Published in final edited form as:

J Clin Child Psychol. 2000 March ; 29(1): 66–75.

Disentangling the Impact of Low Cognitive Ability and Inattention on Social Behavior and Peer Relationships

Christine J. Bellanti,

Department of Psychology, Pennsylvania State University

Karen L. Bierman, and

Department of Psychology, Pennsylvania State University

Conduct Problems Prevention Research Group¹

Abstract

Examined the shared and unique contributions of low cognitive ability and inattention to the development of social behavior problems and peer relationships of children at the time of school entry. Kindergarten and first-grade assessments of cognitive ability, inattention and prosocial and aggressive behavior were collected for a multisite, normative sample. Sociometric assessments of peer relationships were collected at the end of first grade. Cognitive ability and inattention both contributed to the prediction of social behavior and peer relationships. Low cognitive ability was particularly predictive of prosocial skill deficits, and social behavior mediated the relation between cognitive ability and social preference. Inattention predicted both prosocial skill deficits and elevated aggressive-disruptive behavior problems. Behavior problems partially mediated the relation between inattention and social preference. Identified subgroups of children with elevated levels of inattention or low cognitive ability showed different patterns of peer problems, with low acceptance characteristic of the low cognitive ability (only) group and high dislike ratings characteristic of the inattentive and inattentive/low-ability group. Implications are discussed for the design of early intervention and prevention programs.

Children with learning problems, including those identified as learning disabled (McConaughy & Ritter, 1986; Nabuzoka & Smith, 1993), developmentally delayed (Guralnick & Groom, 1987) and low-achieving (Green, Forehand, Beck, & Vosk, 1980; Taylor, 1990), often experience problems gaining acceptance and avoiding rejection by peers. Poor peer relationships, in turn, predict serious difficulties in later life, including truancy, antisocial behavior, social anxiety, and an increased need for mental health services (Parker & Asher, 1987). Peer relationships provide an important context for the development of basic social

Requests for reprints should be sent to Karen L. Bierman, Department of Psychology, Pennsylvania State University, 522 Moore Building, University Park, PA 16802. kb2@psu.edu.

Christine Bellanti is now at Bradley Hospital, Brown University School of Medicine.

¹Members of the Conduct Problems Prevention Research Group (CPPRG), in alphabetical order, are Karen L. Bierman, Pennsylvania State University; John D. Coie, Duke University; Kenneth A. Dodge, Duke University; Mark T. Greenberg, Pennsylvania State University; John E. Lochman, University of Alabama; Robert J. McMahon, University of Washington; and Ellen Pinderhughes, Vanderbilt University.

Publisher's Disclaimer: Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

skills, such as an understanding of reciprocity, the capacity for perspective-taking, and the ability to regulate aggression (Hartup, 1983). Children with learning problems who experience low levels of positive peer interaction during the early school years may become more isolated and socially alienated over time as they miss out on important peer learning experiences (Coie, 1990; Kistner & Gatlin, 1989). Hence, understanding how various learning problems affect developing peer relationships during the early school years maybe important to guide early intervention and prevention efforts.

It is unclear why children with learning problems fail to do well socially. Several researchers have argued that it is not academic difficulties, per se, that account for peer dislike but the problematic social behaviors that frequently accompany learning problems (Bryan & Bryan, 1978; Taylor, 1990). For example, disruptive and aggressive children with learning problems are frequently rejected, whereas many nonaggressive low achievers do not have peer problems (Flicek & Landau, 1985; McMichael, 1980; Taylor, 1990). Bryan and Bryan (1978) found that the peer problems of learning disabled children remained after their academic performance improved, suggesting that their social behavior rather than their academic difficulties led to their peer problems. Different types of learning problems may affect the development of social behavior in different ways, either by interfering with the learning of positive social behaviors or by increasing child propensities for aggressive-disruptive behaviors.

Some researchers have postulated that developmental delays in cognitive ability (low IQ) may affect social development primarily by delaying the acquisition of positive social skills, contributing to social withdrawal and poor peer relationships (Guralnick & Groom, 1985). Intellectual ability appears to promote the development of social competence (Green et al., 1980). Conversely, children who are cognitively delayed show significant deficits in social skill development, including higher rates of solitary play and unoccupied time, less sophisticated social play, and briefer social interactions than their nondelayed peers (Guralnick & Groom, 1985, 1987; Guralnick & Weinhouse, 1984). Cognitively delayed children have particular difficulties following rules in group play and entering group play successfully. They often rely on intrusive entry strategies and experience unsuccessful social bids (Guralnick & Groom, 1987; Kopp, Baker, & Brown, 1992). Similarly, learning disabled children often exhibit deficits in prosocial skills, including low rates of positive statements and cooperative behavior, poor leadership skills, and elevated rates of solitary play (B. W. Gottlieb, Gottlieb, Berkell, & Levy, 1986; LaGreca, 1981; Nabuzoka & Smith, 1993).

In contrast, other types of learning problems may increase child risk for the development of aggressive and disruptive social behaviors (Flicek & Landau, 1985). For example, children with identified learning disabilities frequently display disruptive and aggressive behaviors, possibly due to deficits in attention control and social information processing (Bryan, Wheeler, Felcan, & Henck, 1976; McConaughy & Ritter, 1986; Sandler et al., 1993). Attention deficits are associated with impulsive social information processing and hostile attributional biases (Dodge & Newman, 1981), high rates of boisterous and intrusive social behaviors (Whalen & Henker, 1985), frequent disruptions and rule violations in play (Landau & Moore, 1991), and elevated levels of negative affect in peer interactions (Whalen & Henker, 1985).

Although previous research has documented peer problems among children with cognitive deficits, additional research is needed to elucidate the particular mechanisms by which various types of cognitive difficulties affect social development. In one noteworthy study of mainstreamed mildly mentally retarded children, J. Gottlieb, Semmel, and Veldman (1978) found that cognitive ability was primarily predictive of peer acceptance, whereas negative behavior was more predictive of peer rejection. This finding suggests that different cognitive processes may be related to delays in positive social behavior and excessive negative social behavior, which, in turn, may differentially affect peer relationships. However, to better

understand how various aspects of cognitive functioning (e.g., lower cognitive ability, inattention) may relate differentially to social behavior and peer problems, a broader sampling method is needed.

