication in young children with ASD?
Research Question 2: Are there positive associations between specific categories of object play (i.e., NSP and SP) and intentional communication (i.e., NVIC and EL) within the ASD population?
Research Question 3: Is the relationship among these aspects of development significant even after controlling for other probable explanations for the relationship?
Research Question 4: In the ASD population, is there evidence that this association is causal, and if so, in what direction?

Method

Meta-analytic and narrative reviews were conducted to examine the association between object play and intentional communication. Meta-analysis is a method for analyzing published research and includes formalized coding procedures and statistical techniques to summarize quantitative data across a set of comparable studies (Lipsey & Wilson, 2001). The current meta-analysis was considered informal. Consistent with meta-analytic principles, the assumption of independence of units in meta-analysis was addressed by using a single effect size from each study per analysis (Lipsey & Wilson, 2001). In addition, effect sizes were weighted by the sample size. In this review, meta-analytic results were sometimes based on different correlation coefficients (i.e., zero-order correlations, partial, and part correlations). It is acknowledged that the inclusion of studies with different types of correlations could result in under- or overestimates of mean effect sizes. However, this decision was made to maximize the number of studies included in the meta-analysis. A sensitivity analysis was conducted to determine whether the decision to include partial and part correlations influenced the conclusions.

Categorization of Play and Communication Variables

Criteria for object play and intentional communication variables were defined by the authors of this review prior to the literature search, and provided a basis for inclusion or exclusion of a study from the current meta-analysis. Throughout the current article, the term *object play* is used to refer to a broadly defined construct of play comprising NSP and SP behaviors with objects. The object play category encompasses a range of metrics, including play level and frequency. Because research questions addressed the association between object play and intentional communication generally, and not a specific cognitive level of play attainment, any variable reflecting levels of object knowledge was considered object play. When details were available in the studies, NSP was distinguished from SP variables (i.e., if a study categorized a directly measured play variable as symbolic or nonsymbolic, that category was generally maintained in the meta-analysis).

Intentional communication was defined as (a) gestures or nonword vocalizations with attention shown to an object and adult or (b) nonimitative words or signs. The term *intentional communication* is used to refer to a broadly defined construct comprising NVIC and EL. Gestures or nonword vocalizations with coordinated attention to object and person were categorized as NVIC. Knowledge of measurement procedures used (e.g., *the Early Social Communication Scales* [ESCS]; Seibert, Hogan, & Mundy, 1982), in addition to detailed definitions provided in several of the articles (e.g., Wetherby et al., 2007), allowed for determination of whether NVIC met the above criteria. Nonimitative words or signs, with or without attention to an adult, were categorized as EL.

Preliminary Search

Keyword searches were conducted in the Educational Resources Information Center (ERIC) and PsycINFO databases using the combination of keywords (a) *communication* and *play* and *autis** and (b) *language* and *play* and *autis**. The initial search of the ERIC database resulted in 161 and 128 articles, respectively, whereas the search of the PsycINFO database resulted in 524 and 527 articles, respectively. General relevance of articles to the current study from these initial searches was determined by screening the abstracts for evidence that (a) participants included young children with ASD, (b) researchers described play or communication variables, and (c) the article was written in English. This initial screening resulted in 100 abstracts from the ERIC database and 161 abstracts from the PsycINFO database. There was some overlap in studies identified by the two electronic databases.

Relevant reports (including dissertations) identified from the results of the initial database searches were selected for further evaluation if they (a) involved children with ASD ages 18 to 60 months, with more than 50% of the sample falling within these age ranges, or with a sample with an average mental age (MA) within these chronological age (CA) ranges; (b) used a concurrent or longitudinal correlational design or experimental design; and (c) examined both object play and intentional communication variables as defined above. Because development of object play and intentional communication are not necessarily associated with CA in young children with ASD but may be associated with MA, inclusion of studies of slightly chronologically older children functioning in the 18- to 60-month age range was permitted. Again, a sensitivity analysis was conducted in this report to determine whether inclusion of school-age children with preschool MAs influenced the conclusions of the synthesis. Reports were excluded from further evaluation if they used only retrospective data for analyses (e.g., home video or retrospective parent- or clinician-report measures) to reduce error variance and bias that could be introduced from constrained samples typically included in studies using home videos or from parent or clinician report that occurs after an ASD diagnosis. After applying the above inclusion and exclusion criteria, a manual search of the references of the included studies was conducted prior to applying final selection criteria.

Studies considered for the current analyses were subjected to a final set of criteria involving specific variable definitions, measurement procedures, and data analysis. Inclusion criteria for the measurement of object play variables were that play was measured through direct observation, or through parent or clinician report in which items assessing

play were described so it could be determined whether differentiated play with objects was assessed. Inclusion criteria for measurement of the intentional communication variables were that intentional communication was measured through direct observation or parent or clinician report in which description of the report measure made it clear intentional communication was assessed. Studies using parent-report instruments to measure play and communication variables were included in the current study based on evidence that parents can make accurate judgments of their child's development in the context of initial early childhood screening (e.g., Diamond, 1993) and in assessment of specific skills, such as communication (e.g., Dale, 1991). Variables derived from standardized language measures were also included as measures of EL.

Finally, studies were included for analysis if authors reported effect sizes for the associations between play and intentional communication variables, or if the analyses included in the report could be interpreted as demonstrating some evidence of an association (causal or otherwise) between object play and intentional communication, and correlations could be computed based on the information provided. After subjecting the final group of reports to the above criteria, 12 reports were identified that examined the association between object play and intentional communication in children with ASD.

