



Published in final edited form as:

Soc Dev. 2014 May 1; 23(2): 288–305. doi:10.1111/sode.12046.

Social Self Control, Externalizing Behavior, and Peer Liking Among Children with ADHD-CT: A Mediation Model

Paul J. Rosen, Ph.D.¹, Aaron J. Vaughn, Ph.D.², Jeffery N. Epstein, Ph.D.², Betsy Hoza, Ph.D.³, L. Eugene Arnold, M.D., M.Ed.⁴, Lily Hechtman, M.D.⁵, Brooke S.G. Molina, Ph.D.⁶, and James M. Swanson, Ph.D.⁷

¹Dept. of Psychological & Brain Sciences, University of Louisville, Louisville, KY

²Division of Behavioral Medicine & Clinical Psychology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

³Dept. of Psychology, University of Vermont, Burlington, VT

⁴Dept. of Psychiatry, Ohio State University, Columbus, OH

⁵Dept. of Psychiatry, McGill University, Montreal, QB

⁶Depts. of Psychology and Psychiatry, University of Pittsburgh, Pittsburgh, PA

⁷Dept. of Psychology, University of California-Irvine, Irvine, CA

Abstract

This study investigated the role of externalizing behavior as a mediator of the relation between social self-control and peer liking among children with Attention-Deficit/Hyperactivity Disorder-Combined Type (ADHD-CT). A model was proposed whereby externalizing behavior would fully statistically account for the direct relation of social self-control to peer liking. One hundred seventy two children ages 7.0–9.9 years with ADHD-CT were rated by their teachers regarding their social self-control and by their parents and teachers regarding their rates of externalizing behavior. Same-sex classmates provided ratings of overall liking. Structural Equation Modeling (SEM) was used to assess the proposed model. Results supported the proposed model of externalizing behavior as fully statistically accounting for the relation of social self-control to peer liking. This study demonstrated the crucial role that externalizing behaviors play in the social impairment commonly seen among children with ADHD-CT.

Keywords

ADHD; Self-Control; Externalizing Behavior; Peer Rejection

Introduction

Attention-Deficit/Hyperactivity Disorder-Combined Type (ADHD-CT) is characterized by a persistent pattern of developmentally inappropriate levels of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2000). Children with ADHD-CT are often loud, controlling, intrusive, and disruptive in social interactions, and engage in lower rates of prosocial behaviors than do children without ADHD (Whalen & Henker, 1992). Multiple areas of social dysfunction have been documented among children with ADHD-CT, including poor self-control in social situations (Semrud-Clikeman, 2010). Children with ADHD-CT consistently demonstrate poor peer functioning, as they are more likely to be rejected by peers and less likely to be liked by peers than children without ADHD-CT (Hoza, Mrug, Gerdes, et al., 2005b).

Peer Liking of Children with ADHD

Disrupted peer relationships are perhaps the most frequent, persistent, and treatment resistant domain of impairment demonstrated by children with ADHD, with estimates of prevalence of peer rejection in children with ADHD ranging from 50–80% (see Hoza, 2007 for a review). Rejection occurs with both familiar and novel peers and almost immediately in novel social interactions (Erhardt & Hinshaw, 1994; Pelham & Bender, 1982). Children with ADHD consistently demonstrate poor sociometric peer functioning when rated by their peers, and are often actively *disliked* by peers (Hoza, Gerdes, Mrug, et al., 2005a; Mikami, Jack, Emeh, & Stephens, 2010; Mrug, Hoza, Gerdes, et al., 2009; Pelham & Fabiano, 2008). Indeed, children with ADHD received substantially fewer positive nominations and more negative nominations from their classmates than did children without ADHD (Hoza et al., 2005b). Negative peer nominations as demonstrating the greatest differentiation between children with and without ADHD on sociometric measures (Mrug et al., 2009). These disrupted peer relationships are both chronic and resistant to intervention in children with ADHD, as children in the Multimodal Treatment Study of ADHD (MTA) continued to be actively disliked relative to comparison peers following 14 months of active intervention to reduce the core symptoms of ADHD (i.e., inattention, hyperactivity/impulsivity) *regardless of treatment condition* (Hoza et al., 2005a). Children with ADHD were also less likely to have reciprocally-nominated friendships than children without ADHD (Hoza et al., 2005b).

