

Evaluating Predicting Factors of Entering Kindergarten with an Individualized Education Program

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### Abstract

The purpose of the current study was to examine what factors best predict the entrance into kindergarten with an Individualized Education Program (IEP). Cognitive ability, language skills, social skills and adaptive skills were all used as independent variables. The presence of an IEP upon kindergarten entry was used as the dependent variable. The Battelle Developmental Inventory (BDI-2) served as the primary source of quantitative data. The Preschool Language Scales-4, Preschool Language Scales-5, and Developmental Assessment of Young Children-Second Addition also served as a source of quantitative data. The sample consisted of 50 children who had been evaluated at local preschool in upstate New York and have a clear IEP or no IEP status upon kindergarten entry.

The scores of the tests were compiled and statistically analyzed using a Logistic Regression to determine which factors have the highest predictive ability of whether or not a student enters kindergarten with an IEP. The sensitivity and specificity were also calculated and analyzed to determine the accuracy of each model. Results of the analysis indicate that none one predictive variable is significant when all entered in the model together; however, the full model has excellent sensitivity and specificity. Additionally, social skills and adaptive skills emerged to be significant when entered alone. All predictive variables have excellent sensitivity and specificity.

## Evaluating Predicting Factors of Entering Kindergarten with an Individualized Education Program

### **Introduction**

Approximately 80% of children in America attend preschool the year prior to starting kindergarten (Barnett et al., 2010 as cited in Montroy et al., 2014). Understanding the influences of entering kindergarten with an Individualized Education Program (IEP) can have an immense impact on preschool service providers. Preschool service providers could use this research information to concentrate limited funding in an area that will have the greatest impact on the students. For example, if it is found that students who showed language difficulties in preschool are more likely to have an IEP in kindergarten, then higher level services could be provided to help remediate these deficiencies before kindergarten entrance. Therefore, focused high quality early intervention may save costs later. In a study by Muschkin, Ladd and Dodge (2015) it was found that high-quality early intervention significantly reduced special education placement by third-grade. This reduction in special education placement saves the state a considerable amount of money.

For the purposes of the current study several assessment tools were used. The Battelle Developmental Inventory- Second edition (BDI-2) was used as the main source of quantitative data. Standard Scores in the following domains were examined from the BDI-2; Adaptive, Personal-Social, and Cognitive. The Preschool Language Scale (PLS) was used to gather more quantitative data for the language domain. Both assessment tools have great validity and reliability which are explored more below.

The Battelle Developmental Inventory-2 (BDI-2) is an assessment tool that is used to evaluate five domains of child development. These five domains include a cognitive developmental domain, a personal-social developmental domain, an adaptive (self-help) domain, a motor domain and a communication domain (Berls & McEwen, 1999). Each of these domains is further divided into subdomains which are scored individually. The BDI-2 is used to determine the child's strengths and weaknesses, to determine the need for special services and to measure change in the child's development (Berls & McEwen, 1999). The results enable the evaluator to develop and recommend programs specific to the child and to measure the effectiveness of the program or services implements (Berls & McEwen, 1999). The BDI-2 may be used on children from birth to eight years old (Berls & McEwen, 1999). The assessment is comprised of a structured administration, observation and interviews with parents or other sources (Berls & McEwen, 1999). The three administration variations enable the child to achieve the highest score for all skills they perform; however, the three administration variations may be problematic for standardization because the information gathered from one source may not match the information gathered from the other sources (Berls & McEwen, 1999). Additionally, the parent interview portion of the assessment can be subjective in nature.

The BDI-2 was normed on a sample of approximately 800 children ranging from birth to eight years old (Berls & McEwen, 1999). Approximately 100 children were at each age (one year old to eight years old) (Berls & McEwen, 1999). No differences were reported when gender and race were considered (Berls & McEwen, 1999). Seventy-five percent of test sites were considered urban and 25% were considered rural (Berls & McEwen, 1999). Test developers did not take into account socioeconomic status when interpreting results (Berls & McEwen, 1999). Another issue with this test is the possibility of receiving a negative developmental quotient for

come children who perform poorly and an explanation is not provided for this, nor is there a recommendation to interpret these scores (Berls & McEwen, 1999). The BDI has excellent test-retest reliability, inter-rater reliability (.90-.99) and validity was also good for the BDI, ranging from .56 to .99 (Berls & McEwen, 1999). It has been determined that the BDI is a useful tool to screen for eligibility for services based on developmental delay. It has also been shown to be a good tool to measure progress in individual children.

The Preschool Language Scales-Fourth Edition (PLS-IV) is an assessment tool used to assess comprehension and expressive language skills in children from birth to six years eleven months (Suen, 2002). It is individually administered and is used to detect a language delay or disorder (Suen, 2002). It consists of two subscales, auditory comprehension and expressive language comprehension (Suen, 2002). There are also three supplemental subscales which include an articulation screener, a language sample checklist and a caregiver questionnaire (Suen, 2002). The development of these skills can also be monitored using this assessment (Suen, 2002). It was been found that the PLS has good psychometric properties (reliability and validity) (Suen, 2002). This assessment has been used extensively with a wide range of children including children with varying disabilities, socioeconomic backgrounds and abilities (Suen, 2002). Like the BDI, the PLS is also used to make recommendations for interventions and monitor progress (Suen, 2002).

The Developmental Assessment for Young Children is an individually administered assessment used to assess cognitive ability, physical development, communication ability, social-emotional ability and adaptive ability (Plake & Impara 2001). The DAY-C has high reliability in all domains and also has high validity when compared with the Battelle Developmental Inventory-Second Edition (Plake & Impara 2001). Although this assessment has high reliability

and validity, it is not an effective tool to measure the effects of intervention because there is no data to show that it is sensitive enough to treatment effects (Plake & Impara 2001).

In conclusion, both the BDI-2, PLS and the DAY-C appear to be good sources of data to determine the presence of delays or disabilities, to measure these delays/deficiencies over time and to help determine if the children need an IEP upon entrance into kindergarten. A combination of these assessment tools have been used with the children whose scores constitute the current data set.

