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The Protective Effects of Social Factors on the Academic Functioning of Adolescents with ADHD

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Abstract

Objective: There is considerable evidence that externalizing disorders such as Attention-Deficit/Hyperactivity Disorder (ADHD) put youth at risk for a range of adverse academic outcomes. Importantly, some youth avoid these negative outcomes, yet there is a gap in our understanding of these resilient youth. The purpose of this study was to longitudinally evaluate social acceptance and social skills as potential protective factors of the associations between inattentive, hyperactive/impulsive, and oppositional/defiant behaviors with academic outcomes.

Method: Participants included a sample of 93 middle school students comprehensively diagnosed with ADHD. Parents and adolescents completed ratings of social skills and perceived social acceptance. School grades and teacher-rated academic impairment were assessed 18 months later as longitudinal academic functioning outcomes.

Results: Inattention and social acceptance were associated with academic outcomes 18 months later. Regression analyses revealed that parent- and adolescent-rated social acceptance demonstrated promotive effects for grades and against teacher-rated academic impairment. Further, social acceptance significantly interacted with inattention in predicting school grades, such that high parent- and adolescent-rated social acceptance significantly attenuated the relationship between inattention and poor grades, even after controlling for baseline grades and intelligence. The presence of social acceptance was especially critical for adolescents with high levels of inattention. Specifically, adolescents with high inattention and high social acceptance had a mean GPA of 2.5 and adolescents with high inattention and low social acceptance had a mean GPA of 1.5.

Conclusions: These findings demonstrate that social acceptance may be an important intervention target for improving academic outcomes among adolescents with ADHD.

Keywords

Academic Functioning; Attention-Deficit/Hyperactivity Disorder; Protective Factors; Resilience; Social Functioning

Adolescents with attention-deficit/hyperactivity disorder (ADHD) often experience clinically significant academic impairment (DuPaul & Langberg, 2014). Compared to their classroom peers, adolescents with ADHD have significantly lower class grades and standardized test scores and are more likely to drop out of school (Frazier et al., 2007; Kent et al., 2011). Early adolescence and the transition to middle school is an important developmental period for all youth distinguished by multiple biological, developmental, and social changes that occur at this time (Eccles et al., 1993; Wang & Eccles, 2012). The transition to middle school entails moving to a larger school, increased academic demands, heightened importance of peer relationships and social acceptance, and decreased monitoring and support from parents and teachers (Alspaugh, 1998; Eccles, 2004). These types of environmental changes are particularly challenging for young adolescents with ADHD who often have difficulties planning and organizing behaviors and self-monitoring and evaluating progress towards long-term goals (Biederman et al., 2004; Langberg, Dvorsky, & Evans, 2013).

Although a majority of adolescents with ADHD experience academic difficulties, some largely avoid long-term negative academic outcomes and successfully graduate from high school and pursue college (Green & Rabiner, 2013; Martin, 2014). Indeed, a small body of literature suggests that there is a subgroup of individuals with ADHD that function well in some domains despite impairment in other domains (Lee et al., 2008; Modesto-Lowe et al., 2011; Molina et al., 2009). For example, in a sample of adolescents with ADHD, Biederman et al. (1998) found that approximately 20% were functioning well (i.e., defined as scores above the 5th percentile of scores in comparison to a non-ADHD group) across the school, social, and emotional domains, 20% were performing poorly in all three domains, and 60% displayed mixed outcomes.

A developmental psychopathology approach that evaluates both risk and resilience is needed to understand the heterogeneity of academic outcomes seen in adolescents with ADHD. Unfortunately, there is a significant gap in our understanding of these resilient individuals, as ADHD research has historically emphasized risk factors such as symptom severity and comorbid mental health problems. A better understanding of factors that may buffer the negative influence of externalizing symptoms on the academic outcomes of adolescents with ADHD could guide the development or refinement of intervention and prevention programs (Kellam et al., 1999).

Externalizing Behaviors as Risk Factors for Academic Impairment

Developmental models of risk have emphasized the longitudinal progression of early problem behavior as antecedents for future impairment including academic failure and

school dropout (e.g., Kazdin et al., 1997; Tremblay et al., 1992). Importantly, behavior problems (e.g., inhibition, impulsivity, aggression) identified as early as preschool and elementary school predict academic problems in adolescence (e.g., Gray et al., 2014). For example, Kupersmidt and Coie (1990) found that preadolescent externalizing behavior predicted high school dropout even after controlling for peer rejection and absenteeism. Externalizing behaviors limit youths' ability to develop positive relationships with teachers and peers and inhibit their ability to engage academically and to learn effectively through classroom and homework activities (Baker, Grant, Morlock, 2008; Birch & Ladd, 1998; Stipek & Miles, 2008).

Broadly defined, externalizing behaviors include inattention, hyperactivity/impulsivity, and oppositional defiance, and there is evidence that each domain may lead to academic impairment (e.g., Breslau et al., 2009; Brennan, Shaw, Dishion, Wilson, 2012; Hinshaw, 1992). Inattentive behaviors appear to be a particularly strong risk factor for later academic problems (Gray et al., 2014; Pingault et al., 2011). For example, in a population-based sample of 7-year-olds followed to age 16 ($N = 11,640$), Sayal and colleagues (2015) demonstrated that each 1-point increase in inattention at baseline was associated with significantly worse academic outcomes at age 16. There is also ample evidence in samples of children and adolescents with ADHD that symptoms of inattention uniquely predict academic outcomes, above and beyond the influence of hyperactive/impulsive symptoms and oppositional defiant behaviors (e.g., Breslau et al., 2009; Fergusson, Horwood, Ridder, 2005). However, some longitudinal studies of youth with ADHD suggest that co-occurring externalizing behavior problems such as oppositionality also contribute incremental risk for negative school outcomes such as grade retention, suspensions, and high school dropout (Galera et al., 2009; Washbrook, Propper, & Sayal, 2013). Given these mixed findings, research on the heterogeneity of academic functioning in adolescents with ADHD will need to consider inattention, hyperactive/impulsive, and oppositional defiant behavior dimensions separately.