If correlational studies reported more than one variable that fell into a single play or communication category (e.g., two NSP variables), correlations were averaged to create a single coefficient to be used in the meta-analysis to ensure independent units of analysis, an important assumption of meta-analysis. The current review will first describe participants, play variables, intentional communication variables, and measures across all correlational reports. Next, quality indicators of the correlational reports will be summarized. Finally, results of the meta-analyses will be reported.

Results

Correlational Studies

Intraindividual agreement on final inclusion of studies in the meta-analysis, conducted at two time points separated by approximately 18 months, was 100%. A second coder independently recoded 10 out of the 12 studies (83%) to establish interobserver agreement on (a) characteristics of the sample, (b) characteristics of the measurement procedures, (c) definition and categorization of play and communication variables, and (d) inclusion of effect sizes. Average interobserver agreement on attributes of studies included in the meta-analysis was 81% (*SD* = 10%). A total of 10 studies reported concurrent associations between intentional communication and object play in children with ASD, and 5 examined longitudinal associations. Several studies reported both concurrent and longitudinal correlations (Kasari, Paparella, Freeman, & Jahromi, 2008; Stone & Yoder, 2001; Yoder, 2006). Table 1 provides participant and study characteristics for reports included in the meta-analysis.

Participants. A total of 441 participants were involved in the correlational studies, with a mean sample size of 37 and a *SD* of 16. At least 320 males and 67 females were included in the studies. Children received diagnoses of ASD, autistic disorder, or pervasive

Table 1
Participant and Study Characteristics for Studies Included in the Meta-Analysis

References	Sample size and gender	Chronological age	Diagnosis	Diagnostic criteria	Analysis and effect size
Ben-Itzchak and Zachor (2007)	*n* = 25; 23 males, 2 females	20-32 months	ASD	ADI-R, ADOS-G, *DSM-IV* criteria	IC and OP = .44[a]
Kasari, Paparella, Freeman, and Jahromi (2008)	*n* = 58; 46 males, 12 females	41-43 months at intake	Autism	Clinical diagnosis confirmed with ADOS and ADI-R	IC and OP = .34[b], NVIC and SP = .37[b], EL and SP = .32[b], OP⟶IC = .45[c]
Kwon (2008)	*n* = 32; 25 males, 7 females	35-55 months	ASD	Clinical diagnosis confirmed with ADI-R	OP⟶IC = −.01[c]
Rodman et al. (2010)	*n* = 30; 25 males, 5 females	24-68 months	AD or PDD-NOS	Formal diagnosis according to parent report, ADOS-G (to confirm diagnoses)	IC and OP = .34[b]
Sigman and Ruskin (1999)	*n* = 54	47.2 (12.1)	Autism	*DSM-III* (50% of sample), *DSM-III*, CARS, ABC (50% of sample)	IC and OP = .52[a], NVIC and NSP = .49[a], NVIC and SP = .54[a]
Smith, Mirenda, and Zaidman-Zait (2007)	*n* = 35; 28 males, 7 females	20.5-67.6 months	Autistic disorder	CARS, *DSM-IV*	OP⟶IC = .40[c]
Stahmer (1995)	*n* = 7; 7 males	48-84 months	Autism	*DSM-III*	IC and OP = .90[a], EL and SP = .90[a]
Stone and Yoder (2001)	*n* = 35; 27 males, 8 females	23-35 months at intake	Autism (*n* = 24), PDD-NOS (*n* = 11)	CARS, *DSM-III* or *DSM-IV*	IC and OP = .16[a], OP⟶IC = .36[b]
Toth, Munson, Meltzoff, and Dawson (2006)	*n* = 60; 51 males, 9 females	34-52 months	Autistic disorder (*n* = 42), PDD-NOS (*n* = 18)	ADI-R, ADOS, *DSM-IV*	IC and OP = .36[a], NVIC and NSP = .27[a], NVIC and SP = .36[a]
Warreyn, Roeyers, and De Groote (2005)	*n* = 20; 14 males, 6 females	42-76 months	Autism, PDD-NOS	*DSM-IV*	IC and OP = .21[a], NVIC and NSP= −.09[a], NVIC and SP = .34[a]
Wetherby, Watt, Morgan, and Shumway (2007)	*n* = 50; 43 males, 7 females	18.2-26.9 months	Autistic disorder, PDD-NOS	MSEL, VABS, ADOS, SCQ, *DSM-IV*	IC and OP = .56[b], NVIC and NSP=.62[b], NVIC and SP=.64[b], EL and SP = .54[b]
Yoder (2006)	*n* = 35; 31 males, 4 females	21-54 months	Autistic disorder, PDD-NOS	ADOS	IC and OP = .19[a], OP⟶IC = .55[c]

Note: *n* = number of participants in study; ASD = autism spectrum disorder; ADI-R = Autism Diagnostic Interview–Revised; ADOS-G = Autism Diagnosis Observation Schedule–Generic; *DSM-III/IV = Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., American Psychiatric Association [APA] 1980/4th ed., APA, 1994); IC = intentional communication; OP = object play; mo = months; NVIC = nonverbal intentional communication; SP = symbolic play; EL = expressive language; AD = autistic disorder; PDD-NOS = pervasive developmental disorder-not otherwise specified; CARS = Childhood Autism Rating Scales; ABC = Autism Behavior Checklist; NSP = nonsymbolic play; MSEL = Mullen Scales of Early Learning; VABS = Vineland Adaptive Behavior Scales; SCQ = Social Communication Questionnaire.
[a]Zero-order correlation.
[b]Partial correlation.
[c]Correlation coefficient calculated from *t* statistic.

developmental disorder–not otherwise specified (PDD-NOS). Diagnostic criteria and tools varied across studies and included diagnosis based on *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed. [*DSM-III*], American Psychiatric Association [APA], 1980; or 4th ed. [*DSM-IV*], APA, 1994) criteria, diagnostic tools such as the Autism Diagnostic Interview–Revised (ADI-R; Lord, Rutter, & LeCouteur, 1994), the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000), the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988), and/or developmental assessment (see Table 1).