Shevell et al. (2004) conducted a study to determine the outcomes of school age children with a developmental language impairment in preschool. Seventy children were the focus of this study, all of which had a developmental language impairment. Shevell et al. (2004) used standard scores on the BDI-2 to classify children with specific developmental delays. A cut off of 1.5 standard deviations below the mean was used to identify delays. The Vineland Adaptive Behavior Scale was also used to further assess ability in communication, daily living skills, and socialization skills. School placement was obtained for forty-two of the seventy children. Sixty-four percent of the children were integrated without an aide, 12% were integrated with an aide, 2% were integrated with supplemental tutoring, 14% were in a special classroom placement within a regular school and 7% were placed in a special school. Additionally, they found that these children typically had lower cognitive scores and had a higher frequency of behavioral and social difficulties. These behavioral and social difficulties were still observed in the children who had successfully remediated their language difficulties. Shevell et al. (2005) stated that their data suggest that children with an early diagnosis of developmental language impairment have persistent significant developmental and functional difficulties upon entry into school. Thus, their data supports that children with an early language impairment are at a higher risk for

additional neurodevelopmental delays, beyond the scope of a maturational lag (Shevell et al., 2005). Children with a language impairment in preschool, are at a higher risk for entering kindergarten with an IEP and developing additional neurodevelopmental and school problems. Additionally, early language impairment is one of the key diagnostic criteria for autism spectrum disorder (ASD). ASD may put the child at higher risk for additional school problems such as social and emotional problems. Luyster et al. (2008) further discuss language problems associated with ASD and school problems.

Luyster et al. (2008) conducted a study to investigate language development in toddlers with ASD and to also identify early correlates of receptive and expressive language development within this population. These researchers identified language as a critical predictive factor for long-term outcomes for individuals with an Autism Spectrum Disorder. A language delay is one of the key diagnostic criteria for an autism spectrum diagnosis (ASD). More specifically, the absence of first words and phrases is the most common reason why caregivers develop initial concern (Luyster, 2008). This study found evidence that supported that the best predicting factors for receptive and expressive language were gesture use, and non-verbal cognitive ability. This suggests that prior to the development of language, in toddlers, the ability to use gestures to communicate, may be a predictor of language development (Luyster et al., 2008). Gesture use, such as pointing, implies that the child is able to express ideas to others because they do not yet have the verbal language ability (Luyster et al., 2008). The toddler's non-verbal cognitive ability will also be a strong predictive factor of language development, however, cognitive ability is difficult to assess at such a young age. Cognitive ability is not stable at this age, and an accurate intelligence quotient cannot be obtained until the approximate age of seven.

The implications of the findings from the study by Luyster et al. (2008), suggest that early intervention strategies for the ASD population should not only emphasize the sound meaning relationship of spoken language, but also the social cognitive skills that are linked the development of language in young children with ASD. The previous studies suggest that a language delay can be correlated with more academic problems later.

School readiness is a notion that is related to the present study. School readiness generally refers to the idea that children do their best in school when they enter kindergarten with certain skills developed. These developed skills can help them academically and socially. The transition from preschool to kindergarten can pose many difficulties for children including learning how to communicate effectively with others outside of their close networks, learn to negotiate the physical and psychological classroom and learn to manage expectations in the school setting (Mcwayne et al., 2012). Therefore, if children master certain skills before entering kindergarten, they may be in a more advantageous position.

Pentimonti et al. (2016) conducted a study that aimed to identify how school readiness affects children and how different key stake holders identify school readiness. Pre literacy and social skills have been identified in a number of studies to have significant positive effects on their future achievement (National Early Literacy Panel, 2008). Pre-literacy is highly related to language which is one of the focuses of the current study. Justice et al. (2009) (as cited in Pentimonti et al., 2016, p. 149) stated that children with a language impairment are rated by their kindergarten teachers to be significantly less prepared for success in kindergarten across several academic areas. Pentimonti et al. (2016) concluded that of the two broad school readiness components (per-literacy and social-emotional) pre-literacy was found to be most highly correlated with later achievement specifically with decoding and spelling.

Children with a language impairment were also studied by comparing their language and social skills with their future academic success. Pentimonti et al., (2014) studied the effects of a high-quality preschool classroom on children with an identified language impairment and varying social skills. Their results indicated that children with less intact or underdeveloped social skills were rated as being less prepared for school entry than their peers with solid social skills. These effects are moderated when the children had access to a high-quality preschool classroom (Pentimonti et al., 2014). Three groups of children were followed in this research: Absolute Average group, who had the best outcomes were rated as average for language and social skills (Pentimonti et al., 2014). The second group was identified as Socially Awkward and their characteristics include average academic skills and significantly delayed social and behavioral skills (Pentimonti et al., 2014). The third group, Limited Readiness was worst off had significantly under developed language, literacy, social, and behavioral skills (Pentimonti et al., 2014). As anticipated, this research demonstrated that children who had more impairments are more likely to struggle upon school entry. Additionally, it suggests that by providing high-quality preschool, some of these negative effects can be moderated.

The predictive power of language at five years old for later academic achievement has been shown to be very significant in a study from Iceland (Einarsdottir et al., 2016). Their findings support that language is the basis for literacy and academic performance (Einarsdottir et al., 2016). These researchers found a strong correlation between language ability at five years old and academic achievement throughout the next ten years of academics (Einarsdottir et al., 2016). Therefore, not only is language a potential strong predictor for entering kindergarten with an IEP, but it is also supports the prediction that children who have a language deficit in preschool will have lasting negative effects though their school career. They offered possible

remediation to counteract the negative effects of poor language ability including, increased language stimulation in preschool and high quality interactions that influence language skills (Einarsdottir et al., 2016).

