Critical Review: Can joint attention, imitation, and/or play skills predict future language abilities of children with Autism Spectrum Disorders (ASD)?

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This critical review examined the predictive abilities of assessment of joint attention, imitation, and play skills on later expressive and receptive language abilities of children diagnosed with Autism-Spectrum Disorder (ASD). Studies included children aged 2 to 6 years old for initial assessment of joint attention, imitation and/or play skills, and were re-assessed for receptive and expressive language abilities between 1 and 9 years after initial assessment. All study designs were within-groups (repeated measures), longitudinal studies. Overall, the evidence supports the assessment of joint attention, imitation and play skills to identify the predictive abilities that these variables have on future language abilities in children with ASD.

Introduction

Previously termed Pervasive Developmental Disorder (PDD), Autism Spectrum Disorder (ASD) is a spectrum of disorders that include autistic disorder, Asperger's syndrome, Rett's disorder, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). ASD, as defined by the American Psychiatric Association in 2001, is a neuro-developmental disorder characterized by impairments in communication, social interaction, and repetitive and restricted patterns of interest (as cited in Thurm, Lord, Lee & Newschaffer, 2007).

Language ability is one of the most diverse aspects within the ASD population. Some children with ASD acquire large vocabularies and are fluent, while others are nonverbal (Thurm et al., 2007). Early language competency has been identified as being one of the best prognostic indicators for long-term outcomes in children with ASD (Luyster, Qiu, Lopez, & Lord, 2007).

Recent research has described the developmental impairments related to language and communication in terms of three prelinguistic factors: joint attention, imitation, and play skills. Impairments in joint attention have been attributed to the degree to which the child with ASD is regulating and monitoring another person's attention in relation to objects and events (Mundy, Sigman, & Kasari, 1990; Phillips et al. 1995; Charman 1998, as cited in Charman, Baron-Cohen, Swettenham, Baird, Drew, & Cox, 2003). It has been reported that preschool aged children with ASD have difficulty with simple imitation of gestures and actions on objects, and older school aged children with ASD have difficulty with more complex actions (Dawson & Adams 1984, Rogers et al. 1996, as cited in Charman et al. 2003). Children with ASD have also been described as having impairments in play skills. They typically have intact functional play, but produce significantly less acts of pretend play. Their play skills tend to lack the generativity and imaginative quality that typically developing children display in their play skills (Lewis & Boucher 1995, Jarrold et al. 1996, Charman & Baron-Cohen 1997, as cited in Charman et al., 2003).

Joint attention, imitation and play (both functional and symbolic) have all positively correlated with later language abilities in typically developing children (Toth, Munson, Meltzoff & Dawson, 2006). Therefore, the goal of this systematic review was to determine if assessment of joint attention, imitation and/or play skills of children aged 2-6 years old, diagnosed with ASD, are accurate predictors of future language abilities 1 to 9 years after initial assessment.

Clinical Rationale
Little is known about the origin of ASD, especially those factors pertaining to language abilities and why they are so diverse within the population. But what research has found is that early intervention is essential for increasing a child's potential for being an effective communicator. As stated by Stone and Yoder (2001), the potential for influencing children's development through intervention may be greater at younger ages. If we are able to predict a child's language abilities years from the initial assessment, it would be beneficial to look at the main areas of difficulty (i.e. receptive and/or expressive language) he/she is expected to have and choose appropriate intervention goals related to imitation, joint attention and/or play skills in order to target those areas of language weakness. Being able to identify the known areas of future difficulties can lead to improved methods of intervention, ultimately resulting in better outcomes for children with autism.

Also, many parents may be focused on their child's verbal abilities and may believe that that is what will be

worked on in speech-language therapy sessions. It may be confusing to parents when the clinician is targeting pre-linguistic skills such as joint attention, imitation or play. It may be more helpful for parents to understand the reasoning behind their child's goals if clinicians can support their goal selections with evidenced-based research.

Being able to predict language outcomes for children with ASD may lend the field of speech-language pathology considerable evidence as to the effectiveness of speech-language therapy for children with ASD. If we are able to identify predictors of language abilities, future research will be able to assess the effectiveness of treatment by comparing a child's predicted language outcome with actual language outcome following speech-language intervention.