The Importance of Protective Factors

Developmental psychopathology emphasizes not only identifying risks (e.g., externalizing symptoms) but also protective factors. Resilience is a broad term that reflects "positive patterns of adaptation in the context of adversity" (Masten & Obradovic, 2006, p. 14). Currently, the field has adopted the terms "promotive" or "compensatory" effects to describe main or direct effects (i.e., when a promotive factor independently contributes to an outcome by operating in an opposite direction of a risk factor) and reserves the term "protective effects" for describing interactive processes (i.e., factors that operate by reducing or buffering the effects of a risk) (Fergus & Zimmerman, 2005; Masten, 2001; Zimmerman et al., 2002). In this manuscript, we use the terms "buffers" and "protective effects" synonymously to demonstrate when a variable acts by mitigating the negative effect of a risk variable on an outcome of interest. Resilience and the study of protective factors represent an area that has largely been neglected in the ADHD literature. Therefore, the following section includes a discussion of evidence from the developmental literature more broadly, as well as the few studies that have examined protective factors in ADHD samples, focusing specifically on the potential protective role of social factors.

The Protective Role of Social Factors

Social functioning may be an important protective factor and social factors are especially salient in adolescence (Masten & Coatsworth, 1998; Wang & Eccles, 2012). Developmental theory suggests a progressive trajectory, such that youth learn key social skills (e.g., empathy, perspective taking, conflict resolution) in their peer relationships during middle childhood (Pedersen, Vitaro, Barker, & Borge, 2007), and then their display of these social skills contributes to the presence of close and supportive friendships by early adolescence (Buhrmester, 1990). The peer microsystem plays a critical role in this socialization process (East, Lerner, Lerner, Soni, & Jacobson, 1992). In particular, the development of close friendships and the ability to gain social acceptance from peers are two developmental tasks that gain prominence during middle childhood and early adolescence (Hartup, 1992; Masten & Coatsworth, 1998).

Evidence from the developmental literature demonstrates that peer relationships and friendships may serve as academic resources in school and have direct and indirect positive influences on achievement outcomes (Eccles et al., 1993; Wang & Eccles, 2012; Wentzel, 2005). Youth who perceive that they are accepted socially by their peers tend to have increased school belonging, instrumental aid from competent peers, and enhanced self-worth or motivation (Furrer & Skinner, 2003; Veronneau et al., 2010). Peer relationships can also provide academic support through shared resources such as classroom notes and books or modeling of positive academic skills such as studying (Ladd & Price, 1987; Schunk, 1987). Students who are accepted by their peers at school tend to be high achievers and highly involved in school (Garcia-Reid, 2007; Guthrie & Wigfield, 2000), whereas socially rejected and aggressive youth with negative friendships (e.g., conflict) are at risk for academic failure and disengagement from school (French & Conrad, 2001; Kurdek & Sinclair, 2000). Further, although unexamined in adolescent-specific samples, a few studies with younger school-based samples have demonstrated protective effects, finding a significant relationship between social factors and academic achievement after controlling for externalizing behaviors (e.g., inattention, aggression) (e.g., Arnold et al., 2012; Demaray & Jenkins, 2011). Overall, positive social functioning, even in the presence of externalizing behaviors, is a developmental strength that may protect youth from the risk for negative academic outcomes.

Social Factors as Protective in ADHD Samples

Although research examining protective factors and processes within the ADHD population is scarce (Deault, 2010; Modesto-Lowe et al., 2011), initial findings provide a glimpse into the contributions that a resilience perspective can bring toward understanding the heterogeneity of ADHD trajectories. Interestingly, in some of the few studies specifically exploring resilience processes in youth with ADHD, findings support the possibility that dyadic friendships buffer the association between ADHD and subsequent peer victimization (Becker et al., 2013; Cardoos & Hinshaw, 2011). Further, Mikami and Hinshaw (2003, 2006) found that among school-aged girls, popularity with adult staff and goal-directed solitary play concurrently buffered the impact of peer rejection on aggression and internalizing symptoms, respectively, whereas only academic self-concept (regardless of actual academic performance) served as a buffer approximately 4.5 years later. To date, only

one study has examined the protective effects of any social factor for buffering the negative association between ADHD symptoms and academic outcomes. In a longitudinal sample of 127 children/adolescent girls with ADHD and 82 comparison girls, Mikami and Hinshaw (2006) presented data supporting a risk-resilience model, whereby social acceptance (i.e., measured through popularity with adults) served as a protective effect for the academic outcomes of at-risk adolescent girls. Specifically, although ADHD symptoms predicted negative academic achievement five years later, students' popularity with adults buffered the influence of symptoms on achievement. However, this study was limited to an all-female sample and measures of popularity assessed at a summer day camp, which may not generalize to social acceptance in everyday life or at school.

In summary, early adolescence and the transition to middle school is an important developmental stage characterized by multiple biological, developmental, and social changes. For adolescents with ADHD, the middle school years may be a particularly difficult period given increased academic demands and expectations for independence, challenging social context, and exposure to risky adolescent behaviors. A better understanding of factors that may attenuate such influences during this period could guide the development of intervention and prevention programs designed to promote the positive development of adolescents with ADHD (Kellam et al., 1999).