Receptive vocabulary is strongly related to language ability. It is a marker for language development, general ability and literacy (Christensen et al., 2014). Receptive vocabulary continually develops throughout years and has consistently been related to and used to measure overall general ability (Christensen et al., 2014). Receptive vocabulary has also been shown to predict academic ability and success (Christensen et al., 2014). Christensen et al., (2014) attempted to identify the risk factors for low or weak receptive vocabulary from the age of four to eight which is around the time of entry into kindergarten and several subsequent school years. Results indicated that the significant risk factors include low receptive vocabulary skills at the age of four, low maternal education, low school readiness, socio-economic disadvantage and low temperamental persistence (Christensen et al., 2014). Based on their research professionals can adjust or recommend preschool programs or instruction to limit the effects of low receptive vocabulary and build overall language ability. Language has been identified as a potential predictive variable for entrance into kindergarten with an IEP. Since language has shown to have a lasting effect of overall academic success it is crucial to identify the effects and potential interventions.

School readiness was also examined by Konold and Pianta (2005). They compared cognitive ability and social functioning to achievement in first grade. Their results suggest that cognitive ability has a greater predictive factor than social functioning does on academic achievement in the first grade. Their results further identified that cognitive ability supported better achievement even when the child's social functioning was low or when the child has an

externalizing behavior problem (Konold and Pianta, 2005). These results suggest that in the current study cognitive behavior will be more predictive of entering kindergarten with an Individualized Education Program than the social domain. However, these findings are not consistent with other studies.

The effects of attention and cognitive abilities on later achievement were examined by Pagani et al (2010). These researchers found that cognitive ability and attention predicted achievement by the end of second grade (Pagani et al., 2010). In an extension of their study they looked at fine motor skills and their relation to later achievement. Results indicated fine motor skills significantly contributed to the prediction of later achievement (Pagani et al., 2010). Fine motor skills were not considered in the present study; however, cognitive ability was considered. These results would suggest that preschools should incorporate instruction on fine motor skills into their curriculum, as well as teach children how to maintain focus and delay gratification.

Attention skills were also considered by Duncan et al, (2007). In an effort to predict later achievement with school readiness they collected data on the level of academics at school entry, attention skills and socioeconomic skills and compared them to later math and reading achievement (Duncan et al., 2007). Results indicated that the greatest predictors of later achievement are school-entry math, reading and attention skills (Duncan et al., 2007). Early mathematics ability emerged to be the greatest predictor (Duncan et al., 2007). Additionally, results suggested that socioemotional behaviors and social skills were insignificant predictors of later academic performance (Duncan et al., 2007). In contrast, additional studies have concluded that social skills can actually be significant predictors of future academic success.

Many studies have been completed to identify the relationship between social and emotional skills and later academic success. Social and emotional skills allow children to develop positive relationships with their peers and teachers which help to foster the learning environment and academic success (Ladd, Herald, & Kochel, 2006 as cited in Moore et al., 2015). Research suggests that a high-quality preschool can have significant positive impacts on cognitive and social development, attention and academic tasks such as reading and mathematics (Gormley, Phillips, Newmark, Welti, & Adelstein, 2011 as cited in Moore et al., 2015).

A literature review was performed in order to identify predictors of school readiness in literacy and mathematics (Linder, Ramey & Zambak, 2013). Seven predictive variables were shown to have a significant impact on school achievement and school readiness (Linder, Ramey & Zambak, 2013). These seven variables include child care experience, parenting style, home environment, learning-related characteristics (work-related social skills, performance in the classroom), social behavior, performance on mathematical and literacy based tasks and health and socioeconomic status (Linder, Ramey & Zambak, 2013). Several studies were evaluated in this literature review and indicated that increased cognitive self-control was related to increased student achievement (Linder, Ramey & Zambak, 2013). Children who had more aggressive behaviors exhibited less self-control when completing academic tasks, which lead to poorer achievement (Linder, Ramey & Zambak, 2013). This study would imply that social skills, specifically inhibition in social situations, could lead to better classroom performance.

Moore et al., (2015) focused on identifying the social-emotional functioning of at risk children after they had been exposed to a high quality preschool program. The preschool that was examined in the study used a social-emotional program that is designed to increase school readiness (Moore, et al., 2015). The program called “Preschool Promoting Alternative Thinking

Strategies Curriculum” (Preschool Paths) is an evidence based program that includes forty-four lessons that teaches children to recognize and communicate emotions in themselves and others, self-regulation skills and interpersonal skills that are crucial for prosocial behavior and positive relationships (Moore, et al., 2015). Preschool PATHS is based on the Affective-Behavioral-Cognitive-Dynamic model which used the integration of emotion language, behavior and cognitive understanding to promote social and emotional competence (Moore, et al., 2015). They concluded that the children who spent two years in the program in preschool had significantly stronger social competence than children who spent only one year in the program upon kindergarten entry (Moore, et al., 2015). This indicates that social skills may be a crucial component in determining if a student will need an IEP when entering kindergarten. It may also indicate that using a highly effective social-emotional program in preschool may decrease later need for intervention and increase academic success in students.

Denham et al. (2014) conducted a study to assess how preschoolers’ social-emotional learning predicts success in early school. The specific tasks associated with the theory of social-emotional learning that are key early academic success include “(1) Maintaining positive engagement in the physical and social environment, and (2) managing emotional arousal and cognitive demands, while (3) maintaining positive social interaction with peers and adults” (Denham et al., 2014). For the purpose of their study they defined early school success as classroom adjustment and academic readiness. They further elaborated on social-emotional domains as self-regulation, social awareness, responsible decision making, and relationship skills (Denham et al., 2014). The results of their study showed that social problem solving and social competence were related to school adjustment and academic readiness in kindergarten (Denham et al., 2014).