Objectives

The primary objective of this paper was to summarize and critically evaluate selected studies that have identified the predictive abilities of assessment of joint attention, imitation, and/or play skills on later expressive and/or receptive language abilities of children diagnosed with Autism Spectrum Disorder (ASD)/Pervasive Developmental Disorder (PDD). A secondary objective was to increase awareness as to the important clinical implications of the findings.

Methods

Search Strategy
Computerized databases, including PubMed, CINAHL, ProQuest, and SCOPUS, were searched using the following search strategies: (Autism) AND (joint attention (or imitation or play)) AND (predict*); (Autism) AND (language) AND (predict*). The search was limited to journal articles and reviews published after 1990 and written in the English language.

Selection Criteria
Studies included in this critical analysis were required to examine the predictive abilities of joint attention, imitation and/or play skills on later expressive and/or receptive language abilities of children diagnosed with ASD. All participants were initially assessed between the ages of 2 and 6 years of age, and follow-up assessments took place 1 to 9 years following initial assessment. No limits were set on demographics (age, gender, culture, race, or socioeconomic status) of the participants.

Data Collection
Results of the chosen literature yielded seven articles consistent with the selection criteria. All experimental

designs were within-groups (repeated measures), longitudinal studies.

Results

The studies were ordered in such a way as to illustrate the varying degrees of support that authors have found when addressing the main question of this critical review, which was whether the assessment of joint attention, imitation and/or play skills have predictive abilities on future expressive and/or receptive language abilities in children with ASD. The articles begin with authors who support the assessment of only one of the three variables (joint attention, imitation or play skills) and move towards the last study which supports the assessment of all three variables in order to predict future language outcomes in children with ASD.

All experimental designs were within-groups (repeated measures), longitudinal studies. These are considered level 2 research evidence, which is one level below the "gold standard".

Longitudinal Study #1. Mundy et al. (1990) investigated the degree to which individual differences in gestural joint attention skills predict language development among children with autism. Joint attention was assessed on 15 children with autism at a mean age of 45 months. Follow-up assessments were conducted one year after initial assessment. Regression analysis was performed in order to examine the predictive relationships between the variables. Joint attention was found to be a significant predictor of language development.

Overall, this study lends support to the assessment of joint attention in young children with ASD in order to predict language outcome one year later. Results of this study should be interpreted with caution as it was conducted on a relatively small sample size. The study also failed to analyze receptive and expressive language outcomes separately when assessing the predictive abilities of joint attention. Failure to separate these two variables can lead to inaccurate results as receptive and expressive language have many different and important components; receptive language is how a child comprehends information, while expressive language is a child's ability to express himself/herself both verbally and nonverbally. For example, a child can have adequate receptive language without having the expressive language skill level of his/or peers. It is therefore important to analyze these variables as separates, rather than grouping them together under the term "language".

Longitudinal Study #2. Charman et al. (2003) sought to define longitudinal associations between joint attention, play, and imitation abilities and language outcome in infants with ASD. Measures of joint attention, play and imitation were conducted with a sample of 18 infants with ASD at age 20 months. Language outcome was assessed at age 42 months. Scores were not normally distributed so the Mann-Whitney U-test, which is a non-parametric analysis, was adopted. This allowed the researchers to divide performance into dichotomous groups ('high ability' and 'low ability'), and then determine whether and to what degree the two groups differed in shape. Play skills were not statistically significant for predicting both receptive and expressive language skills. Joint attention and imitation tasks were significantly positively associated with receptive language only.

Research found no significant predictive abilities of joint attention, imitation or play skills on expressive language. Also, this article does not provide support for assessment of play skills for receptive language predictions. It does, however, provide support for joint attention and imitation tasks being assessed at 20 months of age in order to predict receptive language outcomes at 42 months of age in children with ASD.

As stated by the authors, these results should be interpreted with caution as a small sample size was used. Also, the researchers were unable to use a formal measure of language at initial assessment due to the majority of the sample falling below basal. Instead, the researchers used an ordinal method of coding to demonstrate whether or not the targeted variable was present or absent. As the authors declared, this weakness is a reflection of the limitations in formal assessment protocol that are available to test young children with ASD.