Studies that involve comparisons of school-based special education student groups, whether learning disabled or developmentally delayed, are subject to sampling biases associated with the classification processes used in various schools. In addition, once identified for special education, a child's social behavior and peer relationships may be affected by the process of identification, labeling, and separation for special academic placement in school. In addition, among children identified as developmentally delayed or learning disabled, there may be heterogeneity with regard to cognitive deficits. For example, studies of learning disabled children are likely to include a number of inattentive children, although not all inattentive children are learning disabled and not all learning disabled children are inattentive.

From a conceptual standpoint, it is reasonable to postulate that cognitive delays (low IQ), which involve deficits in knowledge and reasoning skills, might interfere primarily with the acquisition of positive social skills, contributing to deficits in communication and prosocial play skills. In contrast, inattention, which involves distractibility, difficulties sustaining attentional focus, and deficits in information processing, might contribute to impulsive and intrusive social behavior, negative reactivity, and corresponding high rates of disruptive and aggressive behavior (Pope & Bierman, 1999).

The purpose of this study was to clarify the ways in which low IQ and inattentiveness might differentially affect child social behavior and peer relationships in a large and representative sample during the first 2 years of formal schooling (kindergarten and first grade). The early years were selected for study, as they preceded the formal identification of children in the sample for special education services, thus reducing the potential effects of labeling or special placement on social behavior or peer relationships. In the first part of this study, low cognitive ability and inattention were analyzed as continuous variables to examine their relations with children's social behavior and peer relationships. It was hypothesized that low cognitive ability would predict delays in prosocial skill development, whereas inattention would predict elevated levels of disruptive-aggressive social behavior. In both cases, it was anticipated that the effects of cognitive factors on peer relationships would be mediated by children's social behavior. Previous studies have suggested that learning disabled girls may experience more peer problems than learning disabled boys, possibly because girls who show problematic social behaviors (e.g., aggressive or disruptive behaviors) differ more sharply from normative expectations than do boys who show similar behaviors (Bryan, 1974; B. W. Gottlieb et al., 1986; Gresham & Reschly, 1987; Kistner & Gatlin, 1989). In addition, some investigators have suggested that European American children, particularly girls, identified with learning disabilities experience significantly more peer problems than similarly identified African American children (Bryan, 1974; Kistner & Gatlin, 1989). One hypothesis for this effect is that the discrepancy between expectancy and performance is greatest for European American girls, who traditionally perform better in elementary school than their male or African American classmates (Gresham & Reschly, 1987). However, it is also possible that the findings are artifactual, reflecting the fact that girls, particularly European American girls, who are identified for special education placements are typically more impaired cognitively than boys identified for similar placements (Kistner & Gatlin, 1989). Hence, the first part of this study also examined sex and race differences to determine whether cognitive impairments differentially affect the peer relationships of girls and boys or of African American and European American students in a representative sample that has not been affected by differential sex or ethnic group selection biases.

In the second part of the study, subgroups of kindergarten children characterized by low cognitive ability or inattentiveness at school entry were identified. The social behaviors exhibited by children in each subgroup were examined longitudinally from kindergarten to first grade. Peer liking and disliking were assessed at the end of first grade. We hypothesized that children with low IQ would show deficits in positive social behavior and have difficulty gaining peer acceptance, whereas children with inattention would demonstrate elevations in negative social behavior over time, resulting in active dislike from peers.

Methods

Participants

The 387 participants (195 boys and 192 girls) comprised the normative sample of the Fast Track Project, a multisite study of the development and prevention of conduct disorder (CPPRG, 1992). Participating schools served economically disadvantaged populations in four geographically diverse regions of the United States: Durham, North Carolina; Nashville, Tennessee; Seattle, Washington; and rural central Pennsylvania. Teachers completed the Authority Acceptance behavior problem scale from the Teacher Observation of Classroom Adaptation–Revised (TOCA–R; Werthamer-Larsson, Kellam, & Wheeler, 1991) on all of the kindergarten children in their regular education classrooms. To select participants for the normative sample, children were randomly selected from each decile of the distribution of behavior problems on the Authority Acceptance scale to represent the population at each site according to race, sex, and distribution of behavior problems. The normative sample was selected only from the set of schools randomly assigned to the control condition, so estimates of regional norms were not affected by the preventive intervention. Following the teacher screen, the parents of children identified for the normative sample were invited to participate in the developmental study, first by completing a brief telephone interview and then by completing an in-depth summer home interview. Recruitment of parents continued until a normative sample of 100 participants at each site (87 in Seattle) was attained. The resulting sample was 50% European American, 45% African American, and 50% male.

Measures

Cognitive ability—Two core subtests from the Wechsler Intelligence Scales for Children–Revised (WISC–R; Wechsler, 1974), Vocabulary and Block Design, were individually administered to all children in summer interviews held after their kindergarten year and again after their first-grade year. Sample means across the 2 years were just slightly lower than the national average (scale score $M = 9.15$), reflecting the high-risk characteristics of the schools from which the sample was drawn. Scale scores were averaged together on the two subtests to form a composite estimate of cognitive ability. The IQ estimate attained after kindergarten was correlated with the IQ estimate attained after first grade ($r = .68$). These two scores were standardized within site and then averaged to create an overall estimate of cognitive ability. This composite estimate of IQ was used in all analyses.