Setting and measurement. Assessment took place in a clinic setting for the majority of studies, with some studies reporting that assessments also took place in the home (Kwon, 2008; Smith, Mirenda, & Zaidman-Zait, 2007; Stahmer, 1995) or classroom (Ben-Itzchak & Zachor, 2007; Stahmer, 1995). A variety of measurement contexts and methods were reported across the 12 correlational studies, including semistructured and structured procedures, as well as interviews and checklists (see Table 2). A procedure was considered semistructured if materials were standardized across children and minimal instructions were provided to parents or examiners. A procedure was considered structured if materials were standardized across children and a specific set of tasks were carried out by examiners or caregivers. A total of 29 semistructured and structured procedures were used to assess play and intentional communication variables—6 were parent- or clinician-report measures (see Table 2). Of the 23 direct observation measures, 12 were semistructured and 11 were structured. It is evident that researchers used a combination of procedures along a continuum of structure to measure variables of interest. All procedures, even those in the home, involved the use of a standard set of toys, highlighting a recognition of the influence certain materials may have on children's play and communication behavior, and the potential importance of controlling certain influential variables in naturalistic and clinic settings (Yoder & Symons, 2010).

Variable description. A total of 17 intentional communication variables and play variables were measured across procedures (see Table 1). Seven communication variables fit into the category of NVIC and nine fit into the category of EL. Yoder (2006) also measured an intentional communication variable that included NVIC and EL acts. Five play variables comprising NSP and SP were categorized broadly as object play. Five play variables were categorized as NSP, and seven were categorized as SP. There was no differentiation between metric (e.g., frequency, diversity) for play or communication variables for the purposes of the current study, and all variables were equally weighted.

Reliability. The studies involved in the current review provided a combination of interobserver agreement indices and intraclass correlation coefficients (ICCs) for measured communication and play variables. Two studies reported no information on reliability or agreement of derived variables (Ben-Itzchak & Zachor, 2007; Smith et al., 2007). Both studies used parent- or clinician-report measures to derive variables. The remaining studies reported some index of agreement on some or all measured variables (i.e., percentage agreement, κ, and Cronbach's α; see Table 2). Of all, 42% of studies provided ICCs for intentional communication variables, and 58% of studies provided ICCs for play variables

Table 2
Description of Measurement for Correlational Studies Examining Children With ASD

References	Measure	Structure	Variables measured	Index of reliability
Ben-Itzchak and Zachor (2007)	Developmental-behavioral scales	Structured	Intentional communication and play	None
Kasari, Paparella, Freeman, and Jahromi (2008)	SPA	Semistructured	Play	ICC
	Mother–child interaction	Semistructured	Play	ICC
	ESCS	Structured	Intentional communication	ICC
Kwon (2008)	SPA	Semistructured	Play	ICC
	Caregiver–child interaction	Semistructured	Play	ICC
	MCDI	Structured	Intentional communication	None
	RDLS	Structured	Intentional communication	None
Rodman et al. (2010)	DPA	Semistructured	Play	IOA
	Turn-taking test	Structured	Intentional communication	IOA
Sigman and Ruskin (1999)	Structured play observation	Semistructured	Play	ICC
	ESCS	Structured	Intentional communication	ICC
Smith, Mirenda, and Zaidman-Zait (2007)	MCDI	Structured	Play	None
	MCDI	Structured	Intentional communication	None
Stahmer (1995)	Play sessions	Semistructured	Play	κ
	EOWPVT	Structured	Intentional communication	None
Stone and Yoder (2001)	Play assessment scale	Semistructured	Play	ICC
	Parent interview for autism	Structured	Intentional communication	None
	MCDI	Structured	Intentional communication	None
	SICD-R (intake) PLS-3 (follow-up)	Structured	Intentional communication	None
Toth, Munson, Meltzoff, and Dawson (2006)	Structured play assessment	Structured	Play	ICC
	ESCS	Structured	Intentional communication	ICC
	MSEL	Structured	Intentional communication	None

(continued)

Table 2 (continued)

References	Measure	Structure	Variables measured	Index of reliability
Warreyn, Roeyers, and De Groote (2005)	Play session with mother	Semistructured	Play	Cronbach's α
	Planned tasks with mother	Semistructured	Intentional communication	Cronbach's α
Wetherby, Watt, Morgan, and Shumway (2007)	CSBS	Structured	Intentional communication and play	ICC
Yoder (2006)	DPA	Semistructured	Play	ICC
	ESCS	Structured	Intentional communication	ICC and IOA
	UFPE	Semistructured	Intentional communication	ICC and IOA

Note: ASD = autism spectrum disorder; SPA = structured play assessment; ICC = intraclass correlation coefficient; ESCS = Early Social Communication Scales; MCDI = MacArthur Communicative Development Inventory; RDLS = Reynell Developmental Language Scales; DPA = Developmental Play Assessment; IOA = interobserver agreement; EOWPVT = Expressive One-Word Picture Vocabulary Test; SICD-R = Sequenced Inventory of Communication Development; PLS-3 = Preschool Language Scale–Third edition; MSEL = Mullen Scales of Early Learning; CSBS = Communication and Symbolic Behavior Scales; UFPE = Unstructured Free-Play with an Examiner.

(see Table 2). Overall, ICCs reported indicate good reliability for measured communication and play variables.