Current Study

The present study utilizes a developmental psychopathology perspective of resilience to better understand variability in the academic functioning outcomes of adolescents with ADHD. This study builds on the Mikami and Hinshaw (2003, 2006) studies in several ways: multi-informant measures were collected including parent and adolescent report of social skills and social acceptance and multiple academic outcomes were evaluated longitudinally, including grades and teacher ratings of academic impairment. Although there is no single definition for healthy social functioning during adolescence, it is widely recognized as encompassing: (a) the development and maintenance of close interpersonal relationships, (b) appropriate use of prosocial behaviors and skills, and (c) social acceptance by peers and adults (Parker et al., 2006). Critically, although social skills are necessary for developing successful social relationships, they are not sufficient for social functioning during adolescence (Becker et al., 2014; Mikami et al., 2014). Considering these important distinctions between domains of social functioning, the current study includes measures of both social skills and perceived social acceptance. Further, given the developmental context of adolescent socialization shifting towards peer relationships, unique perspectives exist across parent and adolescent perceptions of functioning, and agreement is often low to moderate (Achenbach, McConaughy, & Howell, 1987). Accordingly, in the present study, parent and adolescent perceptions of social skills and social acceptance were considered separately. Importantly, this study evaluates the impact of these social factors on both an objective and subjective indicator of academic functioning (i.e. grade point average and teacher ratings of overall academic impairment). Lastly, given the important distinction between compensatory effects and interactive processes of resilience, the current study will test both promotive and protective effects using both "compensatory" (main) and interactive effects models.

Although there is compelling evidence for inattentive behaviors being a particularly strong predictor of academic impairment, there is also evidence that hyperactive/impulsive and oppositional defiant behaviors also contribute to academic impairment. As a result, we hypothesized that inattentive, hyperactive/impulsive, and oppositional defiant behavior would each be independently associated with poorer academic outcomes in the current sample. Further, we hypothesized that social skills and social acceptance would provide a promotive effect for academic functioning, and high levels of social acceptance or skills as rated by parent and adolescent-report would demonstrate protective effects by buffering the effect of inattentive, hyperactivity/impulsive, and oppositional defiant behavior on academic outcomes. Specifically, we expect that social acceptance will interact with inattention such that having higher social acceptance will attenuate the relationship between inattention and poor academic functioning.

Method

Participants

Participants were 93 young adolescents (67 males, 26 females) with ADHD initially assessed when in fifth (39.9%), sixth (31.1%), or seventh (29.0%) grade (age range 10.4 to 14.3). All participants were initially assessed in the spring semester of the school year (referred to as T1) and at the end of the fall semester 18 months later (T2). Accordingly, if a participant was in 6th grade at the baseline assessment, he/she would have been in 8th grade at the time of the follow-up assessment (assuming the student was not retained). At T2, participants were in the seventh (37.6%), eighth (32.2%), or ninth (30.2%) grade (age range 11.9 to 15.8 years). Per criteria described below, 50 participants were diagnosed with ADHD Predominantly Inattentive Type (ADHD-I) and 43 participants were diagnosed with ADHD Combined Type (ADHD-C). Approximately 47% of the participants were taking medication for ADHD ($n = 44$). 78% of the participants were Caucasian ($n = 72$), with the remaining participants African American ($n = 15$), multiracial ($n = 5$), or Hispanic/Latino ($n = 1$). Thirty-eight percent of the youth lived in dual parent households. Participants' annual family income ranged from less than \$10,000 to over \$225,000 ($M = \$54,592$; $SD = \$51,510$; $Median = \$37,500$). Highest level of parent education is as follows: did not earn a high school degree (4%), high school degree (29%), associate's degree (26%), bachelor's degree (23%), and advanced degree (18%).

Procedures

Data were collected as part of a randomized clinical trial (total $N = 326$) examining psychosocial interventions for young adolescents with ADHD. The 93 participants included in the current set of analyses were included in the community care (i.e., control) condition and did not receive any study-provided intervention services while participating in this study. The study was reviewed and approved by the Institutional Review Board (IRB) and parents signed informed consent and youth provided assent. Parents/guardians who called research staff to express interest in the study were administered a phone screen. On the phone screen, parents had to indicate that their child had a diagnosis of ADHD or had to endorse their child as currently exhibiting at least 4 of 9 symptoms of inattention from the *Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition* (DSM-IV; American

Psychiatric Association, 1994) on a rating scale in order to be scheduled for an inclusion/exclusion evaluation. The inclusionary criteria were: (a) meeting full diagnostic criteria for ADHD-I or ADHD-C; (b) an IQ ≥ 80 as estimated using the *Wechsler Intelligence Scale for Children, Fourth Edition* (WISC-IV; Wechsler, 2003); and (c) not meeting criteria for a primary diagnosis of a pervasive developmental disorder or meeting diagnostic criteria for: bipolar disorder, psychosis, substance dependence other than tobacco, or obsessive-compulsive disorder.

ADHD diagnoses were determined using procedures similar to those used in the MTA Study (MTA Cooperative Group, 1999). Primarily, the presence of ADHD symptoms was established using the *Children's Interview for Psychiatric Syndromes – Parent Version* (P-ChIPS; Fristad, Teare, Weller, Weller, & Salmon, 1998; Weller, Weller, Rooney, & Fristad, 2000), a well-validated semi-structured diagnostic interview that was administered to parents by advanced doctoral students and doctoral-level psychologists. Parent report of ADHD symptoms on the P-ChIPS could be supplemented with unique ADHD symptoms as endorsed by teachers on the *Disruptive Behavior Disorder Rating Scale* (DBD; Pelham et al., 1992), but only if the parent endorsed at least 4 symptoms in a domain. The DBD (Pelham et al., 1992) is a well-validated teacher-report measure of *DSM-IV* ADHD, ODD, and CD symptoms, with items rated on a four-point scale (0 = *not at all present*, 3 = *very much present*). Participants also had to demonstrate clinically significant impairment as evidenced by parent or teacher report on the *Impairment Rating Scale* (IRS; scores of 3 or greater; Fabiano et al., 2006). The P-ChIPS was also used to assess for the presence of comorbid psychiatric disorders. Using *DSM-IV* criteria, 48% of the participants ($n = 46$) met criteria for comorbid ODD or CD, 27% ($n = 28$) met criteria for an anxiety disorder (i.e., social phobia, separation anxiety disorder, specific phobia, or generalized anxiety disorder), and 14% ($n = 15$) met criteria for a depressive disorder (i.e., dysthymia or major depressive disorder).