Social Self-Control and Peer Liking of Children with ADHD

Numerous studies have demonstrated poor social functioning among children with ADHD (Hoza, 2007). Cavell's (1990) tri-component hierarchical model of social competence distinguishes social *skills*, which are the basic building blocks of social communication (i.e., social encoding, nonverbal communication) from social *behavior*, which includes the ability to flexibly and appropriately employ social knowledge and behavior in a manner that is adaptive to situation and context (i.e., social conduct, controlling reactivity.), and social *functioning* among peers, which includes peer perceptions and liking and other elements of social status. The tri-component model posits that social skills influence social behavior, but also acknowledges that social performance deficits can occur in the presence of intact social skills. Specifically, the model suggests that poor application of social skills in peer interactions may occur because of interference by factors such as emotional reactivity or

behavioral impulsivity (Cavell, 1990). The social competence deficits of children with ADHD (and children with ADHD-CT in particular) typically reflect poor control of social *behavior* rather than deficits in social skills knowledge (Wheeler & Carlson, 1994). In particular, children with ADHD show substantial deficits in social self-control (defined within this study as ability to control reactivity and moderate behavior in social interactions with peers). Children with ADHD-CT are, overactive, disruptive, reactive, and impulsive (Erhardt & Hinshaw, 1994), and it is not surprising that these difficulties impact their ability to demonstrate effective self-control in social interactions. Indeed, children with ADHD-CT (but not ADHD-Predominantly Inattentive [ADHD-PI] subtype) demonstrated greater intensity, poorer regulation, and more aggressive reactivity in social interactions (Maegden and Carlson, 2000), as well as poorer social self-control than children without ADHD (Van der Oord et al., 2005). These deficits in social self-control persisted even after accounting for differences in disruptive behavior, as children with ADHD-CT demonstrated more off-topic and hostile responses than typically functioning children in an analogue “chat room” task even after accounting for differences in Oppositional Defiant Disorder (Mikami et al., 2007).

Poor social self-control puts children at substantial risk for negative peer outcomes. The hierarchical tri-component model of social competence posits that inappropriate social behavior is a leading contributor to poor social status (Cavell, 1990). Indeed, studies have consistently indicated that poor social behavior, reactivity, and emotional dysregulation have all been linked to poorer peer relations in childhood (Rosen, Milich, & Harris, 2012; Stormshak, Bierman, Bruschi, et al., 1999; Semrud-Clikeman, 2010). Poor social self-control is a particularly important contributor to the peer problems of children with ADHD-CT. Studies have indicated that children with ADHD-CT demonstrate poorer self-control in social settings than children with ADHD-PI (Mikami et al., 2007; Semrud-Clikeman, 2010), whereas Solanto and colleagues (2009) noted that poor social self-control was linked to poorer parent-and teacher-rated peer relations for children with ADHD-CT but not ADHD-PI. Poor social self-control has been posited as a mechanism underlying the well-established finding that children with ADHD-CT come to be quickly disliked by their peers (Nixon, 2001).

Social Self-Control, Externalizing Behavior, and Peer Liking: A Mediation Model

There are well-established links between poor social self-control and externalizing behavior in children with ADHD (Greene, Biederman, Faraone, et al., 1996). Indeed, Vazsonyi and Huang (2010) demonstrated strong fit of a longitudinal model of social self-control and externalizing behavior, with social self-control in early childhood accounting for 44.8% of the variance of externalizing behavior in early childhood and significantly predicting trajectories of externalizing behavior into middle childhood. While many definitions of externalizing behavior include poor peer-oriented social self-control (i.e., hostile behavior, aggression, etc.; Hinshaw, 1992) they remain distinct and differentiable constructs. Externalizing behavior as typically defined encompasses not just negative behavior towards peers, but also a range of behaviors related to disobedience to adults (i.e., oppositional and defiant behavior). Similarly, many elements of poor social self-control (i.e. emotional reactivity, failure to moderate behavior according to social roles) may manifest in behaviors

that would not typically fall within the definition of externalizing behavior (Vazsonyi & Huang, 2010).