Inattention—In the Spring of the kindergarten year, teachers and parents each completed the 113-item Child Behavior Checklist (the Teacher Report Form [CBCL–TRF] and Parent Report Form [CBCL–PRF], respectively; Achenbach, 1991). For the purposes of this study, a pure assessment of the cognitive functions associated with inattention was desired rather than a scale that included hyperactive or disruptive behaviors along with inattentive items. A previous study (Stormshak, Bierman, & CPPRG, 1998) using a confirmatory factor analysis method identified six items on the CBCL–TRF and CBCL–PRF that assessed inattention distinct from aggression or hyperactivity. These six items were “can’t concentrate,” “daydreams,” “confused,” “poor school work,” “stares blankly,” and “acts young.” The teacher and parent scales were internally consistent ($\alpha = .95$ and $.89$, respectively) and were significantly correlated ($r = .42$).

In the Spring of the first-grade year, teachers and parents both completed the Attention Deficit Hyperactivity Disorder Checklist (DuPaul, 1990), which included 14 items, each rated on a 4-point scale, ranging from 1 (*not at all*) to 4 (*very well*). Again, only the 6 items that assessed inattention (rather than disruptive or hyperactive behavior) were used for this study. These items were “easily distracted,” “difficulty sustaining attention,” “difficulty following directions,” “frequently shifts activities,” “doesn't listen,” and “often loses things.” The teacher and parent scales were internally consistent ($\alpha = .95$ and $.92$, respectively), significantly intercorrelated ($r = .43$), and significantly related to kindergarten ratings ($r_s = .47$ and $.57$ for teachers and parents, respectively). At both time points, inattention ratings were only mildly correlated with IQ ($r_s = -.12$ to $-.31$).

To create a temporally stable and cross-situational composite measure of inattention (parallel to our composite measure of IQ), the four 6-item inattention scales were combined (e.g., parent and teacher ratings, each collected at the end of kindergarten and at the end of first grade). First, each measure was standardized by site (within time). Then, these four standardized measures were averaged and restandardized within site. This composite measure was used as an index of the child's cognitive functioning in the area of attention control in all analyses.

Peer relationships—Sociometric interviews were administered individually during the Spring of the first-grade year. Each child in participating classrooms was presented with a list of all class members and asked to nominate classmates they liked most and classmates they liked least (unlimited nominations were accepted for both of these questions). Children were allowed to nominate peers of both sexes to increase the stability of measurement (Terry & Coie, 1991). Nominations were standardized within classroom to control for variations in class size and, for some analyses, were combined to create social preference scores, using the Coie, Dodge, and Coppotelli (1982) procedure.

In addition, during these interviews, children were asked to nominate classmates who exhibited aggressive and prosocial behaviors. The following descriptors were used: “Some kids start fights, say mean things or hit others” (aggressive) and “Some kids cooperate a lot, they help others and share” (prosocial). Children were asked to list as many classmates as they believed fit these descriptors. Nominations were summed for each child and standardized within class.

Aggressive behavior—To assess aggressive behavior in kindergarten, the Aggression scale from the CBCL–TRF was used and was completed by teachers at the end of the kindergarten year ($\alpha = .88$). To assess later aggressive–disruptive behavior, at the beginning and end of the first-grade year, teacher ratings on the Authority Acceptance scale of the TOCA–R were collected in October and April of the first-grade year ($\alpha = .93$). Aggressive behavior was assessed separately at each time point to enable an examination of prediction and change in aggression over time. Aggression ratings were standardized within site at each time point.

Prosocial behavior—In kindergarten, teachers completed the Social Competence Scale (SCT; CPPRG, 1998), a 25-item measure assessing prosocial behavior, frustration tolerance, and communication skills. Teachers rated items on a 5-point scale, ranging from 0 (*not at all*) to 4 (*very well*), to describe child behavior ($\alpha = .91$). At the beginning and end of the first-grade year, teachers rated 9 of the same social competence items ($\alpha = .84$; 1-year stability $r = .43$). Prosocial behavior ratings were inversely correlated with aggression in both kindergarten ($r = -.59$) and first grade ($r = -.66$). The three assessments, collected at different time points, were analyzed separately to enable an examination of prediction and change in prosocial behavior over time. Prosocial ratings were standardized within site at each time point.

Procedures

To collect measures from parents and children, families were visited at their homes during the summer prior to first grade and again during the summer after first grade. An interviewer read through the entire CBCL-PRF problem checklist with the primary caregiver, noting the caregiver's responses. A second interviewer met with the child and administered a number of instruments, including the WISC-R.

Initial face-to-face contacts were made with kindergarten teachers when they completed the Authority Acceptance scale of the TOCA-R on all children in their class (the measure used to select the sample). Later in the Spring of the kindergarten year, rating forms (the SCT and the CBCL-TRF) were left with teachers, who completed the forms on their own and then returned them to the project. First-grade teachers were interviewed in the Fall (October) and Spring (April-May), and interviewers administered the TOCA-R and the social competence ratings. Both parents and teachers received monetary compensation for their ratings. Parents provided informed consent for their participation, their child's participation, and the collection of teacher ratings. Peer nominations, as noted, were collected during individual interviews held at school in April-May of first grade. Only children with parental consent were interviewed.

Results

Relations Between Cognitive Variables and Social Behavior

It was hypothesized that cognitive ability and inattention would be associated with prosocial and aggressive behavior, respectively. Given the sample size and number of comparisons, a $p < .01$ level was used to interpret significance to reduce the risk of Type I error. As shown in Table 1, simple Pearson correlations revealed significant associations between the cognitive variables (cognitive ability and inattention) and the measures of social behavior (prosocial and aggressive), with correlations ranging from $r = -.14$ to $r = .63$. Cognitive ability was particularly predictive of prosocial behavior; a Fisher r -to- z transformation revealed that the correlation between cognitive ability and prosocial behavior was significantly higher than the correlation between cognitive ability and aggression. Inattention was equally predictive of both low prosocial and elevated aggressive behaviors.