Measures

Risk Factors

ADHD and ODD symptoms.: At T1, parents and teachers completed the Disruptive Behaviors Disorders scale (DBD; Pelham et al., 1992). Van Eck et al. (2010) demonstrated support for the reliability of the measure and for the factor structure in a large sample of middle school students. Summary scores for each of the inattention (9 items), hyperactive/impulsive (9 items) and oppositional defiant (8 items) scales were used in the present study as a continuous measures of risk since each of these symptom domains has been previously associated with social and academic impairments. Parent- and teacher-ratings on each of the three scales were used to create a multi-informant composite of risk in the domains of inattention, hyperactivity/impulsivity, and oppositional behavior. Specifically, in order to fully capture the presence of risk behavior in this sample regardless of setting, composite risk scores were created by taking the highest (most severe) rating from either the parent or teacher report at the item level. Internal consistencies were high - parent (inattention $\alpha = .88$, hyperactivity/impulsivity $\alpha = .89$, oppositional/defiant $\alpha = .90$) and teacher (inattention $\alpha = .95$, hyperactivity/impulsivity $\alpha = .96$, oppositional/defiant $\alpha = .96$).

Protective Factors

Social Skills.: At T1, adolescents and parents reported on youths' general social skills using the *Social Skills Improvement System* (SSIS; Gresham & Elliott, 2008; Gresham, Elliott, & Kettler, 2010). On both versions, items are rated on a 4-point scale from 0 (never/not true) to 3 (almost always/very true), and standard scores are calculated with higher scores indicating better social skills. Social skills items on the SSIS include a widerange of child behaviors, including communication, cooperation, assertion, responsibility, empathy, engagement, and self-control. Most items on the SSIS focus on broad social skills that apply to social relationships generally (i.e., relationships with parents, teachers, siblings, and peers). Specifically, only four of the 46 items are specific to peer relationships, with three of these items focused on how the individual behaves in the peer group (i.e., "starts conversations with peers," "interacts well with other children," "tolerates peers when they are annoying") and only one item focused on how well the individual is regarded in the peer group (i.e., "makes friends easily"). Internal and test-retest reliability of the SSIS are good and adequate criterion, convergent and discriminant validity have been established using samples of elementary and middle school-aged youth (Gresham & Elliot, 2008; Gresham, Elliott, Vance & Cook, 2011). Standard scores were used in the present study (α s = .94 and .95 for the parent- and youth-report versions, respectively).

Social Acceptance.: At T1, adolescents and parents completed their respective versions of the *Self-Perception Profile for Children* (SPPC; Harter, 1982, 1985), with the social acceptance domain used in the present study. The SPPC is a well-validated measure (Muris, Meesters, & Fijen, 2003) of self- and other-perceived competence for youth in grades 3 through 8 (Harter, 1985; Harter, 2012). Using a "some kids/other kids" format, ratings are made on a 4-point scale, with higher scores indicating greater perceived acceptance. Items focus on success in the peer domain (e.g., ability to make and maintain friendships, popularity with peers). The social acceptance scale has demonstrated acceptable validity and reliability (i.e., internal consistency, test-retest), and significantly correlates with peer and teacher ratings of children's peer acceptance (Cole et al., 1998; Cole et al., 2001; Harter, 1985; Muris et al., 2003). In the present study, mean scale scores were used (α s = .94 and .79 for the parent- and youth-report versions, respectively).

Academic Outcomes

School Grades.: Report cards were collected for all participants at T1 and T2. As reviewed in the informed consent/assent process, grades for each participant in the study were collected from the school offices at the end of each academic year. All grades were converted into grade point averages (GPA) for core subject areas (English, Social Studies, Math, Science) with a range from 0.0 to 4.0 (0 = F ; 4.0 = A). Completion of parent, student, and teacher ratings at follow-up (T2) corresponded with fourth quarter grades.

Teacher-rated Academic Impairment.: The *Impairment Rating Scale* (IRS; Fabiano et al., 2006) assesses the severity of problems across multiple functional domains on a scale from 0 (*not a problem/definitely does not need treatment or special services*) to 6 (*extreme problem/definitely needs treatment or special services*). The IRS demonstrates excellent temporal stability and evidence of convergent and discriminant validity and is highly effective in

discriminating between children with and without ADHD (Fabiano et al., 2006). The present study focuses on teacher report of impairment in the academic domain, rated at T2. Since this is middle school sample, multiple core teachers completed ratings for each participant (Median = 3 per participant), and the mean was used in the analyses.

Analytical Approach

Preliminary Analyses.: To identify potential covariates that should be included in the regression models, bivariate correlation analyses were conducted to examine whether age, grade, gender and ADHD medication status were significantly associated with either follow-up (T2) outcome (i.e., grades, impairment). In addition, IQ was also considered as a potential covariate in the analyses given that it is positively associated with social functioning (Newcomb, Bukowski & Pattee, 1993) and academic functioning (Molina et al., 2009). Variables correlated with either outcome at $p < .05$ were retained for subsequent regression analyses and intercorrelations between risk and promotive or protective factors were examined.

Primary Analyses.: Using methodology recommended by Zimmerman et al. (2002) and used by Mikami and Hinshaw (2003, 2006), we tested our key hypotheses that the proposed positive social factors would provide (a) “compensatory” or “promotive” (main) effects as well as (b) “protective” (interaction) effects with respect to inattentive, hyperactive/impulsive, and oppositional/defiant behaviors, using hierarchical multiple regressions. Specifically, for each social predictor and academic outcome, models were examined with significantly associated covariates and baseline academic functioning entered on Step 1, followed by hypothesized risk factors (i.e., inattention, hyperactivity/impulsivity, opposition/defiance) entered simultaneously on Step 2, and hypothesized social protective factors (i.e., social acceptance or social skills) entered on Step 3. If the social factor explained significant variance in an academic outcome on step 3 with a positive beta-weight, this confirmed a promotive (main) effect. Once main effects were controlled, we proceeded to test whether the social factors would provide a protective (interaction) effect, by adding the interaction between each hypothesized externalizing scale (i.e., inattention, hyperactivity/impulsivity, opposition/defiance) and the hypothesized protective factor separately at Steps 4, 5, and 6, respectively. The interaction between the social factor and each risk dimension was evaluated separately.¹