Developmental research has suggested that the relation of a child's behavior to the child's social acceptance by peers is substantially affected by the characteristics and norms of the social context in which the behavior occurs (Stormshak et al., 1999). The tri-component model of social competence explicitly recognizes that social performance is only one of many factors impacting social status and acceptance (Cavell, 1990). Researchers have thus proposed a transactional relationship between externalizing behavior and social preference, with externalizing problems both predicting and resulting from peer rejection in younger children (Sturaro et al., 2011). Indeed, studies have demonstrated that peers expressed significantly greater dislike of children who demonstrate greater externalizing behavior towards adults (i.e., oppositionality, defiance, failure to follow rules; Leflot, van Lier, Verschueren, Onghena, & Colpin, 2011), and indicated that the adult-oriented (rule-breaking) elements of externalizing behavior (i.e., failing to follow activity rules, complaining/whining) were significantly related to both concurrent peer liking and longitudinal *change* in peer liking (Mrug et al., 2007).

While deficits in social self-control have long been held to be a primary contributor to poor peer functioning of children with ADHD-CT (Nixon, 2001), there appears to be only a modest relation between changes in social performance and sociometric peer functioning among children with ADHD-CT. Wheeler and Carlson's (1994) model of peer functioning in children with ADHD proposed that externalizing behaviors served as an "interfering response" (p. 7) in the attempts of children with ADHD-CT to demonstrate appropriate social skills performance. Indeed, while negative peer-directed social behaviors (i.e., teasing, interrupting, aggressive behaviors) evidenced significant zero-order correlations with concurrent peer liking among children with ADHD, these correlations became non-significant when included simultaneously in a regression analysis with the adult-directed elements of externalizing behavior (Mrug et al., 2007). Social and behavioral norms are crucial and often overlooked contextual factors that impact peer perception. A social-contextual model of peer perceptions demonstrated that the relation of both positive and negative social behavior to peer ratings was moderated by the classroom-level frequency and acceptability of the behavior (Chang, 2004). These results suggest that the relation of poor social self-control to peer liking may be best examined in the context of externalizing behavior (i.e., violations of behavioral norms and expectations). We thus propose a simple statistical mediation model, whereby the relation of poor social self-control to concurrent peer disliking among children with ADHD-CT is fully statistically accounted for within the context of the rate of externalizing behaviors.

Research Questions

Previous research has documented the relations among social self-control, peer liking, and externalizing behavior; however, the possibility that externalizing behavior *accounts for* the impact of concurrent social self-control on peer liking has yet to be examined among children with ADHD-CT. Indeed, while the tri-component model posits a direct effect of social performance on social status, it also leaves open the possibility that this effect may be

mediated by factors not related to the child's social performance (including the child's externalizing behavior; Cavell, 1990). This study aims to present an initial examination of the above described mediation model by examining the direct and indirect relations of concurrent social self-control, externalizing behaviors, and peer liking. Given the demonstrated relations of externalizing behaviors to social self-control and peer liking, as well as the posited social-contextual theory that violations of environmental norms provide context for the perception of social behaviors, it is proposed that the rate of externalizing behaviors will fully statistically account for the concurrent relation of social self-control to peer liking among children with ADHD-CT.

Methods/Materials

Participants

Participants in this study included 172 children with ADHD-CT (136 boys and 36 girls) and their 1,298 same-sex classmates (1,026 boys, 272 girls) who served primarily as raters (opposite-sex children did not serve as sociometric raters in this study). All children with ADHD-CT were participants in the Multimodal Treatment Study of Children with ADHD (MTA) meeting DSM-IV criteria for a diagnosis of ADHD-CT and were 7.0–9.9 years of age at study entry ($M = 7.73$, $SD = 0.80$; MTA, 1999). Children in the MTA study were recruited across 6 sites. Children were in 1st – 4th grade at the time of initial assessment ($M = 2.27$, $SD = 0.89$). Sixty-seven percent of the children were Caucasian, 13% were Black/African-American, 5% were Hispanic/Latino, 12% were Multiethnic, and 3% were of other (Asian, Native American) or unspecified ethnicities. Thirty percent of the children had received medication treatment for ADHD prior to enrollment in the MTA study. However, medication treatment was discontinued for all children during the baseline assessments. All data were collected for the present study following the establishment of a diagnosis of ADHD-CT but prior to randomization into treatment conditions, thus data on specific treatment groups is not reported. Baseline sociometric measures were only collected at 3 of the 6 sites within the overall MTA study (collection of sociometric measures was optional for each site within the protocol, see Hoza et al., 2005a for more information). Measures were only collected for a subset of children at each site due to factors including school refusal, timing of data collection (i.e. during summer break), lack of consenting classmates, and staff limitations (Hoza et al., 2005a). Hoza and colleagues (2005a) reported that the subset of 172 children for whom sociometric measures were collected were representative of children within the overall MTA study, with no major differences on demographic, symptom severity, or diagnostic variables. Participant information from here forward refers exclusively to the subset of children in the MTA for whom sociometric ratings were completed, not to the larger sample of all children participating in the MTA study.