In 2012 Denham et al. completed another study with an aim to predict early school success with social-emotional behavior. In this study they looked at the effects of Head Start on academic success compared to children who went to private preschool (Denham et al., 2012). They found that children who attended Head Start exhibited more prosocial behavior than their private preschool counterparts (Denham et al., 2012). They attempted to explain this difference by stating that the Head Start classrooms appeared to be more structured, and less chaotic overall (Denham et al., 2012). Head Start also uses a social-emotional program entitled “Al’s Pals” which has been shown to be effective in promoting social-emotional skills and preventing aggression (Denham et al., 2012). Finally their study suggested that emotionally negative or aggressive children usually had more school adjustment issues or weaker academic skills (Denham et al., 2012). This study would suggest that in the current study social skills may be a strong predictor of academic success in kindergarten and entry into kindergarten with an IEP.

Montroy et al. (2014) analyzed the relationship between self-regulation skills, social functioning and later school success. They identified self –regulation as a process where an individual deliberately uses their cognition, motivation and emotions to create an overt behavior response in a contextually appropriate manner (Montroy et al., 2014). Consistent with the previous study, Montroy et al. (2014) found that social skills and problem behaviors mediate the relationship between self-regulation and academic success in literacy. Therefore, self-regulation may be foundational in how children are able to interact with others thus affecting their learning (Montroy et al., 2014).

Identifying the patterns of school readiness among preschool children has the ability to set these children up for greater success in kindergarten and beyond. Mcwayne et al., (2012) attempted to identify if early social skills and cognitive skills are able to predict school

adjustment by the end of kindergarten. They found that maternal level of education was a significant predictor of academic outcome but was not related to predicting social skills. Additionally, authoritarian parenting style was correlated with language development (McWayne et al., 2012). McWayne et al. (2012) also found that the preschool classroom characteristics significantly predicted general knowledge and social skills at the end of kindergarten. Connor & Morrison, (2014) stated that in addition to high quality preschools being beneficial to students, poor quality programs appear to be harmful and are associated with negative child outcomes. These classroom characteristics included a small teacher to child ratio. This study takes into account additional characteristics of the child and the preschool that the present study does not consider such as classroom characteristics and parental demographics.

Connor & Morrison (2014) identified four influences on children's academic success. Child factors, sociocultural factors, parenting, and early childhood care and education were researched in their met-analysis. Their conclusion was that effective preschools consider multiple factors and provide two generational support. Offering support to the parents by providing parenting classes, assisting with discipline practices and improving the home learning environment can help put the child in a better position to succeed in later years (Connor & Morrison, 2014). Providing a linguistically rich learning environment with cognitive challenges and supports for literacy development are key components for an effective preschool program (Connor & Morrison, 2014). These researches assisted in identifying ways to help remediate deficits in the predictive factors being looked at in the present study which may lead to a decreased need for IEPs upon kindergarten entry.

Young children with disabilities are less likely to exhibit prosocial behaviors compared to their typical peers (Lane et al., 2015). Identifying how social skills interact with academics and

future socialization is crucial at the preschool level. If preschools know how these skills influence each other there is the potential to remediate these consequences and prevent them from occurring later. Generally, the focus of preschools is on academics; however, teaching and helping children to develop age-appropriate social skills can mean large positive impacts in later years and is considered the cornerstone of high-quality preschools (Lane et al., 2015). Lane et al., (2015) suggest that imbedding social skills in academic instruction can maximize learning in preschool classrooms. This may lead to increases in sharing and learning social information about peers, which may make children more successful with collaboration exercises in later academic years (Lane et al., 2015). Should the present study find that social skills are the strongest contributor to children entering kindergarten with an IEP, the targeted local preschool may wish to consider implementing strong social instruction within the academic curriculum.

Research on the effects of social and executive functioning on fifth grade achievement was conducted by Sabol & Pianta (2012). The aim of their research was to predict fifth grade socioemotional and achievement outcomes. They stated that early executive functioning and social skills are responsible for a large part of the variation of the academic and social outcomes in elementary school (Sabol & Pianta, 2012). Executive functioning is the planning ability or the high cognitive processes that allow individuals to set goals and self-regulate behaviors. Their findings indicated that lower executive functioning; specifically inhibitory control may lead to increased social interaction difficulties (Sabol & Pianta, 2012). They elaborated to say that these children will have more difficulty controlling their impulsivity and will be more emotional around peers and adults, thus having poorer relationships (Sabol & Pianta, 2012). Additionally they found that demographic information had the strongest predictive ability on fifth grade achievement (Sabol & Pianta, 2012). These effects of school readiness were seen more strongly

with fifth grade math achievement compared to fifth grade reading achievement suggesting that various achievement outcomes may want to be considered individually (Sabol & Pianta, 2012).

Many researchers agree that it is necessary to identify factors that affect children's success in school, especially in the early years (Sajaniemi et al., 2001). Sajaniemi et al. (2001) conducted research to examine whether behavior and cognitive ability could predict later cognitive development in preterm children. In summary, they found that the group with high adaptability, hypersensitivity, low positive affectivity, low social engagement, low persistency and low energy may suggest additional risks that put them at risk for poor performance in mathematics and in comprehension. They suggest that behavioral factors may contribute to achievement starting at the age of four (Sajaniemi et al., 2001). The behavior addressed in the Sajaniemi et al. (2001) study have not fully been considered in the present study. The present study considers adaptive behaviors that include self-care and personal responsibility measures. Sajaniemi et al. (2001) also found a significant difference between genders starting at the age of four. Preterm boys have a higher risk for cognitive disabilities than girls. Although there are differences between the current study and Sajaniemi et al. (2001) both support the notion that focusing special education programs can help children in the school years. Sajaniemi et al. (2001) furthers the claim that "focusing on problem solving skills might improve the development of conceptual thinking and partly prevent severe learning disabilities."