Our primary aim was to examine social factors as a potential moderator of the relations between behavioral risks (i.e., inattention, hyperactivity/impulsivity, and opposition/defiance) and academic outcomes. Since tests of statistical interactions are typically underpowered in nonexperimental research (McClelland & Judd, 1993), we chose to limit the number of covariate or predictor variables included in the models. Further, while including all important covariates and predictor variables from multiple informants strengthens confidence in the findings, increasing the number of variables and paths to be tested, also increases the probability of a Type 1 error. We viewed the inclusion parent- and student-rated social factors in the regression models as important in order to improve upon previous studies in this area and inform future research. Still, we acknowledge that this decision to examine each of these informants with each of these predictor domains with the two academic outcomes in this study may have increased the probability of having a Type 1 error. There is no simple solution to this dilemma, particularly as a Bonferroni or related corrections have been heavily criticized for creating additional methodological and statistical problems (Nagagawa, 2004; Moran, 2003; Perneger, 1998). Therefore, we did not apply such a correction, but acknowledge that if such a correction were used the cross-rater effects of student-rated social acceptance as well as parent-rated social acceptance in relation to grades and academic impairment would be lost with the exception of the interaction of parent-rated social acceptance with inattention in predicting grades.

In the presence of a significant interaction, we followed the procedure suggested by Holmbeck (2002) to graph and interpret the findings using the PROCESS macro for SPSS 22.0 developed by Hayes (2013). The macro estimates coefficients and standard errors for the model, estimating an outcome variable from the predictor, moderator, and the interaction of the two, as well as control variables. The PROCESS macro calculates simple slopes for the effects of the predictor on the outcome at specified values (one standard deviation above and below the mean) of the moderator as well as regions of significant tests. A visual plot of the interaction can then be produced by imputing the resulting tables into the graphical user interface of SPSS. Following model-testing recommendations (e.g., Cohen et al., 2003), continuous variables were mean-centered prior to creating interaction terms to reduce multicollinearity and to aid in the interpretation of significant interactions. Multivariate outliers were examined using Cook's Distance and all values were below Cook and Weisberg's (1982) recommendations. All VIF values were below 3.0 and all tolerance values were above .42, indicating that multicollinearity was not an issue (Cohen et al., 2003).

Missing Data.: Across all study variables including demographic, baseline and follow-up data, only 4.10% of data were missing. Eleven participants were lost to follow-up and were missing ratings at T2 from the original sample of 104. Those with follow-up ratings ($N=93$) were included in all analyses. No differences were found for the baseline variables (i.e., child demographics, externalizing behaviors, social acceptance, social skills, or baseline academic functioning) between children with and without follow-up data (all $ps > .05$). Further, missing data were not predicted by other study variables as demonstrated by Little's Missing Completely at Random (MCAR) test, $\chi^2(18)=199.28$, $p=.19$. Thus, it is unlikely that the few instances of missing data affected the results presented below.

Results

Preliminary Analyses

As shown in Table 1, participant IQ, baseline (T1) GPA, and baseline (T1) teacher-rated academic impairment were significantly correlated with follow-up (T2) academic variables. Participant age, grade, gender, and medication status were not associated with either of the two academic outcomes and were not included in subsequent regression analyses. Intelligence was correlated with grades and teacher-rated academic performance and was included in all subsequent analyses. Intercorrelations between risk variables and social acceptance were all in the expected direction.

Primary Analyses

Effects of social skills.—Neither parent- nor adolescent-rated social skills demonstrated main effects or protective effects for any academic outcome (full results available from corresponding author). Accordingly, only results evaluating social acceptance are presented in Table 2.

Effects of social acceptance.

Grades.: After controlling for the influence of baseline academic impairment and IQ (Step 1), inattention was a significant risk factor for grades ($\beta = -.21$, $p = .02$), above and beyond

all other variables in the model including hyperactivity/impulsivity and oppositional defiance (Step 2).

In the model with parent-ratings, social acceptance demonstrated a promotive (main) effect, predicting grade point average at Step 3 ($\beta = .19, p = .03$), after controlling for the risk variables of inattention, hyperactivity/impulsivity, opposition/defiance, and baseline covariates. There was also a significant protective (interactive) effect between inattention and parent-rated social acceptance in predicting grades ($\beta = .28, p = .006$). A visual plot of this interaction (see Figure 1, left) demonstrates that the relationship between inattention and grades was attenuated for adolescents with high social acceptance (i.e., +1 SD). Further, for adolescents with low social acceptance (i.e., -1 SD) rated by parents, the relationship between inattention and low grades was exacerbated ($t(93) = -2.01, p = .04$). Further, those with high inattention ($M=24.48$) and high parent-rated social acceptance earned higher GPAs compared to those with high inattention and low social acceptance. GPA did not differ across levels of parent-rated social acceptance for those with low inattention ($M=15.24$).

In a separate model, adolescent-ratings of social acceptance also demonstrated a significant main (promotive) effect by positively predicting grades ($\beta = .18, p = .04$), after controlling for inattention, hyperactivity/impulsivity, oppositional defiance, and baseline covariates. Further, there was a significant interaction effect between inattention and adolescent-rated social acceptance in predicting grade point average ($\beta = .32, p = .04$). A visual plot of this interaction (see Figure 1, right) demonstrates that that relationship between inattention and low grades was attenuated for adolescents with high social acceptance (i.e., +1 SD), but for adolescents with low self-ratings of social acceptance, inattention was no longer associated with grades.

Academic impairment. Consistent with the models predicting grades, in the two models predicting teacher-rated impairment, inattention was again a significant risk factor, demonstrating a main effect (Step 2) in predicting T2 academic impairment ($\beta = .28, p = .04$), above and beyond the influence of baseline academic impairment, IQ, and hyperactivity/impulsivity and oppositional defiance.