Procedure

Procedures for the recruitment and assessment of children within the MTA study have been previously described (i.e., Hinshaw, March, Abikoff, et al., 1997; MTA Collaborative Group, 1999a; 1999b). Specifically, a multi-site multiple-gating procedure was used to recruit children from both community and clinical sources, whereby families completed screening assessments by phone (phase 1), followed by a packet of questionnaires at home/

school (phase 2), followed by an in-person assessment (phase 3). All questionnaires in this study were completed during the second phase of the assessment process. Children were included in the present study if they were between the ages of 7.0–9.9 years, met full criteria for ADHD-CT, and did not meet criteria for any condition that could interfere with treatment (i.e., Autism Spectrum Disorder, Bipolar Disorder, psychosis, $IQ < 80$). All data were collected for the present study at the baseline assessment time point.

Peer sociometric measures were collected from all same-sex classmates for whom informed consent had been obtained. Opposite-sex raters were not used as young children have substantially more social interaction with same vs. opposite-sex classmates (i.e., Shrum, Cheek, & Hunter, 1988). No two children with ADHD-CT from the MTA study for whom sociometric data were collected were in the same classroom; thus children were each rated by a unique set of raters. Sociometric measures were administered individually to children in first and second grades ($N=106$, 61.6%) and group administered to children in third and fourth grades ($N=66$, 38.4%) unless a child had teacher-identified reading difficulties, in which case the measures were administered individually. Procedures for informed consent and the administration of sociometric measures have been previously described in detail (Hoza et al., 2005a; 2005b). Means and standard deviations of all measures are presented in Table 1, intercorrelations of all measures are presented in Table 2.

Measures

Social Self-Control

Social Skills Rating System – Self-Control scale: The Social Skills Rating System-Teacher (SSRS-T; Gresham & Elliot, 1989) is a teacher-reported measure that assesses broad social skills performance in children, and has been substantially validated across a broad range of populations (Matson & Wilkins, 2009). The SSRS-T is a 30 item measure that yields three subscales, including a 10-item Self-Control subscale that assesses children's abilities to control reactivity in social interactions (i.e., “compromises in conflict situations,” “controls temper in conflict situations,” “responds appropriately to teasing”). Psychometric analyses of the SSRS-T have found adequate support for the factor structure of the Self-Control subscale among children with ADHD (Van der Oord et al., 2005), and the SSRS Self-Control subscale has demonstrated validity as a measure of social self-control (Murray-Close et al., 2010; Vazsonyi & Huang, 2010). Eight of the ten items on the SSRS-T Self-Control explicitly refer to self-control in social situations with peers while two items (“Controls temper in conflict situations with adults,” “Receives criticism well”) either refer explicitly to adults or do not specify peer interactions. Given the current study's focus on examining peer social interactions in the context of externalizing behavior, analyses including the SSRS-T Social Self-Control subscale were conducted separately using a full (10-item) and peer-only (8 items) version of the scale. Reliabilities were acceptable within the present study for both the peer-only and full versions of the scale (α s = .82–.85)

Externalizing Behavior

Child Behavior Checklist/Teacher Report Form: The Child Behavior Checklist (CBCL; Achenbach, 1991) and Teacher Report Form (TRF; Achenbach, 1991) are commonly-used parallel parent-report (CBCL) and teacher-report (TRF) measures of a child's emotional and

behavioral functioning that yield two composites and eight problem subscales. Only the Externalizing Problems index was used in this study. Of note, the Externalizing Problems scales do *not* include symptoms of ADHD. The CBCL and TRF are widely-used and well-validated measures (Achenbach, 1991), and demonstrated acceptable reliability in the present study (alphas = .90–.95). The CBCL and TRF Externalizing Problems score were included within the current study as potential indicators of parent- and teacher-reported externalizing behaviors, respectively.