Correlated measurement error. Correlated measurement error may occur if coders are not blind to the hypotheses and other variable scores of the participants (Yoder & Symons, 2010), leading to increased Type I error. Of the correlational studies, 50% reported no information regarding blindness of coders to hypotheses of the study or observed variable scores (Ben-Itzchak & Zachor, 2007; Kasari et al., 2008; Kwon, 2008; Rodman et al., 2010; Smith et al., 2007; Stone & Yoder, 2001), whereas 42% of studies reported that coders were blind to hypotheses (Sigman & Ruskin, 1999; Stahmer, 1995; Toth, Munson, Meltzoff, & Dawson, 2006; Warreyn, Roeyers, & De Groote, 2005; Yoder, 2006).

Another source of correlated measurement error for concurrent correlational studies occurs when variables are derived from the same measurement procedure. In concurrent reports, a single study had increased risk of correlated measurement error due to derivation of both variables from a single measure (Ben-Itzchak & Zachor, 2007). The remaining concurrent studies measured variables using different procedures, or at different points in time during the same procedure, reducing the likelihood that presence of one variable would elicit the presence of another. In sum, risk of inflated Type I error and inflated population estimates of the effect size is slightly increased due to possible nonblindness of observers to hypotheses and participants' scores on both variables, and minimally increased due to derivation of variables from the same procedure.

Alternative explanations. One limitation of correlational analyses is the presence of alternative explanations for the identified associations. In the concurrent and longitudinal

correlational analyses in the current review, there remains the possibility that the detected association between two variables is actually due to a third variable that causes variation in play and communication. Six studies did not control for putative third variables that might explain the play-communication associations (Ben-Itzchak & Zachor, 2007; Smith et al., 2007; Stahmer, 1995; Stone & Yoder, 2001; Toth et al., 2006; Warreyn et al., 2005). In addition, Yoder (2006) did not control for putative third variables in concurrent correlational analyses. For these studies, there is an increased chance that the associations reported were in fact due to some other factor (e.g., MA). Five studies did control for additional variables in their analyses, including MA (Kasari et al., 2008; Kwon, 2008; Sigman & Ruskin, 1999), CA (Rodman et al., 2010; Wetherby et al., 2007), gender (Rodman et al., 2010), and IQ (Rodman et al., 2010). Yoder (2006) controlled for EL in longitudinal analyses. Across all five studies that controlled for a putative third variable, associations between object play and intentional communication remained significant.

Results of meta-analysis for concurrent correlational studies. Meta-analytic techniques were used to summarize concurrent correlational effect sizes across studies. A minimum of three studies was set as the criterion for computing confidence intervals (CI) around mean weighted effect sizes because summarizing across only one or two studies results in such large CI that doing so adds little to our understanding of the population effect size. Summaries were made at the most specific level this criterion allowed.

A random effects model was used to compute all summary effect sizes. A random effects model assumes that the true effect size varies from study to study due to such factors as age of the sample, measurement, or other study characteristics, and thus provides a greater basis for generalization than do their alternative, fixed-effects models (Borenstein, Hedges, Higgins, & Rothstein, 2009). Statistics for the meta-analysis were computed using SPSS 17 and a macro presented in Wilson (2002). Forest plots were generated using Comprehensive Meta-Analysis (Version 2.0) software (Borenstein, Hedges, Higgins, & Rothstein, 2005). Correlation coefficients were transformed using Fisher's *z*-transformation for all calculations due to nonnormality of the sampling distribution of *r* (Alexander, Scozzaro, & Borodkin, 1989) and entered into spreadsheets used in the analysis. An inverse transform of the resulting average *z*-transformed correlation was computed automatically by the statistical software and used in the final reporting of effect sizes and CI for ease of interpretation. Lipsey and Wilson (2001) reported the following conventions for interpretation of effect sizes reported as correlations: (a) $r \leq .10$ is a small effect, (b) $r = .11$ to .39 is a medium effect, and (c) $r \geq .40$ is a large effect. Interpretations of effect sizes are reported below based on these conventions. Results of concurrent and longitudinal meta-analyses are displayed in Table 3.

Correlations from 10 studies were used to compute an average effect size of the concurrent association between intentional communication and object play (see Table 1 and Figure 1, for individual study effect sizes). An average effect size of $r = .39$ was produced, with a 95% CI of .27 to .49. This is a medium to large effect size for the association with a CI that does not include zero, indicating the association is statistically significant (see Figure 1). Sensitivity analyses were run to determine whether findings of the full meta-analyses would be robust to inclusion criteria, specifically, the decision to include studies reporting different correlation coefficients (zero-order, partial, and part) and to include

Table 3
Random Effects Meta-Analysis for Correlations Between Object Play and Intentional Communication

Association	ES	95% CI	*k*	*n*
IC and OP	.39	[.27, .49]	10	374
NVIC and NSP	.38	[.11, .60]	4	184
NVIC and SP	.47	[.34, .58]	5	242
EL and NSP	—	—	—	—
EL and SP	.53	[.20, .75]	3	115
OP IC[a]	.37	[.19, .53]	5	188