Parent-rated social acceptance demonstrated a promotive (main) effect, predicting academic impairment at Step 3 ($\beta = -.25, p = .004$), after controlling for all previous variables. However, the subsequent interactions between the risk behavior variables and parent-ratings of social acceptance were not statistically significant. In a separate model, adolescent-rated social acceptance also demonstrated a significant promotive effect, but the subsequent interactions were not significant.

Discussion

Although rarely studied, research on resilience in ADHD has the potential to provide a needed complement to the extensive knowledge base on risks and deficits associated with the disorder. This study examined the interactions between risk and protective factors in relation to academic functioning in a sample of young adolescents diagnosed with ADHD. Extant research suggests that positive parenting practices and social factors (e.g., friendship

quality, prosocial skills, peer acceptance, teacher-student relationships) may protect youth with ADHD against negative outcomes such as interpersonal impairment (Burchinal et al., 2008; Deault, 2010; Demaray & Jenkins, 2011; Latimer et al., 2003; Mikami & Hinshaw, 2003, 2006). The current study builds on prior work by (a) examining both risk and protective factors in an effort to determine the promotive and interactive effects of these dimensions; (b) using a longitudinal design that controlled for baseline functioning and IQ; (c) extending previous research with pre-school and elementary-school aged children to young adolescence when social factors are increasingly salient; and (d) incorporating multiple informants including adolescent, teacher, and parent reports. Specifically, this study evaluated the roles of perceived social acceptance and social skills as both promotive (as defined as a “compensatory effect”) and protective (as defined as an “interactive effect”) effects (e.g., Fergus & Zimmerman, 2005; Masten, 2001; Zimmerman et al., 2002). Social acceptance demonstrated promotive effects in predicting future school grades and teacher-rated academic impairment, as well as protective effects in buffering the prospective relation between inattention and school grades.

Consistent with past research in ADHD samples, inattention was more strongly negatively associated with academic outcomes than symptoms of hyperactivity/impulsivity or oppositional defiance (see Tables 1 and 2). In multiple cases, inattention predicted academic outcomes above and beyond intelligence, hyperactivity/impulsivity, and oppositional defiance. Indeed, hyperactive/impulsive and ODD symptoms were no longer significant as risk variables when entered into the model with symptoms of inattention (Table 2). This suggests that the association between hyperactive/impulsive and oppositional defiant behaviors with academic outcomes at the bivariate level may be due to shared variance with inattention. This finding highlights the importance of future research on risk and protective factors evaluating the unique contribution of each of these symptom domains, rather than considering externalizing symptoms broadly as a risk factor.

Regarding the promotive effects, after controlling for IQ, baseline academic functioning, and inattentive, hyperactive/impulsive, and oppositional/defiant behaviors, both adolescent- and parent-rated social acceptance predicted higher GPA and teacher-rated academic impairment 18 months later. This finding is not surprising given the clear and established link between social factors including peer regard and ADHD behaviors on myriad of functional outcomes for youth with ADHD (e.g., Hinshaw, 1992; Mikami & Hinshaw, 2006; Parker et al., 2006). Nonetheless, the cross-rater nature of these findings is noteworthy, as is the fact that academic outcomes were measured almost a year and a half after baseline. As such, not only are the classrooms and teachers different from those at baseline, but the academic and social expectations and dynamics are likely to have changed. Further, the finding that adolescents’ rating of social acceptance was associated with academic outcomes in a similar fashion as parent ratings is contrary to research suggesting that youth with ADHD have inflated self-perceptions of their own functioning (e.g., Hoza et al., 1993). The cross-informant nature of these findings suggests that the unique perspectives from a multi-informant approach is important for evaluating promotive and protective factors in adolescent ADHD samples.

A more novel contribution of the present study is the finding that social acceptance moderated the association between inattention and grades, such that high parent- and

adolescent-rated social acceptance reduced the risk of poor grades. Further, these relationships held after controlling for baseline GPA and IQ. Analyses examining the conditional effects of inattention on academic functioning (see Figure 1) demonstrated that inattention was less detrimental to GPA when social acceptance was high. Specifically, in the presence of high inattention, those with high self-perceived social acceptance earned higher grades ($GPA = 2.47$) compared to students with high inattention and low social acceptance ($GPA = 1.54$). However, social acceptance did not differentially impact grades for those with low inattention in either model, such that those with low inattention earned GPAs similar to the sample mean ($M = 2.08$). Importantly, given this is a clinically diagnosed sample of ADHD, those with low inattention still displayed symptoms of inattention near the clinical range.

In contrast, parent- and adolescent- rated social acceptance served as a promotive factor but not as a protective factor for teacher-rated academic impairment. Said another way, higher social acceptance was significantly associated with lower teacher-rated impairment (see Table 2), but this association did not vary as a function of level of risk (i.e. symptoms of inattention) or level of social acceptance. It is not clear why social acceptance is particularly important for youth with high levels inattention as related to grades but not teacher-ratings. As shown in Table 1, the association between T2 GPA and teacher-rated impairment was moderate to high (.60). Nevertheless, a significant portion of unique variance remains, suggesting that teachers are considering other factors when rating overall academic impairment. It may be that for youth with high levels of inattention, the peer support that comes with high social acceptance is crucial to getting academic tasks that contribute heavily to GPA accomplished (e.g. remembering to bring back and turn in homework assignments). In contrast, when teachers rate academic impairment, they are likely considering the adolescent's functioning in the academic context broadly. In this broad sense, youth who are socially accepted are likely to be perceived by their teachers as generally less academically impaired, regardless of their level of ADHD symptoms.