Longitudinal Study #3. Thurm et al. (2007) sought to determine predictors at ages 2 and 3 years for receptive and expressive language at 4 or 5 years of age in children with ASD/PDD-NOS. Initial and follow-up assessments were administered to a sample of 83 children with ASD/PDD-NOS. Pearson correlations were used to analyze the relationships between the predictive variables and outcome variables.

Nonverbal cognitive ability at age 2 was found to predict expressive and receptive language at age 5. Specifically, imitating sounds was a significant predictor of age 5 expressive language, with imitating simple movements being marginally significant. Responding to joint attention was found to be a significant predictor for receptive language at age 5. Consistent with findings by Luyster et al. (2007),

nonverbal cognitive ability was not a significant predictor of expressive or receptive language when initially assessed at age 3.

In general, these findings suggest that imitation of sounds is a significant predictor of age 5 expressive language. Responding to joint attention was found to be a significant predictor of receptive language. Initial assessment of children with ASD/PDD-NOS must be completed by 2 years of age in order for these factors to be significant predictors of expressive and receptive language at age 5.

Longitudinal Study #4. Luyster et al. (2007) examined whether the assessment of pre-speech and gesture using the MacArthur-Bates Communicative Development Inventory (CDI) can be used at ages 2 and 3 years to predict language outcome at age 9 years in children with ASD. Pre-speech variables included: responding to: name, 'no', or 'there's mommy/daddy'; imitating words or names; and labelling objects. Gestures included early gestures (joint attention activities such as showing, pointing, and playing peek-a-boo) and late gestures (actions with objects, pretending to be a parent, and imitating other adult actions which includes object imitation and functional and symbolic play).

Pre-speech and gesture were assessed at ages 2 and 3 years on a sample of 62 children with ASD. Receptive and expressive language was assessed for follow-up at 9 years of age. Regression analysis was conducted in order to determine the predictive connections between the variables.

Number of late gestures (imitation and play skills) at 2 years of age was significantly positively associated with receptive and expressive language outcome at 9 years of age. Contrary to authors' predictions, pre-speech and early gestures at 2 years of age were not significant predictors of later language. By age 3 years, joint attention, imitation and play were not significant predictors of language outcome at age 9. Correlations were found to be significant between ages 2 and 3 early and late gesture use and age 9 language age equivalents, but correlations were higher for late gestures.

This article provides support for assessing late gesture variables (imitation and play skills, but not joint attention) at age 2 years using the CDI for predictors of expressive and receptive language at age 9 for children with ASD.

Longitudinal Study #5. Sigman and Ruskin (1999) examined the long-term relationship that early nonverbal communication and representational play skills have with subsequent language gains in children

with autism. A sample of 70 children with autism, aged 2 to 6 years, was assessed. Regression analysis was conducted in order to identify the predictive abilities of the variables.

Short-term follow-up assessments included 41 children with autism one year after initial assessment. Initiating and responding to joint attention, initiating behavioural regulation, and responding to social interaction at initial assessment were significantly predictive of expressive language level one year later.

Long-term follow-up assessments included 51 children with autism aged 10 to 13 years. Rate of responding to joint attention and the number of different functional play acts at initial assessment were determined to predict gains in expressive language at long-term follow-up assessment.

Overall, these findings suggest that, when assessed between the ages of 2 and 6, initiating and responding to joint attention were predictive factors of expressive language level one year later. This study also lends support to assessing joint attention and functional play acts during the preschool years for accurate prediction of future expressive language abilities at between 10 and 13 years of age.

Results from this study should be interpreted with caution as the authors failed to identify a standardized language assessment for the initial assessment of a portion of the sample. Instead, they used a linguist's interpretations, which were highly correlated with reported language age by parents. This means that variations within the linguist's interpretations were highly related to variations within the parents' interpretations, and the researchers could therefore use the linguist's interpretations as reliable data.