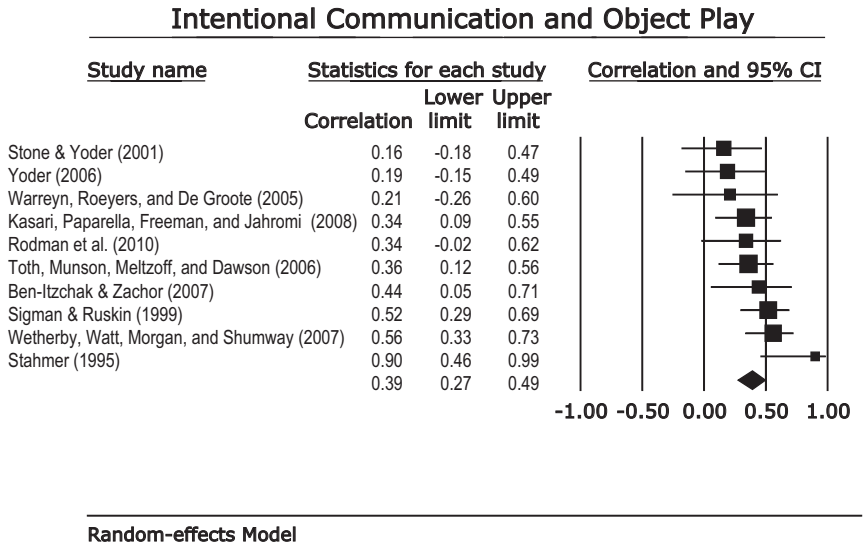
Note: ES = effect size; CI = confidence interval; *k* = number of studies used in the analysis; *N* = total number of participants in analysis; IC = intentional communication; OP = object play; NVIC = nonverbal intentional communication; NSP = nonsymbolic play; SP = symbolic play; EL = expressive language.
[a]A longitudinal correlation coefficient. All other effect sizes are concurrent correlations.

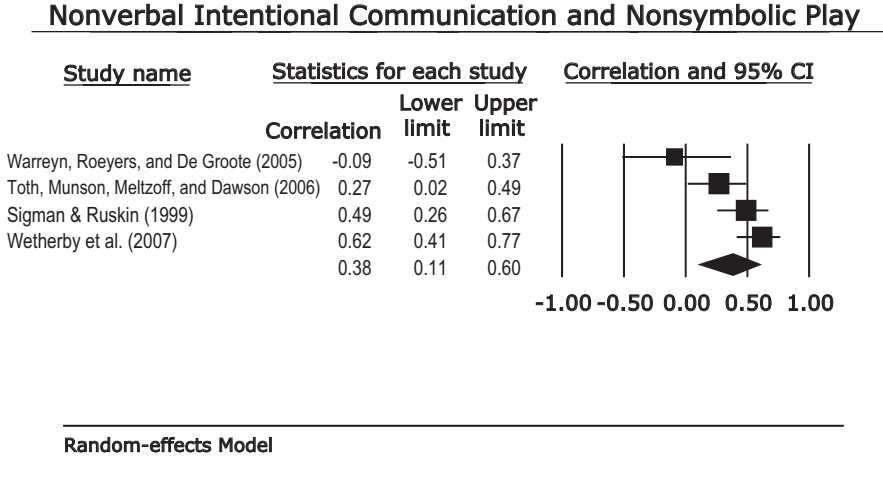
studies in which participants had an average MA falling within 18 to 60 months, but CAs into the school-age period. These sensitivity analyses allowed us to examine whether our inclusion criteria had an undue influence on results of the meta-analyses by excluding the studies based on these broader criteria. If results of both sets of analyses were not appreciably different, we could then conclude that the results of the meta-analysis were robust to decisions surrounding inclusion criteria. Both sensitivity analyses involved the concurrent correlation between the broad constructs of object play and intentional communication to ensure enough studies were included. First, a random effects meta-analysis was run using only the studies reporting zero-order correlations ($n = 5$). A summary effect size of $r = .32$, 95% CI = [.08, .52], was computed, indicating a medium effect size. Next, an analysis was run using only studies in which participants' CA ranges fell within 18 to 60 months ($n = 6$). A summary effect size of $r = .37$, 95% CI = [.26, .48], was computed, indicating a medium effect size. The similarity of the effect sizes (.39 for full meta-analysis) and large overlap in the CI ([.27, .49] for full meta-analysis) between results of these sensitivity analyses versus results from the larger synthesis indicate that it is likely results reported on the full sample of studies were not negatively affected by decisions made regarding age and effect size inclusion criteria.

To further examine the association between intentional communication and object play, average effect sizes were computed for the association between the categories of NVIC, EL, NSP, and SP. An average effect size of $r = .38$, 95% CI = [.11, .60], for the association between NVIC and NSP was computed from four studies (see Figure 1). Effect sizes from five studies were used to compute an average effect size of $r = .47$, 95% CI = [.34, .58], for the association between NVIC and SP (see Figure 2). An additional analysis was run to compute an average effect size of $r = .53$, 95% CI = [.20, .75], from three studies examining the association between EL and SP (see Figure 2). In sum, the concurrent association between NVIC and NSP was found to be statistically significant and medium to large in children with ASD, whereas the concurrent associations between NVIC and SP, and EL and SP were found to be statistically significant and large.

Results of meta-analysis for longitudinal correlational studies. Five studies were included in the meta-analysis examining object play as a longitudinal predictor of intentional

Figure 1
Forest Plots of Individual Concurrent Correlations and Results of Meta-Analyses