Carr, Gugiu and Barnes (2014) stated that many studies have shown pre-kindergarten programs have been successful at closing the achievement gap between disadvantaged peers and their more advantaged peers. Although these researchers stated the gap usually does not stay closed, it does offer some relief for the first few years of education. Specifically identifying the child's weaknesses can help provide them with the intervention they need to remediate their

deficiencies. Further identifying which predictive factors have the highest correlation with kindergarten achievement can help to decrease the achievement gap and prevent it from increasing in later years. The current study aims to identify the strongest predictive factors of entering kindergarten with an Individualized Education program at a local preschool in upstate New York. The purpose of identifying these predictive factors is to (1) prioritize or streamline the focus of preschool level interventions, (2) set preschool aged students up for greater success in kindergarten and (3) potentially decrease the cost of academic interventions in later education years and set these children up for greater success in kindergarten.

## **Method**

### **Participants**

A sample of 50 children participated in the study. There were 31 males and 19 females ranging in age from 30 months to 59 months. Additionally, 32 of the participants met criteria for an IEP at the kindergarten level and 18 students were recommended to enter kindergarten without an IEP. Children were all previous students at a local preschool located in Plattsburgh, New York. Some participants had a range of delays and disorders and also received various interventions and classroom placements, other participants were evaluated but may not have received formal services. This cohort was selected based on convenience. Children were selected based upon the battery of tests that were administered. The participants were included in the study based on the availability of outcome data. If outcome data was not available, participants were excluded from the study.

## **Procedure**

Data on participants between the ages of 30 months to 59 months were collected from a local preschool agency in Plattsburgh, New York. The parents of these children were not contacted because no personal identification information was provided to the researcher. The preschool compiled the data, which included, age of testing, gender, and scores obtained on the Battelle Developmental Inventory-2 as well as the Preschool Language Scales (4 or 5) and the Developmental Assessment for Young Children- Second Edition. The protocol was approved by the Committee on the Protection of Human Subject (COPHS) on the SUNY Plattsburgh campus. All instruments have good to excellent psychometric properties.

The Battelle Developmental Inventory-2 is a norm-referenced, individually administered assessment which measures motor, adaptive, communication, cognitive and personal-social domains for children from birth to eight years old. This assessment is used to identify individual strengths and weaknesses and also to make recommendations for interventions.

The Preschool Language Scales (either the 4<sup>th</sup> or 5<sup>th</sup> edition) was used to further assess the individual's language abilities. The PLS-4 was re-normed and updated to the PLS-5, during the period where data was compiled from. Therefore, some individuals were administered the 4<sup>th</sup> edition and some the 5<sup>th</sup> edition. This assessment has good reliability and validity. Like the BDI-2, the PLS (4<sup>th</sup> edition and 5<sup>th</sup> edition) is also used to assess strengths and weaknesses and to make recommendations for interventions.

The Developmental Assessment for Young Children-second Edition is used to assess children from birth to five years eleven months old (Plake & Impara 2001). The DAY-C can be used to measure cognitive ability, communication, social-emotional development, physical

development and adaptive behavior (Plake & Impara 2001). This assessment has good reliability and validity (Plake & Impara 2001). In the current study only the communication scores were used.

### **Results**

As seen in Appendix A (Table A1) participants mean adaptive scores emerged to be the highest and the mean cognitive score emerged to be the lowest. All scores are Standard Scores with the national mean being 100 and the standard deviation being 15. Standard Scores below 85 are considered below average. The skewness of the data is within normal limits and some of the data only has a slight kurtosis. All independent variables are correlated with each other; however, they are not so highly correlated with each other that the results are compromised.

A Logistic Regression was used to examine the predictive power of each independent variable. Variables were entered in two blocks; Block one included age and gender and Block two included cognitive, adaptive, social, and communication scores. Results did not yield significant predictive power for any one variable as seen in Appendix B Table B1. However, the full model yielded significant results Chi-square (6) = 21.32,  $p < .01$ , Nagelkerke  $R^2 = 0.48$ . This indicates that the combination of all independent variables has a strong predictive power for the dependent variable. Additionally, as seen in Appendix B Table B2, the model has a 93.80% accuracy for identifying children in need of an IEP. Out of the 30 children who entered kindergarten with an IEP only two were identified by the model to not need an IEP. The sensitivity of the full model was calculated to be 76.92% and the specificity was calculated to be 81.81% indicating that it has a strong ability to accurately identify students who do or do not need an IEP upon kindergarten entrance. This table can also be seen in Appendix B Table B3.

Each independent variable was also entered individually as Block two. Block one remained with age and gender. When only social scores were used as the predictive variable, the model emerged to be significant (as seen in Appendix C, Table C1), Chi-squared (3) = 16.88,  $p < .01$ , Nagelkerke  $R^2 = 0.393$ . The overall predictive power of this model emerged to be 90.6% accurate (as seen in Appendix C Table C2). Three of the 32 children identified as needing an IEP upon kindergarten entrance were determined to not need an IEP (as seen in Appendix C Table C2). When only social scores are considered, the sensitivity (76.31%) and specificity (75.00%) drop slightly; however, it is still significant (see Appendix C Table C3).

When cognitive scores were entered alone as Block two, results were not significant (see Appendix D Table D1). This model is insignificant, chi squared (3) = 8.97,  $P > .01$ , Nagelkerke  $R^2 = 0.225$ . However; the model was still highly accurate with appropriately identifying students who need an IEP upon kindergarten entrance (96.9%), only one student out of the 32 who entered kindergarten with an IEP was identified by this model as not needing an IEP (see Appendix D Table D2). Additionally, the sensitivity (81.57%) and specificity (91.66%) were higher than for social skills (see Appendix D Table D3).

Communication emerged to be a significant variable when entered independently in Block 2 (see appendix E Table E1). However, it is insignificant when examining coefficients; chi-squared (3) = 9.22,  $P > .01$ , Nagelkerke  $R^2 = 0.231$ . Four out of the 32 students who were identified as needing an IEP upon kindergarten entrance was determined to not need an IEP by this model (see Appendix E Table E2). The sensitivity (77.77%) and specificity (71.42%) were also slightly lower, indicating this model is more likely to identify false positives and false negatives (see Appendix E Table E3).