Swanson, Nolan, and Pelham Checklist for DSM-IV: The SNAP-IV (Swanson, 1992) is a commonly-used parallel parent and teacher rating scale that measures symptoms of ADHD and Oppositional Defiant Disorder (ODD) on a four point scale. Only the SNAP-IV ODD subscale was used in this study, as it is most analogous to and highly correlated with the Externalizing subscale on the CBCL (Langberg, Epstein, Loren, et al., 2009). The SNAP-IV ODD subscale does *not* include specific symptoms of ADHD and the SNAP-IV ADHD-specific subscales were *not* utilized as indicators in the current study, as the purpose of this study was to examine the mediating role of *externalizing* (i.e., oppositional and defiant) behaviors rather than symptoms of hyperactivity and/or inattention. The SNAP-IV ODD scale presents the eight symptoms of ODD and asks parents/teachers to report how frequently they occur on a four-point Likert scale (0 = not at all, 3 = very much), with responses composited to provide a single dimensional estimate of oppositional and defiant behavior. The SNAP-IV parent and teacher-reported ODD scales demonstrated acceptable reliability in the present study (alphas = .91–.92). The parent- and teacher-reported SNAP-IV ODD subscales were included within the current study's analyses as potential indicators of parent- and teacher-reported externalizing behaviors, respectively.

Peer Liking

Peer Sociometric Rating: Peer Liking was assessed using sociometric ratings according to the guidelines outlined by Hoza and colleagues (2005a; 2005b). Consented classmates of participants were given a list of all participating same-sex children in the classroom and asked to rate how much they liked the children on a 5-point Likert scale. The rating scale included both text anchors (1 = 'Really like,' 5 = 'Really do not like') and visual anchors (1 = smiling face, 5 = frowning face). Opposite-sex raters were not used as young children have substantially more social interaction with same vs. opposite-sex classmates (i.e., Shrum, Cheek, & Hunter, 1988). The Mean Liking scale was computed by averaging across the 5-point Likert scale ratings of the child by classmates, and reflected the degree to which the child was liked by his or her classmates ($M = 3.15$, $SD = 0.80$). Lower Mean Liking scores reflected *greater* liking within the classroom. One-way ANOVAs did not indicate any significant difference in Mean Liking by grade, gender, minority-status, or prior medication treatment, $F_s < .25$, $p_s > .10$.

Statistical Analytic Plan

Model Specification: The current study used structural equation modeling (SEM) to assess the fit of a structural model whereby externalizing behaviors statistically mediated the relation of social self-control to sociometric peer liking. A significant strength of this study was the ability to use distinct raters of each of the constructs of interest so as to assess

statistical mediation across raters. In order to minimize shared-rater effects and provide a more conservative test of mediation, raters were selected to provide the most ecologically valid assessment of each construct of interest. Accordingly, social self-control was assessed exclusively through teacher-ratings, externalizing behavior was assessed through both parent-and teacher-report ratings, and peer liking was assessed exclusively through peer ratings. Teachers were selected as informants of social self-control as they are able to directly observe the within-classroom social interactions that are most likely to influence the perceptions of a child's classmates. Parents and teachers were each selected as informants of externalizing behavior as they both represent valid raters of externalizing behavior (Achenbach, 1991) and inclusion of parents and teachers allows for the model to account for externalizing behavior across multiple settings (i.e., home, school, non-school activities). Parent-report of externalizing behavior also allowed for a rating that was source-independent from teacher-rated social self-control. Peer ratings were selected to assess peer liking given the substantial body of evidence supporting the validity of sociometric ratings in the assessment of peer perceptions (Hoza, 2007). Selection of teacher ratings of social skills performance and parent and teacher ratings of externalizing behavior also represented a conservative test of mediation, as the raters of social self-control (teachers) and peer liking (peers) shared a setting (i.e., classroom) that was not shared with one of the raters of externalizing behavior (parents). Thus, potential statistical mediation could not be attributed entirely to shared-rater or shared-environment variance.