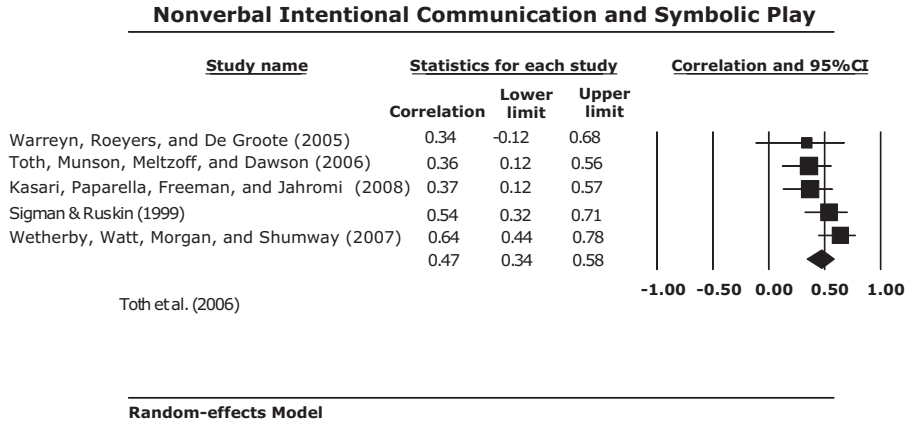


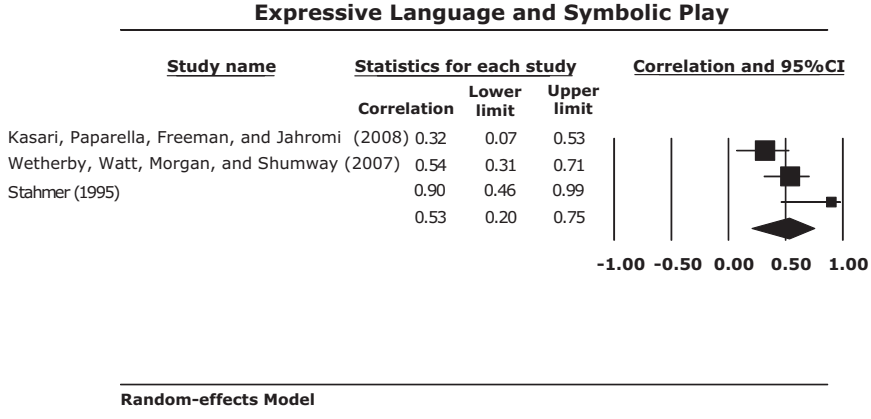


Note: The top panel depicts effect sizes for the concurrent association between intentional communication and object play. The bottom panel depicts effect sizes for the concurrent association between nonverbal intentional communication and nonsymbolic play. Individual study correlations are represented by squares, and pooled estimates weighted by sample size are represented by diamonds.

communication. An average effect size of $r = .37$ was computed for the longitudinal association of object play and intentional communication, with 95% CI = [.19, .53] (see Figure 3). This reveals a medium to large and statistically significant association for this sample of studies involving young children with ASD.

Figure 2
Forest Plots of Individual Concurrent Correlations and Results of Meta-Analyses



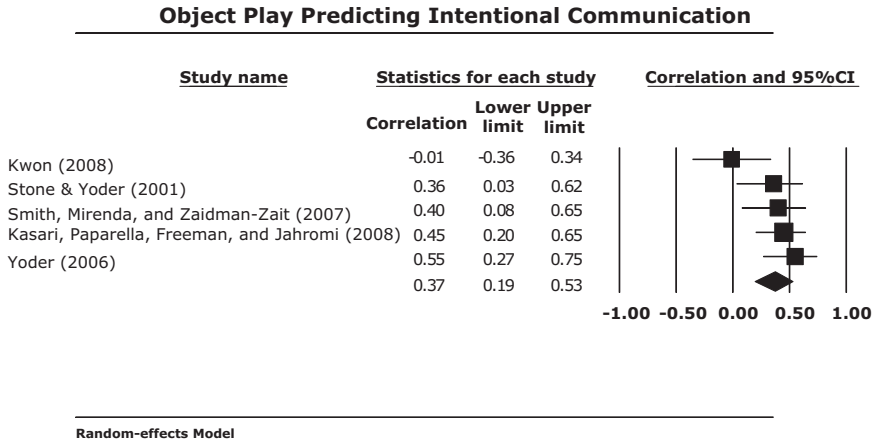


Note: The top panel depicts effect sizes for the concurrent association between nonverbal intentional communication and symbolic play. The bottom panel depicts effect sizes for the concurrent association between expressive language and symbolic play. Individual study correlations are represented by squares, and pooled estimates weighted by sample size are represented by diamonds.

Randomized Controlled Trial

A single, internally valid and well-conducted, randomized controlled trial (RCT; Kasari et al., 2008) further elucidates the nature of the association between object play and intentional communication in young children with ASD. Kasari and colleagues (2008) measured

Figure 3
Forest Plot of Individual Longitudinal Correlations and Results of Meta-Analysis



Note: The above panel depicts effect sizes for the longitudinal association between object play and intentional communication, with play acting as a predictor of later communication. Individual study correlations are represented by squares, and pooled estimates weighted by sample size are represented by diamonds.

play and communication outcomes in 58 children with ASD ages 3 to 4 years old who were randomized to a JA intervention, a SP intervention, or a control condition.

Results from Kasari et al. (2008) provided evidence that affecting symbolic object play has a causal effect on NVIC (i.e., declarative NVIC), and that affecting declarative NVIC has a causal effect on SP. Specifically, the authors reported that children in the SP group showed greater growth in NVIC than children randomized to the control condition (d = .98) at 12-month follow-up. In addition, the JA group showed significantly greater increases in SP as compared with controls (d = .65) at 12-month follow-up. Interestingly, children randomized to the JA intervention and the SP intervention showed greater increases in EL at 12 months posttreatment as compared with children in the control group (d = .59 and .71, respectively). The findings of Kasari et al. suggest that (a) the association between object play and NVIC is causal and (b) the causal direction is bidirectional, and, to a lesser extent, stronger in the direction where play predicts later communication. However, there is not enough information in the article to determine whether the differences in effect sizes are statistically significant. Future well-conducted RCTs that test directly the relative strength of causal influences between SP and intentional communication will shed further light on this possibility.