Adaptive skills emerged to be the most significant scores when examining them independently in Block two (see Appendix F Table F1). This model emerged to be very significant with chi-squared (3) = 13.46,  $P < 0.01$ , Nagelkerke  $R^2 = 0.324$ . Two out of the 32 students identified as needing an IEP upon kindergarten entry were determined to not need an IEP using this model (see Appendix F Table F2). Additionally, the sensitivity (78.94%) and specificity (80.00%) emerged to be the highest with the exception of cognitive scores (see Appendix F Table F3).

### **Discussion**

The focus of this study was to determine which predictive variable has the greatest influence on entering kindergarten with an Individualized Education Program (IEP). Social skills, cognitive ability, adaptive skills, and language ability were all measured. Social skills emerged to be the most significant predictor for the need of an IEP across all statistical analysis performed. When all variables are entered into Block two together, no significant results emerged. However, when examining each variable independently, all variables were significant with the exception of cognitive ability. Although cognitive ability was not a significant predictor, it still had good sensitivity and specificity. The most significant variable entered independently emerged to be adaptive skills.

The validity of this study is thought to be good. However, because of the small sample size and because the population came from one preschool in upstate New York, the generalizability will be relatively weaker. In order to increase generalizability, it is recommended that the study be expanded other preschools within the state of New York. All of

the measures used have good to excellent reliability and are nationally normed, therefore it is likely that the data for each participant is accurate.

There are some limitations to this study including a small sample size, lack of a wide population and lack of outcome data. A larger sample size would potentially allow the results to be generalized more. Although the sample size was relatively small it was still an adequate size and results still emerged to extremely significant. Due to time and availability of outcome data, a limited pool of participants was available. Future researchers may wish to consider a larger group. This larger group may also mean a wider population which could expand to other preschools. This would increase generalizability of the outcome data. The only outcome data used in the current study was the presence of an Individualized Education Program. Future researchers may wish to include other data such as the presences of a 504 program and the classification used for the IEP.

Future research may also wish to analyze the various skills into more specific categories such as self-concept, peer interactions, adult interactions and other specific social skills. They may also wish to look at pragmatic language a skill which is the use of language in a social setting. This may reveal the difference or similarity between social skills and language and help to further identify the best interventions.

The results of this study indicate that using social skills, cognitive ability, adaptive skills and communication ability is the most effective method to determine the need for an IEP upon entrance to kindergarten. Results also suggest that interventions provided will may be most effective when they are targeted at strengthening adaptive and social skills. Looking for programs that are research based such a Preschool PATHS or Al's Pals may help them to

incorporate more social skills instruction in an academic manner. These results could also imply that counseling and other social skills groups may be effective methods to decrease the number of students needing IEPs upon entry to kindergarten. Professionals in the preschool may also consider doing push-in services to all the classrooms to encourage social skills development to all students. The preschool may wish to evaluate their social skills interventions for their students to set them up for continued achievement in the school years.

Previous research and results from this study suggest that there are multiple significant predictors of academic achievement in later years. Being able to appropriately identify at-risk children and disabilities as well as providing high-quality interventions and classrooms will be the cornerstone to being the most effective provider possible. The preschool is encouraged to adapt high-quality programs for all students and to continue to identify specific disabilities and provide appropriate research based interventions.

## References

- Bagnato, S. J., Suen, H. K., Brickley, D., Smith-Jones, J., & Dettore, E. (2002). Child developmental impact of Pittsburgh's early childhood initiative (ECI) in high-risk communities: First-phase authentic evaluation research. *Early Childhood Research Quarterly, 17*(4), 559-580. doi:10.1016/S0885-2006(02)00182-5
- Carr, K., Gugiu, C., & Barnes, M. (2014, May). Area: 2014 #PB 2014 11 Predicting in Kindergarten based on ... Retrieved March 14, 2016, from [https://oerc.osu.edu/sites/oerc.osu.edu/files/research/in-progress/OERC\\_ResearchBrief\\_AcademicSuccessPS-K\\_Final\\_6.13.14\\_#PB-2014-11.pdf](https://oerc.osu.edu/sites/oerc.osu.edu/files/research/in-progress/OERC_ResearchBrief_AcademicSuccessPS-K_Final_6.13.14_#PB-2014-11.pdf)
- Christensen, D., Zubrick, S. R., Lawrence, D., Mitrou, F., & Taylor, C. L. (2014). Risk Factors for Low Receptive Vocabulary Abilities in the Preschool and Early School Years in the Longitudinal Study of Australian Children. *Plos ONE, 9*(7), 1-19. doi:10.1371/journal.pone.0101476
- Connor, C. M., & Morrison, F. J. (2014, May). Services or Programs that Influence Young Children's Academic Success and School Completion. Retrieved April 01, 2016, from <http://www.child-encyclopedia.com/school-success/according-experts/services-or-programs-influence-young-childrens-academic-success-and>
- Denham, S. A., Bassett, H. H., Thayer, S. K., Mincic, M. S., Sirotkin, Y. S., & Zinsser, K. (2012). Observing Preschoolers' Social-Emotional Behavior: Structure, Foundations, and Prediction of Early School Success. *Journal Of Genetic Psychology, 173*(3), 246-278. doi:10.1080/00221325.2011.597457
- Denham, S. A., Bassett, H. H., Zinsser, K., & Wyatt, T. M. (2014). How Preschoolers' Social-Emotional Learning Predicts Their Early School Success: Developing Theory-Promoting, Competency-Based Assessments. *Infant & Child Development, 23*(4), 426-454. doi:10.1002/icd.1840
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & ... Japel, C. (2007). School Readiness and Later Achievement. *Developmental Psychology, 43*(6), 1428-1446. doi:10.1037/0012-1649.436.1428
- Einarsdóttir, J. T., Björnsdóttir, A., & Símonardóttir, I. (2016). The Predictive Value of Preschool Language Assessments on Academic Achievement: A 10-Year Longitudinal Study of Icelandic Children. *American Journal Of Speech-Language Pathology, 25*(1), 67-79. doi:10.1044/2015\_AJSLP-14-0184
- Konold, T. R., & Pianta, R. C. (2005). Empirically-Derived, Person-Oriented Patterns of School Readiness in Typically-Developing Children: Description and Prediction to First-Grade Achievement. *Applied Developmental Science, 9*(4), 174-187. Retrieved March 15, 2016.