The MTA study employed both parent- and teacher-rating scales of social self-control (MTA Collaborative Group 1999a; 1999b), which theoretically would allow for the specification of a multi-source latent construct within the model. However, previous studies have suggested minimal to low correspondence between parent- and teacher report of social skills performance (Van der Ord et al., 2005). Accordingly, correlation analyses were conducted to assess the interrelatedness of the proposed indicators to determine if the model would be better fit by indicating a single-source or multi-source latent construct. Correlation analyses indicated a significant but small correlation of teacher- and parent-rated SSRS Self-Control, $r(158) = .21$, suggesting that it was not appropriate to include teacher- and parent-rated social self-control in a single multi-source latent construct. Further support for the decision to use a single (teacher-rated) rather than multi-source construct to represent social self-control came from analysis of the items of the SSRS Self-Control that indicated the measure did *not* provide parallel teacher and parent report. Specifically, 8 of 10 items on the teacher scale explicitly reference peer interactions while only 3 of 10 items on the parent scale explicitly reference interactions with children (with 4 items explicitly referencing adult interactions). As this study sought to examine the mediating role of general externalizing behavior on the effects of social self-control in peer interactions on peer liking, only the teacher-reported SSRS Social Self-Control scale was included in the present study.

Similarly, the MTA Study provided parent- and teacher-report measures of externalizing behavior (MTA Collaborative Group 1999a; 1999b). In contrast to the measure of social self-control, the parent- and teacher-report measures of externalizing behavior were each developed to provide parallel report. Numerous studies have suggested that parents and teachers both provide valid ratings of a child's externalizing behavior (i.e., Achenbach, 1991), and inclusion of both parent and teacher report allowed the model to capture

externalizing difficulties across a broader range of settings (i.e., school, home, etc.). However, previous studies have suggested frequent discrepancy in parent and teacher report of externalizing behavior (Kolko & Kazdin, 1993). Correlation analyses noted significant moderate correlations of parent-report and teacher-report ratings of externalizing behavior (r s (156) = .30–.42, p s < .001), but also noted substantially greater correlations among the proposed indicators of externalizing behavior within-rater (parent-report: r (156) = .75–.78, p s < .001; teacher-report: r (158) = .81–.87, p s < .001) than across-rater. A model was thus specified whereby within-rater parent-reported and teacher-reported externalizing behavior were identified as separate latent constructs that were informed by a general across-rater externalizing behavior latent construct. Given that the parent- and teacher-rated indicators were designed as parallel measures, the CBCL-TRF and the parent and teacher SNAP pathways were freed to covary to control for within-measure variance. Only the general externalizing construct was specified to be directly associated with the social self-control or peer liking measures.

Model Testing: A three step analysis was conducted to assess for the presence of mediation, according to the recommendations of James and colleagues (2006). 1) A direct relation of teacher-rated social self-control with peer liking was assessed using simple regression. While many have indicated that a direct effect is not required to demonstrate mediation (i.e., MacKinnon, 2008), the direct effect was assessed in this study given the inconsistent relation of social behavior rating scales and sociometric measures across the research literature (Hoza et al., 2005). 2) In step 2, SEM was selected due to its ability to assess relations of latent constructs with multiple indicators and its substantially powerful method of controlling for measurement error (Kline, 2005). Externalizing behavior was introduced into the model as a full statistical mediator of the effect of social self-control on peer liking. Given the presence of missing data, the Monte Carlo Method for Assessing Mediation (MCMAM) was used to estimate indirect effects (MacKinnon, Lockwood, & Williams, 2004; Selig & Preacher, 2008). Invariance testing was conducted to assess for invariance across gender and prior medication history according to Kline's (2005) recommendation by assessing the significance of the χ^2 statistic for a model where all parameters are freed to vary by group in comparison to a model where all parameters are constrained to equality across groups. Finally, given that temporal directionality cannot be assumed given the cross-sectional nature of the data in the present study, alternative model testing was conducted in step 3 to assess the fit of an inverted mediation (social self-control as a mediator of externalizing behavior-peer liking) model. All SEM model testing was conducted using AMOS 20, whereas MCMAM testing was conducted using a publically available web-tool (Selig & Preacher, 2008). Missing data was estimated using full-information maximum likelihood estimation. Missing data occurred due to failure of parents or teachers to complete questionnaires within the study, and ranged from $n=6$ to $n=11$ across the questionnaires. Children were only included in the study if their peers had successfully completed peer sociometric ratings, thus no data was missing from the peer liking rating.