Given the correlation between cognitive ability and inattention, it was possible that these two variables accounted for the same variance in social behavior. To determine the unique variance in these predictions, partial correlations were also computed (with cognitive ability partialled out of correlations between inattention and social behavior and, conversely, with inattention partialled out of correlations between cognitive ability and social behavior). As shown in Table 1, cognitive ability continued to make a small but significant unique contribution to the prediction of prosocial behavior (as rated by kindergarten teachers, first-grade teachers, and first-grade peers) but did not make a unique contribution to the prediction of aggressive behavior. In contrast, inattention continued to make a strong and unique contribution to the prediction of both aggressive and prosocial behavior, even when the effects accounted for by cognitive ability were partialled out.

Relations Between Cognitive Variables and Peer Relations

Next, it was predicted that cognitive ability and inattention would each be associated with problematic peer relationships. To test these predictions, simple correlations were computed to examine the relation of cognitive ability and inattention to measures of peer relationships (*like most* nominations and *like least* nominations). As shown in Table 2, all correlations were significant ($r_s = .15-.48$). Next, to examine the extent to which the two cognitive variables explained unique variance in the prediction of peer relationships, partial correlations were computed. When the effects of inattention were partialled out, cognitive ability still made a

unique contribution to the prediction of *like most* nominations. With cognitive ability partialled out, inattention still made a strong and unique contribution to the prediction of both *like most* and *like least* nominations, with the contribution to *like least* nominations being significantly greater than the contribution to *like most* nominations (Fischer *r*-to-*z* transformation, $p < .05$).

Sex and Ethnic Group Differences

To determine whether relations between the cognitive variables and the social-behavior/peer-relationship measures differed for boys and girls or for African American and European American children, regression analyses were computed. Using the six first-grade social behaviors and peer nominations as the dependent variables, the predictors included inattention, cognitive ability, sex, and ethnic-racial group and interaction terms of inattention and cognitive ability by sex and by ethnic-racial group. Significant main effects for sex emerged in predictions of five of the six measures. Girls were rated by first-grade teachers and peers as less aggressive than boys (girls $M_s = -.15$ and $-.41$ vs. boys $M_s = .50$ and $.70$, respectively) and more prosocial (girls $M_s = .17$ and $.10$ vs. boys $M_s = -.50$ and $-.29$, respectively). Girls also received fewer *like least* nominations (girls $M = -.23$ vs. boys $M = .17$). In only 1 of the 12 comparisons did sex show a predictive interaction, as inattention was more predictive of aggression for boys ($r = .41$) than it was for girls ($r = .30$), $F(1, 321) = 12.65$, $p < .001$. Hence, although base rates of social problems varied by sex, inattention and low IQ had a similar impact on social behavior for boys and girls.

No significant main effects for ethnic group emerged in the regression analyses. However, ethnic group interacted with inattention to predict both teacher ratings of aggression, $F(1, 321) = 9.15$, $p < .01$, and peer *like most* ratings, $F(1, 317) = 11.63$, $p < .01$. In both cases, correlations between inattention and the social outcomes were higher for African American children ($r_s = .61$ and $-.36$, respectively) for than for European American children ($r_s = .41$ and $-.33$, respectively). Cognitive ability was also more predictive of peer prosocial ratings for African American children ($r = .42$) than for European American children ($r = .17$). Although differences in magnitude emerged in 3 of the 12 comparisons, correlations between the cognitive skills and social adjustment measures were significant for children in both groups, suggesting that the predictive model had good generalizability across these ethnic groups as well as across sex.

Test of the Mediational Model

It was predicted that social behavior would mediate the relation between each of the cognitive factors (cognitive ability and inattention) and peer relationships. To simplify the modeling, *like most* and *like least* nominations were combined to create social preference scores to index peer relationships (Coie et al., 1982). Social preference scores have the advantage of including information about both liking and disliking and, in past research, have demonstrated a high level of concurrent and predictive validity, thus providing a good summary index of a child's peer relationships. (Coie et al., 1982). In addition, positive and negative social behaviors were entered together as a block in these analyses, because multicollinearity prevented the identification of stable coefficients for separate dimensions of positive and negative behavior.

Following the Baron and Kenny (1986) model, a series of regressions were computed. First, a set of preliminary regressions demonstrated the expected predictive relations between (a) cognitive ability and social preference (multiple $R = .24$, $R^2 = .06$, $p < .001$), (b) cognitive ability and social behavior (multiple $R = .40$, $R^2 = .16$, $p < .001$), and (c) social behavior and social preference (multiple $R = .57$, $R^2 = .32$, $p < .001$). Then, to test for mediation, social behavior (prosocial and aggressive behavior, entered as a block) was selected for first entry into a forward regression equation. Once social behavior was entered, cognitive ability was

entered. Cognitive ability no longer made a significant contribution to the prediction, indicating that social behavior fully mediated the relation between cognitive ability and peer social preference.

Next, a similar set of regressions was computed using inattention as the independent variable. Inattention predicted social preference (multiple $R = .52$, $R^2 = .27$, $p < .001$), inattention predicted social behavior (multiple $R = .71$, $R^2 = .50$, $p < .001$), and social behavior predicted social preference (multiple $R = .57$, $R^2 = .32$, $p < .001$). Then inattention and social behavior were placed in a forward regression equation, with social behavior selected for first entry. After social behavior was entered, inattention continued to make a significant contribution to the prediction of social preference (semipartial $R^2 = .19$, $p < .001$), indicating that social behavior provided partial but not full mediation of the relation between inattention and social preference.

Subgroup Comparisons

Although linear analyses are useful for understanding how dimensions of inattention and cognitive ability relate to social behavior and peer preference, they do not provide a clear picture of the characteristics of children who have high levels of inattention or cognitive ability. To clarify the social behavioral characteristics and peer relationships of children with different patterns of cognitive deficits, subgroups were identified. Children were considered to have a problem if their scores were 1 *SD* above (for inattention) or below (for cognitive ability) the means for their site and sex. They were considered not to have a problem if their scores were within 0.5 *SD* of the mean for their site and sex. These procedures resulted in the identification of four groups of children: (a) low cognitive ability and elevated inattention (4% of the sample; 9 boys and 7 girls), (b) elevated inattention only (6%; 18 boys and 4 girls), (c) low cognitive ability only (4%; 7 boys and 8 girls), and (d) nonproblem comparison (42%; 74 boys and 87 girls).