Measuring Social Functioning: Social Skills and Social Acceptance

Contrary to expectations, neither parent- or adolescent-rated social *skills* were associated with the academic outcomes measured in this study. This lack of associations further supports the validity of the distinction between social skills and their application in social contexts in order to gain peer acceptance or friendships as distinct domains of social adjustment (Parker et al., 2006). Indeed, substantial research documents that peer functioning during adolescence is a heterogeneous and multidimensional construct, comprised of peer group acceptance, friendship success, family relationships, romantic relationships and appropriate use of social skills or behaviors (Becker, Luebke, & Langberg, 2012; Parker et al., 2006) and that youth and adolescents with ADHD may experience difficulties across some or all of these domains (McQuade & Hoza, 2008; Mikami et al., 2014). Indeed, as shown in Table 1, the bivariate associations between ratings of social acceptance and social skills in the present study were small to moderate ($r = .23-.32$), suggesting that a host of additional factors contributes to whether or not youth are accepted by their peers. The present findings call attention to the importance of researchers attempting to holistically capture the heterogeneous and multidimensionality of social functioning.

Limitations

One limitation of the present study is the lack of naturalistic observations and peer socio-metric measures to assess social skills, peer acceptance and friendship. Although very few researchers have implemented these rigorous methods (especially in adolescent samples), it is worth noting that socio-metric measures are considered the optimal means or “gold standards” for assessment of peer functioning (Mikami et al., 2014). Further, it is also worth noting that the present study was limited to parent and student perspectives and future work should also consider collecting teacher ratings of adolescents’ social functioning. Additionally, the present study was limited to social skills and social acceptance and did not examine other social indicators relevant during early and late adolescence, including friendship quality, romantic relationships, teacher-student relationships, or family relationships.

Importantly, this study was also limited to two time points, and future work evaluating protective factors with ADHD should include multiple time points in order to better understand the nuance of these associations and their developmental trajectories over time. Further, given the moderate sample size, this study did not examine potential differences across ADHD presentations (i.e., ADHD-IA and ADHD-C), and future work could evaluate whether these associations differ across ADHD presentations. Another limitation of the present study was that a matched-comparison sample of adolescents without ADHD was not available. Comparisons to a normative group would be informative for understanding the role of social skills and peer acceptance for academic functioning among adolescents with ADHD specifically versus adolescents more generally. However, from a resilience perspective, it can be argued that comparisons to a normative group are less important than the variability in perceived social functioning among adolescents with ADHD and the relationships between social acceptance and outcomes for this particular at-risk group.

Future Directions

The precise mechanisms that contribute to the buffering effect of social acceptance for inattention and academic outcomes remain untested. The present study focused on within-child characteristics (e.g., parent- and adolescent-perceived social acceptance and skills), however the overall school context might also be important when considering different patterns of academic functioning (Gutman & Midgley, 2000; Roeser et al., 1998). Future studies could benefit from clarifying the processes through which social acceptance serves as a buffer against academic failure. For example, social acceptance may buffer against negative academic outcomes through mediators such as friendship quality, school connectedness, abstaining from deviant peer groups, teacher-student relationships, or parenting factors. Specifically, being able to socialize with a friend or adult, and feeling connected at school may be associated with increased motivation for academic tasks (see Wentzel, 2005 for a review). Further, socially competent adolescents presumably develop positive relationships with their teachers who in turn may be more likely to assist them academically. Factors such as school connectedness and quality of relationships with teachers may not only impact adjustment in middle school, but may over time contribute to reduced rates of dropout in high school (Dryfoos, 1990; Roeser et al., 1998). Evaluation of these mechanisms should be a priority for future research.

Overall, resilience research in youth with ADHD would benefit from theoretically driven investigations that seek to more systematically understand the developmental pathways and processes associated with factors that protect against negative functional outcomes. The developmental psychopathology perspective emphasizes the importance of studying vulnerabilities to risk factors, the role of protective factors, contextual differences, and also transactional relationships and cascading effects over time (e.g., Deault, 2010). Indeed, future investigations of ADHD, social relationships, and academic functioning would benefit from a more thorough grounding in developmental science (Becker et al., 2012). More studies are also needed that include a consideration of different domains of peer functioning (e.g., social acceptance, friendship quality) within different settings (e.g., school, family, neighborhood). Further, comprehensive models that simultaneously examine the role of potential moderating and mediating mechanisms in predicting outcomes are needed to tease apart these complex relationships.

Conclusion

To better understand, predict, and improve the heterogeneous trajectories of adolescents with ADHD, it is important that researchers and clinicians consider the role of specific protective processes. Findings from the present study suggest that adolescents with high levels of inattention who exhibit social acceptance may experience resilient academic outcomes. This finding is critical given that academic impairment tends to persist in adolescents with ADHD and can result in school dropout and/or failure to pursue a college education (Kent et al., 2011). Protective effects were not found for parent or adolescent ratings of social skills and this finding is consistent with literature documenting that social skills interventions have had limited success for youth with ADHD because they have failed to impact friendships and peer relationships (see Mikami et al., 2014). Future research can seek to elucidate more specific mechanisms through which youth and adolescents with ADHD become resilient.

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Figure 1. Parent-rated and Adolescent-rated Social Acceptance Moderates the Longitudinal Relations of Inattention with Grades

Note. $N = 93$. Follow-up grade point average as a function of (a) parent-rated social acceptance (left) and (b) student-rated social acceptance (right) for adolescents with high and low levels of inattention. One SD above or below the mean was used to characterize higher (+4.62) and lower (−4.62) levels of inattention. Both analyses controlled for baseline GPA and IQ. Slopes are reported.