In all SEM analyses, model fit was assessed using $\chi^2/df < 3.0$, Comparative Fit Index (CFI) > .95, and Root Mean Square Error of Approximation (RMSEA) .08 according to Kline's (2005) recommended thresholds. Model fit was only considered acceptable if all three

indices (i.e., $\chi^2/df = 3.0$; CFI = 0.95; RMSEA = .08) met the recommended thresholds. Of note, although the raw chi-square (χ^2) statistic is reported, it was *not* used to determine model fit due to its extreme sensitivity to sample size. Instead, the normed chi-square ($\chi^2/df = 3.0$) statistic was used, due to its decreased sensitivity to sample size (Kline, 2005). Parameter significance was assessed through examination of the χ^2 statistic. Significant χ^2 indicates that the model fit is substantially worse with the parameter constrained to zero, and that the parameter thus contributes significant variance to the model (Loehlin, 2004).

To assess mediation, nested model testing was conducted to compare the fits of a constrained full mediation model whereby the social self-control to peer liking parameter was constrained to zero and an unconstrained model whereby the social self-control to peer liking parameter was freed to vary. Nested model testing was used to compare the goodness-of-fit of the mediation and unconstrained models. Goodness-of-fit is defined in the present study as the most parsimonious model that does not significantly worsen the fit of the model to the data (MacKinnon, 2008). Nonsignificant χ^2 in nested model testing indicates that model fit is not significantly worsened by constraining the social self-control to peer liking parameter to zero, and thus supports the appropriateness of the more parsimonious mediation model over the less parsimonious unconstrained model in accordance with the parsimony principle (Kline, 2005).

Results

Direct effects model testing

In step 1 of the model testing, simple regression was used to assess the direct relation of social self-control to peer liking. As expected, results indicated a small but significant effect of social self-control to peer liking such that children with poorer teacher-rated self control in social interactions were liked significantly less by classmates, $R^2 = .04$, $F(1, 159) = 6.61$, $\beta = -.20$, $p < .01$. Essentially identical results were obtained when using the 8 item peer interaction-only version of the SSRS Self-Control scale.

Mediation model testing

In step 2, a model was specified with externalizing behavior fully mediating the relation of teacher-rated social self-control to peer-rated liking. Direct relations were specified between social self-control and externalizing behavior and between externalizing behavior and peer liking, with the social self-control to peer liking parameter constrained to zero. The constrained mediation model had 10 unconstrained parameters and 172 participants, well above Kline's (2005) recommended minimum 10:1 participant-to parameter ratio. As hypothesized, SEM supported the overall fit of the full mediation model, $\chi^2(5, N = 172) = 8.17$, $p > .15$; $\chi^2/df = 1.63$; CFI = 0.99; RMSEA = .07 (see Figure 1). Parameter testing indicated that poorer social self-control was significantly related to greater rates of externalizing behavior, $\beta = -.74$, $\chi^2(1) = 86.86$, $p < .001$. As hypothesized, parameter testing indicated that higher rates of externalizing behavior were significantly related to lower peer liking, $\beta = .25$, $\chi^2(1) = 7.92$, $p < .01$. Nested model testing indicated that the full mediation model did not represent a significant worsening of fit over the unconstrained model, $\chi^2(1) = 0.42$, $p > .50$, supporting the adoption of the more parsimonious mediation

model over the less parsimonious unconstrained model. MCMAM testing of the social self-control to externalizing parameter ($b = -.43$, $SE = .12$) and externalizing to peer-liking parameter ($b = -.09$, $SE = .04$) indicated a small but significant indirect effect of social self-control, $\beta = -.19$, 95% CI LL = -0.09 , UL = -0.01 . Overall, the full mediation model accounted for approximately 7% of the variance in sociometric peer functioning, $R^2 = .07$. Results again were virtually identical when using the 8 item peer-interaction only version of the SSRS Self-Control scale.