A repeated measures analysis of variance (ANOVA) was computed to examine group differences in patterns of teacher-rated aggressive-disruptive behavior over three points in time (Spring of kindergarten, Fall of first grade, Spring of first grade). This analysis revealed a significant effect for group, $F(3, 212) = 26.06$, $p < .001$, and nonsignificant effects for time and for the group by time interaction, $ps > .10$. Follow-up post hoc tests revealed significant group differences at each of the time points sampled. As shown in Table 3, at each time point, rates of aggressive-disruptive behavior were higher for children in the two inattentive groups than for children in the low cognitive (only) group or the nonproblematic comparison group.

A similar repeated measures ANOVA was conducted on teacher ratings of prosocial behavior. This analysis revealed a significant main effect for group, $F(3, 212) = 33.37$, $p < .001$, and nonsignificant effects for time and for the time by group interaction, $ps > .10$. Post hoc comparisons revealed that in kindergarten and first grade, all three problem groups exhibited lower rates of prosocial behavior than did the nonproblem comparison group. In addition, in first grade, rates of prosocial behavior for children in the two inattentive groups were significantly lower than for children in the low cognitive ability (only) group (see Table 3).

Finally, group differences in peer *like most* and *like least* nominations collected at the end of first grade were examined with ANOVAs, revealing significant effects, $F(3, 216) = 11.90$ and $F(3, 227) = 8.09$, respectively, both $ps < .001$. As shown in Table 3, post hoc comparisons revealed that all three problem groups were less liked than the nonproblem comparison group; in addition, the two inattentive groups had significantly higher *like least* scores.

Discussion

Consistent with previous studies linking developmental delays and learning disabilities with problematic peer relationships (e.g., Milich & Landau, 1989; Nabuzoka & Smith, 1993; Taylor, 1990), these results revealed that both low IQ and inattention had a negative impact on social behavioral development and peer adjustment at school entry. Extending beyond previous research, this study demonstrated that low cognitive ability and inattention were only moderately correlated and contributed unique variance to the prediction of peer relationships in first grade. As postulated, children with lower cognitive ability showed deficiencies in prosocial behavior in kindergarten and first grade and were less accepted by peers. A test of a mediational model demonstrated that the relation between low-IQ and peer social preference was explained fully by the impact of low-IQ on child social behavior, particularly the development of prosocial skills. In contrast, inattention was associated with both elevated rates of disruptive and aggressive behavior as well as deficits in prosocial skills. Results indicate that aggressive and prosocial behavior provided partial mediation between inattentiveness at school entry and measures of peer relationships 1 year later. Interestingly, the observed correlation between inattention and children's social behavior was of greater magnitude than the association between early cognitive ability and social behavior, indicating a stronger relation between inattention and social behavior. In the subgroup comparisons, children who were highly inattentive (whether or not they also had low cognitive ability) were more aggressive and less prosocial than nonproblem or low-ability children and were more likely to be disliked by the end of first grade.

Whereas low cognitive ability reflects deficits in acquired knowledge and reasoning skills, inattention reflects distractibility, difficulties sustaining attention, and difficulties focusing selective attention, perhaps explaining their differential impact on social development and peer relations. The findings of this study regarding low IQ are consistent with previous studies conducted on identified groups of developmentally delayed children that have documented deficits in social play skills (Guralnick & Groom, 1987). Similar to the impact it has on the acquisition of knowledge and reasoning skills in academic domains, low cognitive ability may delay the acquisition of skills and reasoning related to social competence. For example, poor verbal ability may impede the development of effective communication skills necessary to facilitate cooperative play. Children with low cognitive ability may compensate for their poorer social play skills or social understanding by engaging in more solitary or parallel play. However, by engaging in fewer interactions with peers, low-ability children may limit their opportunities for social learning and for the practice of positive social behaviors. As children enter school, peer interactions become more complex and involve more cooperative and competitive interaction and less solitary or parallel play (Hartup, 1983). In this context, less skilled children easily may be overlooked, resulting in social isolation and low levels of peer acceptance.

In contrast, inattentiveness predicted elevated levels of aggressive-disruptive behavior as well as prosocial skill deficits and elicited active dislike from peers. Several factors may account for the negative impact of inattention on social development and peer relationships during early elementary school. As children enter elementary school, expectations for both behavioral control and academic performance increase. Successfully adapting to these greater demands requires the child to monitor his or her own behavior and to engage in rule-governed behavior (Kopp et al., 1992). Inattentive children often have difficulty *tracking*, that is, remembering rules in the absence of immediate environmental stimuli and using them as guides for behavior (Barkley, 1990). In a classroom setting, failures in executive functioning and deficits in rule-governed behavior can affect academic success (e.g., staying on task, remembering multistep instructions, completing assignments) and behavioral adaptation (e.g., raising one's hand, remaining quiet, staying in one's seat). In social contexts at school, the distractibility and

impulsivity that are associated with inattention may lead to preemptive social information processing, increasing perceptual errors and hostile attributional biases, thereby increasing rates of reactive aggression (Dodge & Newman, 1981). It has been observed that inattentive children do not attend to and therefore do not acquire social behaviors as easily or utilize social behaviors as effectively as normative children, resulting in low levels of prosocial and cooperative behaviors (Whalen & Henker, 1985). Without an understanding of the rules of peer games, decisions about who is “in” or “out” or what is “fair” may seem arbitrary to children who are not attending well to social cues and sequences. Thus, inattentive children may feel persecuted and unfairly treated if they are told they are not playing correctly, sparking frustration and aggressive outbursts. Interestingly, although the impact of inattention on peer relationships was mediated partially by prosocial and aggressive behaviors, inattention also had a direct impact on social preference.