- Lane, J. D., Gast, D. L., Shepley, C., & Ledford, J. R. (2015). Including Social Opportunities During Small Group Instruction of Preschool Children With Social-Communication Delays. *Journal Of Early Intervention, 37*(1), 3-22. doi:10.1177/1053815115588828
- Linder, S. M., Ramey, M.D., Zambak, S.. (2013). Retrieved April 01, 2016, from <http://ecrp.uiuc.edu/v15n1/linder.html>
- Leopold, W. (2007, November 13). Early Academic Skills, Not Behavior, Best Predict School Success. Retrieved April 01, 2016, from <http://www.northwestern.edu/newscenter/stories/2007/11/duncan.html>
- Luyster, R. J., Kadlec, M. B., Carter, A., & Tager-Flusberg, H. (2008). Language Assessment and Development in Toddlers with Autism Spectrum Disorders. *J Autism Dev Disord Journal of Autism and Developmental Disorders, 38*(8), 1426-1438.
- McWayne, C. M., Wright, L. G., Cheung, K., & Hahs-Vaughn, D. L. (2012). Patterns of School Readiness Among Head Start Children: Meaningful Within-Group Variability During the Transition to Kindergarten. *Journal Of Educational Psychology, 104*(3), 862-878. doi:10.1037/a0028884
- Montroy, J. J., Bowles, R. P., Skibbe, L. E., & Foster, T. D. (2014). Social skills and problem behaviors as mediators of the relationship between behavioral self-regulation and academic achievement. *Early Childhood Research Quarterly, 29*(3), 298-309. doi:10.1016/j.ecresq.2014.03.002
- Moore, J. E., Cooper, B. R., Domitrovich, C. E., Morgan, N. R., Cleveland, M. J., Shah, H., & ... Greenberg, M. T. (2015). The effects of exposure to an enhanced preschool program on the social-emotional functioning of at-risk children. *Early Childhood Research Quarterly, 32*127-138. doi:10.1016/j.ecresq.2015.03.004
- Muschkin, C. G., Ladd, H. F., & Dodge, K. A. (2015). Impact of North Carolinas Early Childhood Initiatives on Special Education Placements in Third Grade. *Educational Evaluation and Policy Analysis, 37*(4), 478-500.
- National early literacy panel (NELP), 2008, *Developing early Literacy: Report of the National Early Literacy Panel* (Washington, DC: National Institute for Literacy).
- Nugent, L. (2008). Predictors of special education referral: Child characteristics and state pre-kindergarten quality. *Dissertation Abstracts International Section A, 68*, 5032.
- Pentimonti, J. M., Murphy, K. A., Justice, L. M., Logan, J. R., & Kaderavek, J. N. (2016). School readiness of children with language impairment: predicting literacy skills from pre-literacy and social-behavioural dimensions. *International Journal Of Language & Communication Disorders, 51*(2), 148-161. doi:10.1111/1460-6984.12193
- Pentimonti, J. M., Justice, L. M., & Kaderavek, J. N. (2014). School-readiness profiles of children with language impairment: linkages to home and classroom

- experiences. *International Journal Of Language & Communication Disorders*, 49(5), 567-583. doi:10.1111/1460-6984.12094
- Pagani, L. S., Fitzpatrick, C., Archambault, I., & Janosz, M. (2010). School Readiness and Later Achievement: A French Canadian Replication and Extension. *Developmental Psychology*, 46(5), 984-994. doi:10.1037/a0018881
- Plake, B.S., & Impara, J.C. (Eds). (2001). *The fourteenth mental measurements yearbook*. Lincoln, NE: Buros Institute of Mental Measurements.
- Sajaniemi, N., Hakamies-Blomqvist, L., Katainen, S., & Wendt, L. V. (2001). Early cognitive and behavioral predictors of later performance: A follow-up study of ELBW children from ages 2 to 4. *Early Childhood Research Quarterly*, 16(3), 343-361.
- Sabol, T. J., & Pianta, R. C. (2012). Patterns of School Readiness Forecast Achievement and Socioemotional Development at the End of Elementary School. *Child Development*, 83(1), 282-299. doi:10.1111/j.1467-8624.2011.01678.x
- Shevell, M. I., Majnemer, A., Webster, R. I., Platt, R. W., & Birnbaum, R. (2005). Outcomes at school age of preschool children with developmental language impairment. *Pediatric Neurology*, 32(4), 264-269.
- Shevell, M., Majnemer, A., Platt, R. W., Webster, R., & Birnbaum, R. (2005). Developmental and functional outcomes in children with global developmental delay or developmental language impairment. *Developmental Medicine & Child Neurology*, 47(10), 678-683.
- Snyder, P., Lawson, S., Thompson, B., Stricklin, S., & Sexton, D. (1993). Evaluating the Psychometric Integrity of Instruments Used in Early Intervention Research: The Battelle Developmental Inventory. *Topics in Early Childhood Special Education*, 13(2), 216-232.
- Tyner, A., McEwen, I.R. (1999). Battelle developmental inventory. *Physical Therapy*, 79(8), 776-783.
- Zupancic, M., & Kavcic, T. (2006). The age of entry into high-quality preschool, child and family factors, and developmental outcomes in early childhood. *European Early Childhood Education Research Journal*, 14(1), 91-111.