Longitudinal Study #6. Toth et al. (2006) sought to identify the predictive abilities of joint attention, imitation, and toy play on language ability in children with ASD/PDD-NOS. A sample of 60 children with ASD (42 children with autism, and 18 children with PDD-NOS) was initially assessed between the ages of 34 and 52 months. Follow-up assessments were conducted until 65 to 78 months of age, and growth trajectories were created. Multiple regression analyses were used to identify the predictive abilities of the three variables. Growth trajectories were used in order to establish the rate of communication development in the sample population. The individual predictor variables were standardized and entered as predictors of individual differences in the growth trajectories.

Initiating protodeclarative joint attention and immediate imitation were found to be strongly associated with concurrent language ability in 3 to 4 year old children with ASD, suggesting that these skills are important stepping stones for successful development of language. Joint attention was not a statistically significant variable. Both toy play and deferred imitation were significantly predictive of the rate of acquisition of communication skills over a 2 year period. In combination, these skills were associated with even faster positive rates of change in communication skills in children with ASD.

These findings show that toy play and deferred imitation significantly predicted the rate of continued development of language and communication skills (both receptive and expressive) over the preschool and early school-age years. Results from this study suggest that when assessed between 34 and 52 months of age, joint attention has no predictive abilities of language skills at between 65 and 78 months of age. Study outcomes provide support as to crucial goals that need to be targeted in speech-language therapy with children with ASD/PDD-NOS.

Longitudinal Study #7. Stone and Yoder (2001) sought to identify early child predictors (motor imitation, joint attention, object play) and environmental predictors of spoken language development in children with ADD/PDD-NOS two years after initial assessment. Initial assessments were completed on a sample of 35 children with ASD/PDD-NOS at age 2. Follow-up assessments were conducted approximately 27 months after initial evaluations.

Inter-correlational analysis, which is used to identify a connection between two or more variables, revealed that joint attention, motor imitation and object play skills were significantly correlated with expressive language at follow-up assessment ($r = 0.34$, $p < 0.05$; $r = 0.55$, $p < 0.01$; and $r = 0.36$, $p < 0.05$, respectively). Partial correlations were then conducted in order to identify which of the age 2 variables predicted later expressive language beyond the effects of initial language level. This analysis revealed that only motor imitation was a unique predictor of later expressive language after controlling for initial language level (partial $r = 0.38$, $p < 0.05$).

Although joint attention and object play skills do not appear to be significant after controlling for initial language level, they are still important variables to take into consideration when assessing children. Partial correlational analysis is a method of analyzing how much of a significant difference can be accounted for by different variables. Undoubtedly, joint attention and play skills are related to initial language level, whereas

motor imitation has fewer similarities and therefore relatedness to initial language level. Therefore, although partial correlational analysis supported motor imitation separate from initial language level, the other two variables that were significant before the partial correlation analysis was completed should still be considered during assessment due to their clinical relevance.

Overall, this study suggests that at age 2, the assessment of joint attention, motor imitation and object play has predictive abilities of expressive language skills two years later. Partial correlational analysis of these variables lends reasonable support as to the predictive abilities that age 2 motor imitation skills have on age 4 expressive language abilities.

Discussion

The evidence from these studies needs to be interpreted with caution, as six of the seven studies did not achieve an adequate degree of power due to insufficient sample sizes. Longitudinal Study #3 was the only study with a sufficient number of participants in its sample. Longitudinal Studies #1 and #2 had severely insufficient numbers in their samples, but all other studies fell just short of adequate sample sizes. Researchers for all seven of the studies failed to report their methods of checking and controlling for outliers in their samples. This is a weakness as it is a requirement that must be met before correlation and regression analyses can be conducted on a data set.

As stated before, all seven studies were longitudinal studies, which are considered one level below the "gold standard" of research. This means that although we can have fairly good confidence in the results of longitudinal studies, these are still not considered to be within the highest level of evidence that research studies can achieve.

A major limitation of the research is that although several of the studies analyzed in this paper reported that many participants received different types and amounts of therapies, this factor was not controlled for. Stone and Yoder (2001) found that children who were involved in speech-language therapy statistically had better expressive language outcomes than those who were not enrolled in speech-language therapy. Therefore, controlling for and reporting on this factor is crucial in order to accurately interpret the data results.

Although only a limitation in one study, it is of vital clinical importance to analyze receptive and expressive language separately. Consideration for the use of Augmentative and Alternative Communication systems

should also be taken into account when assessing children within the ASD population.