Discussion

Summary of Results

Mean effect sizes from properly conducted meta-analyses provide more confidence in estimates of the size of the association of interest than any one study. Specifically, concur-

rent correlations revealed positive and moderate to large associations between (a) broadly defined intentional communication and broadly defined object play, (b) NVIC and NSP, (c) NVIC and SP, and (d) EL and SP in young children with ASD. Longitudinal findings also indicate a positive, moderate to large association between object play and later intentional communication in children with ASD. Narrative review of these correlational studies revealed these effect size estimates were attained across a wide continuum of standardized procedures with little reason to suspect that correlated measurement error could explain the associations. In addition, studies controlling for third variable explanations still reported significant correlations, increasing the likelihood that the association between object play and intentional communication is present in the population and not due to sample-specific covariation with a "third variable." A single, internally valid RCT provided evidence suggesting increases in object play cause increases in NVIC *and* that increases in NVIC cause increases in SP. Although it could not be determined whether effect sizes were significantly different, these data are suggestive of an association in which SP leads to NVIC to a greater extent than NVIC leads to SP. Further data are needed from similarly well-conduced RCTs to test this hypothesis.

Of particular interest in studies of young children with ASD are the large concurrent associations between NVIC and SP, and EL and SP, particularly because SP is a primary deficit for this population. Importantly, SP is social in its origins. To develop SP, a child must be aware of people and events in his or her environment to observe and later imitate actions with objects that cannot be discovered through solitary manipulation of those objects alone. For many children with ASD, the ability to attend to objects of interest and people in their environment is limited. Hence, children with ASD may be less able to notice and learn from events occurring around them. What may be reflected in the large association between NVIC and SP, and also EL and SP, is the requisite skill of coordinating attention to object and person. Coordinated attention to object and person is integral to the development of SP skills and is critical in the definition of NVIC. Children with ASD who can successfully coordinate their attention to a person and object are more likely to observe and learn from observations of adults in their environment as these adults are interacting with objects and engaging in events on a daily basis.

Limitations of the Review

The findings must be considered within the limitations of this review. First, the number of studies reporting categories of play and intentional communication varied, leading to the exclusion of the examination of the concurrent association between NSP and EL, and the longitudinal association with intentional communication as a predictor of later object play. A small number of studies provide less basis for estimation of population effect size of the association between play and communication than a larger set of studies. However, disciplined synthesis on small numbers of studies has the advantage of producing a clear estimate of what is known to date. Second, the type of correlations used in the meta-analysis varied between studies. Although potentially problematic, similarity in the effect sizes and large overlap in CIs as determined with the sensitivity analysis indicated including partial and part correlations in the summary did not invalidate the conclusions of this review. Sensitivity analyses were restricted to comparisons with a sufficient number of studies in

subgroup analyses. Therefore, it is possible that age and effect size decisions affected results for which we could not run sensitivity analyses. Finally, because there was only one internally valid experimental study, we are only cautiously concluding that the play-communication association is causal. In addition, sufficient information was unavailable to test whether one direction of effect was stronger than another.

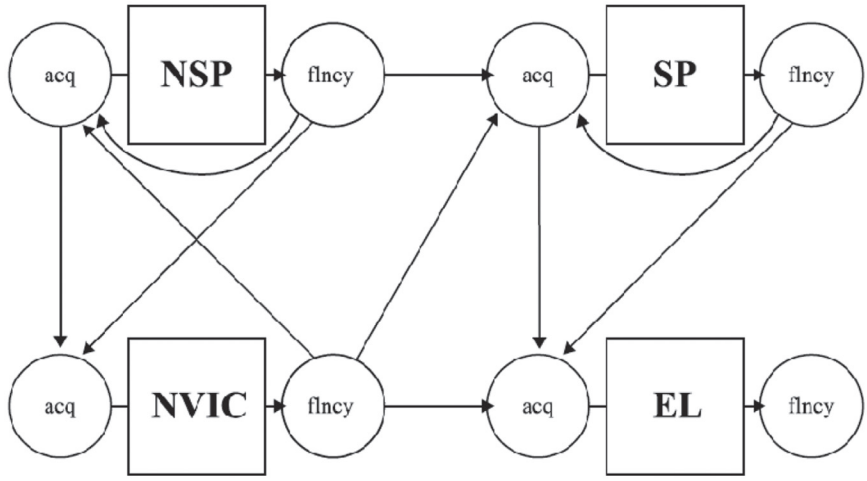
Implications for Intervention

As described by Bruner (1983), joint action routines established between young infants and their adult caregivers provide a foundational interaction pattern into which objects can be introduced, and motivation and topics for itentionally communicating are established. These joint action routines provide an important context for implementation of intervention strategies for young children with ASD.

Following is a suggested sequence of intervention targets with children's entry skill level in mind. Initially, a child's ability to participate in certain types of interactions involving objects and people may inform parents and clinicians of the specific play and communication skills to target in young children with ASD. For example, if a child is limited in his or her capacity to participate in joint action routines, intervention can initially focus on increasing the child's participation in socially based games such as peek-a-boo or pat-a-cake. Increasing children's participation in such back-and-forth interactions may allow them to become more competent in a social milieu, and also help them master the reciprocal format needed for expressive communication. For a child already able to engage in joint action routines without objects, practitioners and parents would select intervention targets focusing on object play skills and early communicative behavior.