Inattention may have an adverse impact on peer relationships for several reasons, in addition to its association with aggressive behaviors and prosocial skill deficits. Effective interaction involves attending to other's words, their facial cues, their body language, and relevant details in the situation. Poor sustained attention may contribute to social information processing deficits, attending to or utilizing only limited cues in a social situation rather than effectively assessing the entire situation (Dodge & Newman, 1981). Difficulties attending to complex social situations and conforming to implicit rules for social interaction may contribute to insensitive and “strange” social behavior that is distinct from aggressive behavior but equally aversive to peers (Bierman, Smoot & Aumiller, 1993). Inattentive children may have faulty timing and behave in ways that are disruptive to ongoing peer interactions and perceived as intrusive and annoying (Pope, Bierman, & Mumma, 1991). In addition, inattentive children experience frequent rebuke by teachers for their disruptive behaviors and rule violations. Negative feedback from adults may contribute to negative peer reputations and corresponding negative treatment by peers (Hymel, Wagner, & Butler, 1990).

Sex and ethnic group differences were also explored in this study. Previous research suggested that learning disabled girls, particularly European American girls, frequently experience more pervasive behavioral and peer relationship problems than learning disabled boys (Bryan, 1974; B. W. Gottlieb et al., 1986). However, it is possible that these sex and ethnic group differences were artifacts reflecting biases in the selection processes associated with the identification of learning disabled children in school settings. That is, female students identified as learning disabled, particularly European American girls, are often more severely impaired than identified boys, perhaps because boys are more readily placed in a special education classroom than are girls with equivalent cognitive deficits (Kistner & Gatlin, 1989). In this sample, which was not affected by differential sex or ethnic group selection procedures, main effects for sex emerged, such that girls were less inattentive, less aggressive, and more prosocial than boys and less likely to be disliked by peers. However, for both boys and girls and for African American and European American children, similar patterns of relations emerged between cognitive deficits (low IQ and inattention), social behavior (prosocial and aggressive behavior), and peer relationships, suggesting that the developmental model generalizes well across sex and the ethnic groups studied here.

In summary, results from this study suggest that children with low cognitive ability and inattentiveness experience difficulty with social behavior (aggression and prosocial skill deficits) at school entry and that these behaviors place them at risk for stable social maladjustment and poor peer relationships in elementary school. Early intervention may be critical for these children to remediate their social skill deficits, minimize additional frustration and failure in the classroom, and prevent long-term consequences to their social-emotional adjustment. A focus on social development is quite common in preschool classrooms but is often eliminated as children enter public school, despite the added social and behavioral

complexities associated with the change in school structure. Classroom-based interventions, such as Promoting Alternative Thinking Strategies (Greenberg, Kusche, Cook & Quamma, 1995), utilize direct instruction and role-play practice to teach emotional understanding and self-control skills, prosocial friendship skills, communication skills, and problem-solving skills. Such programs may be of particular benefit to inattentive and low-ability students who have skill deficits; in addition, this type of classroom program may better prepare the peer environment to accept classmates who are less skillful. Classroom-based programs may be combined with social skill training programs and behavior management programs that focus on remediating the deficits of targeted at-risk students (Bierman, Greenberg, & CPPRG, 1996). Multifaceted coaching interventions focus on increasing positive social skills, self-control skills, and social problem-solving skills (see reviews by Bierman, 1989; Coie & Koepl, 1990; Dodge, 1989). For inattentive children who exhibit high rates of negative social behavior, coaching strategies may be combined with behavioral management programs that utilize response cost strategies to decrease targeted aggressive behaviors (Bierman, Miller, & Stabb, 1987). It is important to note that the needs of low-ability and inattentive children need to be considered both in the content and the process of intervention design. Coaching interventions typically include instructions, modeling, and discussions designed to enhance child understanding of key social concepts, which are reinforced with opportunities to practice skills and receive performance feedback (Mize & Ladd, 1990). Given the cognitive deficits associated with both low ability and inattention, the opportunities for hands-on practice and performance feedback may be critical in these interventions, as these children may have difficulty generalizing from cognitive presentations of skill concepts to actual behavioral performance without substantive opportunities for practice and behavior shaping.

The limitations of this study need to be recognized. First, the measures of attention were limited to ratings by teachers and parents. A more definitive test of the relation between attention skills and social adjustment would involve behavioral measures of the child's attention capacities. In addition, cognitive ability was estimated using two subscales of the WISC-R; a broader assessment of cognitive functioning might provide more detailed information. Future research with expanded assessment procedures may provide a more fully elaborated model regarding relations between various cognitive capabilities and social development. In addition, the impact of both inattention and cognitive ability on children's responsivity to preventive interventions needs to be understood. These results confirm that children with cognitive deficits are at risk for problems with social development and peer relationships and that these children can be identified as early as kindergarten. Further research should address the development of effective remedial intervention and prevention efforts for this at-risk group.

Acknowledgments

This work was supported in part by National Institute of Mental Health (NIMH) Grants R18MH48043, R18MH50951, R18MH50952, and R18MH50953. The Center for Substance Abuse Prevention also provided support for Fast Track through a memorandum of agreement with the NIMH. Support also came from the U.S. Department of Education Grant S184U30002 and NIMH Grants K05MH00797 and K05MH01027.