Despite these limitations, there were trends that consistently emerged from the literature. Firstly, three of the studies found joint attention and imitation to be accurate predictors of receptive language abilities at follow-up. One of the studies found play skills to be a significant predictor of later receptive language, while another identified play skills as being a significant predictor of the rate of language acquisition. This factor has a direct effect on a child's language level at time of reassessment. Secondly, four of the studies found imitation to be a significant predictor of later expressive language abilities, with one study noting that imitation has predictive abilities on the rate of expressive language acquisition. Also, one of the four studies demonstrated that imitation was the only significant predictor of later expressive language levels after controlling for initial expressive language level. Three of the studies found joint attention and play to be adequate predictors of later expressive language abilities, with one study confirming the predictive abilities of play skills on the rate of acquisition of expressive language. Lastly, two of the studies that took measures at both 2 and 3 years of age established that assessment must be completed by 2 years of age in order for the variables (imitation and play skills) to have significant predictive abilities. Both factors lost their predictive abilities at age 3, as they were no longer statistically significant predictors. This is likely due to the fact that there is a wide range of 'normal' when looking at language abilities of younger children. As children get older, the range of typically developing language gets narrower. Thus, as the requirements for language get more specific (i.e. 3 years of age, versus 2 years of age), it is less likely that regression analyses are going to be able to identify the predictive abilities that assessing joint attention, imitation and/or play skills have on future language abilities.

Therefore, although support for the predictive abilities of assessment of joint attention, imitation and play skills on later receptive and/or expressive language abilities of children diagnosed with ASD is not evident in all studies, there is sufficient support of these variables individually in various studies in order to warrant them importance. A major contributor to this inconsistency within the literature is likely due to the vastly diverse nature of the ASD population.

Conclusion and Recommendations

In summary, although there are limitations within these studies, important research data have been examined and have demonstrated important results that need to be

explored further. In combination, all of the seven studies support the proposal of assessing joint attention, imitation and play skills of children with ASD in the early preschool years in order to predict future expressive and receptive language outcomes. Although the research is not absolute in the degree to which each variable can predict future language, together the research supports all three as being important factors to consider when assessing and treating language in children with ASD.

After critically evaluating the literature, there are three important recommendations that are suggested for future research in this area: Firstly, it is recommended that more studies with adequate sample sizes be conducted on these factors in order to have concrete evidence of the predictive abilities of joint attention, imitation and play skills on future language outcomes. Studies should be conducted on children with ASD being approximately 2 years of age at the time of initial assessment. Secondly, studies should attempt to control for the type and amount of speech-language therapy the children in the study are receiving. This was the most clinically significant limitation of the research conducted thus far, and therefore must be corrected for. Ideally, this could be accomplished by providing speech and language services to the sample population and guaranteeing the same amount of therapy time for each child, and if possible, ensuring that therapy be administered by the same speech-language pathologists. Finally, research studies should include Alternative and Augmented Communication (AAC) methods in their expressive language outcome measures, as many children with ASD are using these tools as productive means to communicate. Data that does not take AAC into consideration may be misrepresenting the expressive abilities of these children, as verbal expression of language is not the only form of meaningful expressive communication.

Clinical Implications

Overall, these studies have important clinical implications for speech-language pathologists when working with children with ASD. This preliminary research has provided speech-language pathologists with evidence-based guidance as to important areas that they should assess and target within their language intervention programs when working with young children (especially those in their early preschool years) with ASD. Not only will assessment of joint attention, imitation and play skills help the development of appropriate goals for the child with ASD for maximum language outcomes, but will also help the clinician

explain his/her goal rationale to the parents in order to help them become supportive and involved in their child's therapy program. As shown in the study by Toth et al. (2006), not only do these factors have predictive abilities on future expressive and receptive language, but also on the rate of acquisition of these factors. This means that targeting joint attention, imitation and/or play skills may help the child reach a higher level of language functioning in a shorter amount of time than if these factors were not targeted.

In conclusion, it is suggested that clinicians integrate joint attention, imitation and play skills into their assessment protocol in order to determine the most effective intervention plan for their preschool aged clients diagnosed with Autism Spectrum Disorder.

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