The model for implementation of intervention described in the following paragraphs targets play and communication skills in a child with ASD (see Figure 4). Based on the initial empirical evidence described in the review of Kasari et al. (2008), the proposed model for intervention captures the possible bidirectional influences of two play skills (NSP and SP) and two communication skills (nonverbal and expressive) on one another. In addition, the model focuses on two stages of learning: (a) acquisition and (b) fluency. The first component of the model emphasizes directly targeting NSP skills in intervention, focusing on acquisition and movement of NSP in a horizontal direction. In addition to the child's level of development, the CA of the child should be considered when selecting the play objects and actions to target during intervention. This is due to the fact that the play skills and objects used during treatment may differ for a younger child as compared with a chronologically older child. This approach suggests that clinicians and parents teach children to increase the number of chronologically appropriate objects or toys with which they engage in a functional manner and increase the number of different functional actions they use on objects or toys. Opportunities to practice newly acquired NSP skills are thought to lead to fluency, resulting in generalization of play actions across contexts. Subsequently, the children's use of generalized play actions is thought to elicit models of how to produce other NSP skills from adult play partners. As these NSP actions become widely used, and provide varied contexts for interactions, turn-taking with an adult is thought to become easier. In the context of such turn-taking interactions, NVIC skills are directly targeted during intervention and are thought to be acquired as the cognitive load associated with acquisition of NSP skills is reduced.

Figure 4
Model for early intervention targeting play and communication outcomes in children with ASD



Note: Acquisition of targets is depicted in circles containing "acq." Fluency of targets is depicted in circles containing "flncy." Arrows indicate directional and interactional influences of play and communication skills. Nonsymbolic play (NSP), nonverbal intentional communication (NVIC), symbolic play (SP), and expressive language (EL) outcomes would be directly targeted and taught by treatment in this proposed model.

Similarly, increased opportunities to practice newly acquired NVIC are thought to lead to fluency in this skill area. This fluency in NVIC may lead to acquisition of additional NSP skills because a child is able to communicate more effectively with an adult play partner his or her interest in different objects or toys. Such communicative behavior would elicit adult models of how to interact functionally with these new and interesting objects. However, as the child becomes fluent in his or her NSP, this level of play may no longer elicit the cutting edge of intentional communication from the child. When clinicians and parents notice joint interactions around functional play with objects are no longer scaffolding the use of increasingly complex communication, SP skills should be targeted directly in intervention. Such direct teaching of SP skills (again, with attention to CA and use of chronologically appropriate play objects and actions) may be necessary because young children with ASD appear to have specific deficits in this area of development.

Fluency in NVIC (i.e., coordinating attention to object and person) is thought to contribute to this vertical movement from NSP to SP because the child's increased cognitive resources that are no longer required to coordinate attention between object and person would be directed toward learning more complex play behaviors. Furthermore, opportunities to practice newly acquired SP skills are again thought to lead to fluency of SP. Fluency of SP may then lead to generalization of recently acquired SP skills, and elicit models from others regarding new SP schema and new symbolic communication skills, as others talk about the schema in which the child is engaged. As the child acquires and becomes fluent in new SP skills, the child has an increased need and motivation to communicate symbolically

because nonverbal communication is no longer sufficiently informative to convey his or her thoughts, feelings, and ideas that accompany increasingly abstract play schemes. As the child becomes fluent in his or her SP, adult language input becomes increasingly varied and complex, providing linguistic input, which maps directly onto the child's play behaviors, providing rich language learning opportunities. In addition, if SP and symbolic communication share an underlying cognitive construct of mental representation, increased capacity for symbolic representation in play may facilitate development of symbolic communication (verbal, signed, or pictorial). Acquisition and practice of symbolic communication is believed to lead to fluency of symbolic communication behaviors. The hypotheses formulated throughout this model can, and should, be tested.

Consideration of the type and level of social-communication skills in young children with ASD may inform play intervention content and goals. Based on findings from the current review, this could have implications for children's development of EL, as well as outcomes later in development. The nature and direction of the object play and intentional communication association examined in this article suggest that a systematic analysis of current interaction skills of very young children with ASD could inform intervention planning and implementation. It also suggests very specific roles for NSP and SP in increasing children's nonverbal and symbolic intentional communication. One potential application of these findings has been described above, and should be examined in future studies.

How This Review Adds to the Literature

Although a few researchers are beginning to address play and communication goals in the same session (e.g., Kasari et al., 2008), this review provides the empirical and theoretical rationale for more tests of the efficacy of such treatments in young children with ASD than do introduction and discussion sections in existing literature. Due in part to the page limitations and other demands that research articles must address, this synthesis provides the detail and disciplined approach to literature review that is not afforded in existing empirical studies on a single treatment approach.

Future Directions

It is likely that meta-analysis is a useful and potentially powerful tool to provide insight into the current state across fields of study and can be used to move important areas of inquiry forward. The current review, although limited to the small available literature, provided a disciplined summary of the available evidence. Future studies would add to the rigor of the research base if they included several classes of information. Based on the findings of the above narrative review, this would include for correlational studies reporting ICCs for all levels of variables used in analyses, keeping coders blind to hypotheses of the study and other variable scores, and deriving variables from different measurement procedures.

Although the current state of the field suggests object play has a causal association with intentional communication, more research needs to be done to determine whether these findings replicate, as well as the relative strength of the direction of causality. Conducting internally valid group experiments similar to those of Kasari et al. (2008) will enable detection

of causal associations between object play and intentional communication, as well as provide more information regarding directionality and magnitude of the association in young children with ASD. Particularly challenging is devising a treatment that influences one variable (e.g., play) without directly influencing the other variable (e.g., communication); this is necessary, however, if we are to infer whether the association is causal.

A main goal in early intervention for young children with ASD is to maximize functional use of skills and ultimately to optimize developmental and lifelong outcomes. Remediating early deficits in play and communication behaviors enables progress toward these goals. If research supports the posited model, teaching only play or only communication without attention to the other skill is unlikely to be as productive as teaching both when needed by the child. A better understanding of how early play and communication relate to one another will allow for more effective planning and implementation by researchers, practitioners, and parents of strategies designed to reach the primary goals of early intervention.

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