References

- Achenbach, TM. Integrative guide for the 1991 CBCL/4–18, YSR, and CBCL–TRF profiles. Burlington: University of Vermont Department of Psychiatry; 1991.
- Barkley RA. A critique of current diagnostic criteria for attention-deficit-hyperactive disorder: Clinical and research implications. *Developmental and Behavioral Pediatrics* 1990;11:343–352.
- Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 1986;6:1173–1182. [PubMed: 3806354]

- Bierman, KL. Improving the peer relationships of rejected children. In: Lahey, B.; Kazdin, A., editors. *Advances in clinical child psychology*. New York: Plenum; 1989. p. 53-84.
- Bierman, KL.; Greenberg, MT.; Conduct Problems Prevention Research Group. Social skill training in the Fast Track program. In: Peters, R DeV; McMahon, RJ., editors. *Preventing childhood disorders, substance abuse and delinquency*. Newbury Park, CA: Sage; 1996. p. 65-89.
- Bierman KL, Miller CL, Stabb SD. Improving the social behavior and peer acceptance of rejected boys: Effects of social skill training with instructions and prohibitions. *Journal of Consulting and Clinical Psychology* 1987;55:194–200. [PubMed: 3571672]
- Bierman KL, Smoot D, Aumiller K. Characteristics of aggressive–rejected, aggressive (nonrejected), and rejected (non-aggressive) boys. *Child Development* 1993;64:139–151. [PubMed: 8436026]
- Bryan TH. Peer popularity of learning disabled children. *Journal of Learning Disabilities* 1974;7:621–625.
- Bryan T, Bryan J. Social interactions of learning disabled children. *Learning Disability Quarterly* 1978;1:33–38.
- Bryan TH, Wheeler R, Felcan J, Henck T. “Come on, dummy”: An observational study of children's communication. *Journal of Learning Disabilities* 1976;9:53–61.
- Coie, JD. Toward a theory of peer rejection. In: Asher, SR.; Coie, JD., editors. *Peer rejection in childhood*. New York: Cambridge University Press; 1990. p. 365-402.
- Coie JD, Dodge KA, Coppotelli H. Dimensions and types of social status: A cross-age perspective. *Developmental Psychology* 1982;18:557–570.
- Coie, JD.; Koeppl, GK. Adapting intervention to the problems of aggressive and disruptive rejected children. In: Asher, SR.; Coie, JD., editors. *Peer rejection in childhood*. New York: Cambridge University Press; 1990. p. 309-336.
- Conduct Problems Prevention Research Group. A developmental and clinical model for the prevention of conduct disorder: The Fast Track program. *Development and Psychopathology* 1992;4:509–527.
- Conduct Problems Prevention Research Group. The Fast Track Social Competence Scale (Technical Report) [Online]. 1998. Available: <http://www.fasttrack.vanderbilt.edu>
- Dodge, KA. Enhancing social relationships. In: Mash, EJ.; Barkley, RJ., editors. *Behavioral treatment of child disorders*. New York: Guilford; 1989. p. 222-244.
- Dodge KA, Newman JP. Biased decision-making processes in aggressive boys. *Journal of Abnormal Psychology* 1981;90:375–379. [PubMed: 7264069]
- DuPaul, GJ. The ADHD Rating Scale: Normative data, reliability, and validity. University of Massachusetts Medical Center; Worcester: 1990. Unpublished manuscript
- Fabes RA, Eisenberg N. Young children's coping with interpersonal anger. *Child Development* 1992;63:116–128. [PubMed: 1551321]
- Flicek M, Landau S. Social status problems of learning-disabled and hyperactive/learning disabled boys. *Journal of Clinical Child Psychology* 1985;14:340–344.
- Gottlieb BW, Gottlieb J, Berkell D, Levy L. Sociometric status and solitary play of LD boys and girls. *Journal of Learning Disabilities* 1986;19:619–622. [PubMed: 3540166]
- Gottlieb J, Semmel MI, Veldman DJ. Correlates of social status among mainstreamed mentally retarded children. *Journal of Educational Psychology* 1978;70:396–405.
- Green KD, Forehand R, Beck H, Vosk B. An assessment of the relationship among measures of children's social competence and children's academic achievement. *Child Development* 1980;51:1149–1156.
- Greenberg MT, Kusche CA, Cook ET, Quamma JP. Promoting emotional competence in school-aged children: The effects of the PATHS curriculum. *Development and Psychopathology* 1995;7:117–136.
- Gresham FM, Reschly D. Sociometric differences between mildly handicapped and nonhandicapped Black and White students. *Journal of Educational Psychology* 1987;79:195–197.
- Guralnick MJ, Groom JM. Correlates of peer-related social competence of developmentally delayed preschool children. *American Journal of Mental Deficiency* 1985;90:140–150. [PubMed: 4050874]
- Guralnick MJ, Groom JM. The peer relations of mildly delayed and nonhandicapped preschool children in mainstreamed play groups. *Child Development* 1987;58:1556–1572. [PubMed: 3691202]