Table 1
Means, Standard Deviations and Intercorrelations Among Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Gender		.01	-.02	.00	-.03	-.24*	-.24*	-.03	-.07	-.09	-.06	-.14	.14	-.06	.05	-.19
2. Medication Status			.03	.08	.07	.08	.18	.16	.05	.02	-.02	.06	-.06	.16	-.08	.04
3. Age				.76	.05	-.07	.04	.09	.07	.14	.02	-.02	-.17	.13	-.17	.17
4. Grade					.10	.06	.01	.09	.02	.08	.02	-.13	-.17	.13	-.12	.02
5. Intelligence						-.06	-.09	-.04	-.13	-.12	.02	-.05	.44***	-.24*	.38**	-.39**
6. IA Composite Risk							.65***	.61***	-.09	.08	-.05	.03	-.25*	.41***	-.24*	.28**
7. HI Composite Risk								.71***	-.04	.03	-.23*	.05	-.17	.26*	-.15	.18 ⁺
8. ODD Composite Risk									-.09	.07	-.45***	-.10	-.14	.18 ⁺	-.23*	.14
9. PR Social Acceptance										.59***	.23*	.19	.20*	-.12	.26*	-.29**
10. SR Social Acceptance											.15	.32**	.30**	-.11	.29**	-.23*
11. PR Social Skills												.34**	-.03	-.10	.10	.07
12. SR Social Skills													.06	-.06	.09	.03
13. T1 GPA														-.63***	.54***	-.59***
14. T1 TR Academic Impairment															-.40***	.49***
15. T2 GPA																-.60***
16. T2 TR Academic Impairment																
Mean	--	--	12.33	95.30	6.86	19.86	13.21	10.10	2.70	2.94	84.23	95.00	2.32	3.05	2.08	2.89
Standard Deviation	--	--	.99	13.62	.86	4.62	6.37	5.39	.85	.74	14.78	17.42	.94	1.80	1.06	1.81

Note. N=93. T2 GPA and Academic Impairment is 18-months longitudinal follow-up from all other study variables collected at T1 (baseline). Because race, sex and medication status are dichotomous variables, correlation coefficients that include these demographic variables represent point-biserial correlations. TR = teacher-ratings. PR = parent-ratings. SR = student-ratings. IA= inattention symptom severity, HI= hyperactivity and impulsivity symptom severity, ODD= oppositional defiant disorder symptom severity. For gender, 1=males, 2=females. Age is calculated in years. For medication status, 0=not taking medication, 1=currently taking medication. GPA = Grade Point Average.

⁺ p = .07.

* p < .05

** p < .01

*** p < .001

Table 2
Buffering Effects of Parent-and Adolescent-rated Social Acceptance on Adolescent Academic Functioning

<i>DV: Follow-up GPA</i>						<i>DV: TR Academic Impairment</i>					
<i>Protective Variable: PR Social Acceptance</i>	<i>Total R²</i>	<i>R²_{inc}</i>	<i>B</i>	<i>SE</i>	<i>β</i>	<i>Protective Variable: PR Social Acceptance</i>	<i>Total R²</i>	<i>R²_{inc}</i>	<i>B</i>	<i>SE</i>	<i>β</i>
Step 1:	.34	.34***				Step 1:	.31	.31**			
T1 Grade Point Average			.52	.11	.45***	T1 TR Academic Impairment			.42	.09	.42***
FSIQ			.02	.01	.24*	FSIQ			-.04	.01	-.29**
Step 2:	.37	.03				Step 2:	.35	.04*			
IA			-.03	.02	-.21*	IA			.08	.04	.28*
HI			-.02	.02	-.12	HI			.05	.04	.16
ODD			-.01	.02	-.07	ODD			.02	.04	.05
Step 3:	.40	.03*				Step 3:	.41	.06**			
PR Social Acceptance			.23	.11	.19*	PR Social Acceptance			-.54	.18	-.25**
Step 4:	.46	.05*				Step 4:	.42	.01			
IA x PR Social Acceptance			.07	.02	.28**	IA x PR Social Acceptance			-.03	.03	-.10
Step 5:	.46	.00				Step 5:	.43	.01			
HI x PR Social Acceptance			.01	.02	.07	HI x PR Social Acceptance			-.04	.04	-.16
Step 6:	.47	.01				Step 6:	.45	.02			
ODD x PR Social Acceptance			.04	.03	.18	ODD x PR Social Acceptance			-.06	.05	-.21

<i>Protective Variable: SR Social Acceptance</i>	<i>Total R²</i>	<i>R²_{inc}</i>	<i>B</i>	<i>SE</i>	<i>β</i>	<i>Protective Variable: SR Social Acceptance</i>	<i>Total R²</i>	<i>R²_{inc}</i>	<i>B</i>	<i>SE</i>	<i>β</i>
Step 1:	.34	.34***				Step 1:	.31	.31**			
T1 Grade Point Average			.52	.11	.45***	T1 TR Academic Impairment			.42	.09	.42***
FSIQ			.02	.01	.24*	FSIQ			-.04	.01	-.29**
Step 2:	.37	.03				Step 2:	.35	.04*			
IA			-.03	.02	-.21*	IA			.08	.04	.28*
HI			-.02	.02	-.12	HI			.05	.04	.16
ODD			-.01	.02	-.07	ODD			.02	.04	.05

DV: Follow-up GPA						DV: TR Academic Impairment					
Protective Variable: PR Social Acceptance	Total R ²	R ² _{inc}	B	SE	β	Protective Variable: PR Social Acceptance	Total R ²	R ² _{inc}	B	SE	β
Step 3:	.39	.02 [*]				Step 3:	.38	.03 [*]			
SR Social Acceptance			.22	.14	.18 [*]	SR Social Acceptance			-.39	.22	-.17 [*]
Step 4:	.42	.03 [*]				Step 4:	.38	.00			
IA x SR Social Acceptance			.06	.03	.32 [*]	IA x SR Social Acceptance			-.01	.04	-.04
Step 5:	.42	.00				Step 5:	.38	.00			
HI x SR Social Acceptance			.00	.02	.01	HI x SR Social Acceptance			.01	.04	.08
Step 6:	.42	.00				Step 6:	.39	.01			
ODD x SR Social Acceptance			.02	.03	.11	ODD x SR Social Acceptance			-.05	.06	-.15

Note. N= 93. All steps are incremental, where variables in previous steps are included in the model at that step, but not presented in table for space. SR = adolescent self-report ratings. PR = parent-ratings. R² change effect size conventions: .01 = small, .06 = medium, .14 = large (Cohen et al., 2003). All dependent variables were collected at T2, and all predictor variables were collected at T1.

* $p < .05$.

** $p < .01$.

*** $p < .001$.