Appendix A

Table A1

*Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std.	Skewness	Kurtosis		
					Deviation		Statistic	Std. Error	
	Statistic	Std. Error							
Age	50	30	59	40.32	7.802	.547	.337	-1.041	.662
IEP	50	1.00	2.00	1.3600	.48487	.602	.337	-1.708	.662
Social	50	58.00	140.00	88.6400	16.11155	.962	.337	1.329	.662
Cognitive	50	30.00	125.00	82.8800	18.50167	.055	.337	.754	.662
Communication	50	50.00	124.00	85.7000	16.14886	.278	.337	.145	.662
Adaptive	50	61.00	136.00	93.1400	17.04377	.483	.337	.492	.662
Gender	50	1.00	2.00	1.3800	.49031	.510	.337	-1.814	.662
Valid N (listwise)	50								

Table A2

Correlations

		Social	Cognitive	Commun.	Adaptive
Social	Pearson	1	.652**	.572**	.692**
	Correlation				
	Sig. (2-tailed)		.000	.000	.000
	N	50	50	50	50
Cognitive	Pearson	.652**	1	.700**	.410**
	Correlation				
	Sig. (2-tailed)	.000		.000	.003
	N	50	50	50	50
Communication	Pearson	.572**	.700**	1	.318*
	Correlation				
	Sig. (2-tailed)	.000	.000		.025
	N	50	50	50	50
Adaptive	Pearson	.692**	.410**	.318*	1
	Correlation				
	Sig. (2-tailed)	.000	.003	.025	
	N	50	50	50	50

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Appendix B

Table B1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Age	.064	.058	1.204	1	.273	1.066
	Gender(1)	-.784	.920	.725	1	.395	.457
	Social	-.067	.044	2.297	1	.130	.935
	Cognitive	.007	.030	.047	1	.829	1.007
	Communication	-.055	.039	2.048	1	.152	.946
	Adaptive	-.049	.033	2.132	1	.144	.952
	Constant	13.326	4.806	7.689	1	.006	612817.245

a. Variable(s) entered on step 1: Social, Cognitive, Communication, Adaptive.

Table B2

Classification Table: Full Model

Observed		Predicted		
		No IEP	Kindergarten IEP	Percentage Correct
Step 1	IEP	9	9	50.0
	Kindergarten IEP	2	30	93.8
Overall Percentage				78.0

a. The cut value is .500

Table B3

Sensitivity and Specificity: Whole Model

Observed Outcome	Predicted		Outcome
	No IEP	Kindergarten IEP	
No IEP	9	9	
Kindergarten IEP	2	30	
		Sensitivity=76.92%	Specificity=81.81%

Appendix C

Table C1  
Variables in the Equation: Social

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup> Age	.026	.049	.283	1	.594	1.026
Gender(1)	-.530	.820	.418	1	.518	.588
Social	-.102	.033	9.807	1	.002	.903
Constant	9.030	3.374	7.162	1	.007	8351.211

a. Variable(s) entered on step 1: Social.

Table C2  
Classification Table: Social Scores

Observed		Predicted		Percentage Correct
		No IEP	Kindergarten IEP	
Step 0 IEP	No IEP	9	9	50.0
	Kindergarten IEP	3	29	90.6
Overall Percentage				76.0

b. The cut value is .500

Table C3  
Sensitivity and Specificity: Social

Observed Outcome	Predicted		Outcome
	No IEP	Kindergarten IEP	
No IEP	9	9	
Kindergarten IEP	3	29	
		Sensitivity=76.31%	Specificity=75.00%

Appendix D

Table D1

Variables in the Equation: Cognitive

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup> Age	.010	.042	.058	1	.810	1.010
Gender(1)	-.094	.721	.017	1	.897	.911
Cognitive	-.056	.023	6.127	1	.013	.946
Constant	4.967	2.756	3.247	1	.072	143.542

a. Variable(s) entered on step 1: Cognitive.

Table D2

Classification Table : Cognitive

Observed		Predicted		
		No IEP	Kindergarten IEP	Percentage Correct
Step 1	IEP	7	11	38.9
	Kindergarten IEP	1	31	96.9
Overall Percentage				76.0

a. The cut value is .500

Table D3

Sensitivity and Specificity: Cognitive

Observed Outcome	Predicted		Outcome
	No IEP	Kindergarten IEP	
No IEP	9	9	
Kindergarten IEP	3	29	
		Sensitivity=76.31%	Specificity=75.00%

Appendix E

Table E1

Variables in the Equation: Communication

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup> Age	.032	.044	.549	1	.459	1.033
Gender(1)	-.025	.693	.001	1	.971	.975
Communicatio n	-.062	.024	6.663	1	.010	.939
Constant	4.743	2.567	3.413	1	.065	114.750

a. Variable(s) entered on step 1: Communication.

Table E2

Classification Table: Communication

Observed		Predicted		
		No IEP	Kindergarten IEP	Percentage Correct
Step 1 IEP	No IEP	8	10	44.4
	Kindergarten IEP	4	28	87.5
Overall Percentage				72.0

a. The cut value is .500

Table E3

Sensitivity and Specificity: Communication

Observed Outcome	Predicted		Outcome
	No IEP	Kindergarten IEP	
No IEP	8	10	
Kindergarten IEP	4	28	
		Sensitivity=77.77%	Specificity=71.42%

Appendix F

Table F1

Variables in the Equation: Adaptive

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Age	.049	.046	1.132	1	.287	1.050
	Gender(1)	-.022	.727	.001	1	.976	.978
	Adaptive	-.080	.028	8.147	1	.004	.923
	Constant	6.230	2.813	4.905	1	.027	507.845

a. Variable(s) entered on step 1: Adaptive.

Table F2

Classification Table: Adaptive

Observed		Predicted		Percentage Correct
		No IEP	Kindergarten IEP	
Step 1	IEP	8	10	44.4
	No IEP	2	30	93.8
Overall Percentage				76.0

a. The cut value is .500

Table F3

Sensitivity and Specificity: Adaptive

Observed Outcome	Predicted		Outcome
	No IEP	Kindergarten IEP	
No IEP	8	10	
Kindergarten IEP	2	30	
		Sensitivity=78.94%	Specificity=80.00%