- Guralnick MJ, Weinhouse E. Peer-related social interactions of developmentally delayed young children: Development and characteristics. *Developmental Psychology* 1984;20:815–827.
- Hartup, W. Peer relations. In: Hetherington, EM.; Mussen, PH., editors. *Handbook of child psychology: Vol 4. Socialization, personality, and social development*. New York: Wiley; 1983. p. 103-196.
- Hymel, S.; Wagner, E.; Butler, EJ. Reputational bias: View from the peer group. In: Asher, SR.; Coie, JD., editors. *Peer rejection in childhood*. Cambridge, England: Cambridge University Press; 1990. p. 156-186.
- Kistner JA, Gatlin DF. Sociometric differences between learning-disabled and nonhandicapped students: Effects of sex and race. *Journal of Educational Psychology* 1989;81:118–120.
- Kopp CB, Baker BL, Brown KW. Social skills and their correlates: Pre-schoolers with developmental delays. *American Journal of Mental Retardation* 1992;96:557–566. [PubMed: 1344935]
- LaGreca AM. Social behavior and social perception in learning-disabled children: A review with implication for social skills training. *Journal of Pediatric Psychology* 1981;6:395–416. [PubMed: 7320824]
- Landau S, Moore LA. Social skill deficits in children with attention-deficit hyperactivity disorder. *School Psychology Review* 1991;20:235–251.
- McConaughy SH, Ritter DR. Social competence and behavioral problems of learning disabled boys aged 6–11. *Journal of Learning Disabilities* 1986;19:39–45. [PubMed: 3944511]
- McMichael P. Reading difficulties, behavior and social status. *Journal of Educational Psychology* 1980;72:76–86. [PubMed: 7372915]
- Milich, R.; Landau, S. The role of social status variables in differentiating subgroups of hyperactive children. In: Bloomindale, M.; Swanson, J., editors. *Attention deficit disorder: Current concepts and emerging trends in attentional and behavioral disorders of childhood*. Elmsford, NY: Pergamon; 1989. p. 1-16.
- Mize, J.; Ladd, GW. Toward the development of social skills training for preschool children. In: Asher, SR.; Coie, JD., editors. *Peer rejection in childhood*. New York: Cambridge University Press; 1990. p. 339-363.
- Nabuzoka D, Smith PK. Sociometric status and social behavior of children with and without learning difficulties. *Journal of Psychology and Psychiatry and Allied Disciplines* 1993;8:1435–1448.
- Parker JG, Asher SR. Peer relations and later personal adjustment: Are low-accepted children at risk? *Psychological Bulletin* 1987;102:357–389. [PubMed: 3317467]
- Pope AW, Bierman KL. Predicting adolescent peer problems and antisocial activities: The relative roles of aggression and dysregulation. *Developmental Psychology* 1999;35:335–346. [PubMed: 10082005]
- Pope AW, Bierman KL, Mumma GH. Aggression, hyperactivity, and inattention–immaturity: Behavior dimensions associated with peer rejection in elementary school boys. *Developmental Psychology* 1991;27:663–671.
- Sandler AD, Hooper SR, Watson TE, Coleman WL, Footo M, Levine MD. Talkative children: Verbal fluency as a marker for problematic peer relationships in clinic referred children with attention deficits. *Perceptual and Motor Skills* 1993;76:943–951. [PubMed: 8321611]
- Stormshak EA, Bierman KL, CPPRG. The implications of different developmental patterns of disruptive behavior problems for school adjustment. *Development and Psychopathology* 1998;10:451–467. [PubMed: 9741677]
- Taylor AR. Behavioral subtypes of low-achieving children: Differences in school social adjustment. *Journal of Applied Developmental Psychology* 1990;11:487–498.
- Terry R, Coie JD. A comparison of methods for defining sociometric status among children. *Developmental Psychology* 1991;27:867–880.
- Wechsler, D. *Manual for the Wechsler Intelligence Scales for Children–Revised*. New York: Psychological Corporation; 1974.
- Werthamer-Larsson L, Kellam S, Wheeler L. Effects of first-grade classroom environment on shy behavior, aggressive behavior, and concentration problems. *American Journal of Community Psychology* 1991;19:585–602. [PubMed: 1755437]
- Whalen CK, Henker B. The social worlds of hyperactive children. *Clinical Psychology Review* 1985;5:447–478.

Simple and Partial Correlations Linking Cognitive Factors (Ability and Inattention) With Aggressive and Prosocial Behavior in Kindergarten and First Grade

Table 1

Cognitive Factors	Kindergarten				First Grade			
	Teacher Rating		Teacher Rating		Teacher Rating		Peer Rating	
	Aggressive	Prosocial	Aggressive	Prosocial	Aggressive	Prosocial	Aggressive	Prosocial
Simple Correlations								
Cognitive Ability	-.18*	.34**	-.19**	.30**	-.14*	.30**	-.14*	.28**
Inattention	.55**	-.63**	.52**	-.57**	.42**	-.57**	.42**	-.45**
Partial Correlations								
Ability/(Inattention)	-.01	.18*	-.05	.15*	.01	.15*	.01	.13*
Inattention/(Ability)	.53**	-.58**	.49**	-.54**	.39**	-.54**	.39**	-.42**

Note: In the partial correlations, inattention was partialled out of correlations between cognitive ability and behavior; ability was partialled out of correlations between inattention and behavior.

* $p < .01$.

** $p < .001$.

Table 2
Simple and Partial Correlations Linking Cognitive Factors (Ability and Inattention) With Peer Relations in First Grade

Cognitive Factors	First Grade Peer Relations Nominations	
	<i>Like Most</i>	<i>Like Least</i>
Simple Correlations		
Cognitive Ability	.23 [*]	-.15 [*]
Inattention	-.35 ^{**}	.48 ^{**}
Partial Correlations		
Ability/(Inattention)	.13 [*]	-.05
Inattention/(Ability)	-.33 ^{**}	.47 ^{**}

Note: In the partial correlations, inattention was partialled out of correlations between cognitive ability and behavior; ability was partialled out of correlations between inattention and behavior.

*
 $p < .01$.

**
 $p < .001$.

Table 3
Social Behaviors and Sociometric Nominations of Children in Four Subgroups

Behavior	Group									
	Inattentive/Low Ability			Inattentive			Low Ability			F(3, 212)
	M	SD		M	SD		M	SD		
Disruptive/Aggressive										
Kindergarten-Spring	0.79 _a	1.23		0.99 _a	1.41		-0.34 _b	0.69		22.75 ^{**}
Grade 1-Fall	0.73 _a	1.09		0.91 _a	1.11		-0.30 _b	0.81		20.15 ^{**}
Grade 1-Spring	0.48 _a	1.10		0.88 _a	0.89		-0.17 _b	0.73		23.32 ^{**}
Prosocial										
Kindergarten-Spring	-1.09 _a	0.69		-0.93 _a	0.73		-0.02 _a	0.72		29.13 ^{**}
Grade 1-Fall	-1.03 _a	0.81		-0.83 _a	0.87		-0.14 _b	0.74		20.14 ^{**}
Grade 1-Spring	-0.90 _a	0.79		-0.74 _a	0.77		-0.20 _b	0.84		26.71 ^{**}
Peer Relationships										
Like Most	-0.55 _a	0.89		-0.44 _a	0.67		-0.62 _a	0.62		11.90 ^{**}
Like Least	0.58 _a	0.96		0.68 _a	1.29		-0.12 _b	1.07		13.00 ^{**}

Note: Means represent standard scores. Means with different subscripts in each row are significantly different using Duncan's post hoc comparison.

*
 $p < .01$.

**
 $p < .001$.