Model invariance testing

Invariance testing examined whether the model was best fit by a one-group (invariant) or two-group (non-invariant) specification to assess the stability of the model across gender and prior medication history. In accordance with Kline's (2005) recommendations, invariance testing was conducted by assessing the difference in model fit (χ^2) between a model where all parameters are constrained to equivalence across groups (constrained/invariant model) and a model where all parameters are free to vary across groups (unconstrained/non-invariant model). Gender invariance testing indicated no significant worsening of fit by constraining the model across gender, $\chi^2(6) = 8.16$, $p > .15$, suggesting that use of the more parsimonious gender-invariant model acceptably fits the data. Similarly, model testing by prior medication history indicated no significant worsening of fit by constraining the model across groups, $\chi^2(6) = 5.61$, $p > .25$, suggesting that use of the more parsimonious single group model acceptably fits the data. Overall, results supported the invariance of the model across gender and medication history.

Alternative model testing

Given the cross-sectional relation of the variables in the mediation model, temporal mediation effects could not be analyzed. While substantial theoretical justification was evident to specify the direction of the parameters in the full mediation model, the model testing could not rule out the validity of an inverted mediation model whereby social self-control was a mediating rather than mediated variable. Accordingly, alternative model testing was conducted to assess the possibility that social self-control actually mediated the relation of externalizing behavior to peer liking rather than vice versa. An alternative mediation model was specified whereby externalizing behavior was directly related to social self-control, social self-control was directly related to peer liking, and the relation of externalizing behavior to peer liking was constrained to zero. Model testing failed to support the overall fit of the alternative mediation model, as one of the three indicators of fit exceeded recommended thresholds, $\chi^2(5, N = 172) = 12.70$, $p < .05$; $\chi^2/df = 2.54$; CFI = 0.98; RMSEA = .11, all three indicators of model fit were worse for the alternative mediation model than for the unconstrained model ($\chi^2/df = 1.94$; CFI = 0.99; RMSEA = .09), and nested model testing indicated that the alternative mediation model represented a significantly worse fit than the unconstrained model. $\chi^2(1) = 4.96$, $p < .05$. Alternative model testing thus did not support the alternative model of social self-control as a mediator rather than mediated variable. These results were virtually identical when using the 8-item peer interaction-only version of the SSRS-T Social Self-Control scale.

Discussion

The primary goal of this study was to examine the proposed model of externalizing behavior as a mediator of the relation between social self-control and peer liking of children with ADHD-CT. Results supported the proposed model. As hypothesized, structural equation modeling indicated that a significant direct relation of teacher-rated social self-control to peer-rated liking was fully statistically accounted for by externalizing behavior. Specifically, analyses indicated that the rate of externalizing behavior fully accounted for the statistical relation between social self-control and peer liking, such that the more parsimonious mediation model whereby the relation of social self-control to peer liking was constrained to zero did not result in any significant worsening of fit over the unconstrained model. Notably, this study supported the proposed mediation model despite employing a conservative cross-rater approach to control shared-rater variance. Results indicated poorer teacher-rated social self-control was associated with greater externalizing behavior, which was in turn linked to poorer peer-rated liking. To date, research has focused primarily on either social performance deficits *or* externalizing behavior as predictors of peer functioning with few, if any, studies examining possible mediators within this relation. However, existing models of social interaction specify that the relation of social performance and peer functioning may be mediated by a third construct such as externalizing behavior (Cavell, 1990) This study replicates prior research establishing direct relations among social self-control, externalizing behavior and peer functioning, and provides empirical support for the proposed model of externalizing behavior as *fully statistically accounting* for the relations of social self-control to peer liking.

Implications

Poor self-control and resulting socially inappropriate behavior in peer interactions has long been held to be a key reason that peers dislike and reject children with ADHD-CT. The findings of the current study are consistent with this hypothesis, as poor social self-control was directly linked to low ratings of peer liking. However, considerable questions remain as to the role of other factors in peer preferences, as children with ADHD-CT often continue to be actively disliked and rejected by their peers even when social behavior and ADHD-CT symptomatology improve (Hoza et al., 2005b). Chang's (2004) social-contextual model demonstrated that the effects of both positive and negative social behavior to peer preferences are moderated by the environmental (i.e., classroom) acceptability of their behavior, suggesting that it is not so much the negative social behavior as the violating of more broad environmental behavioral norms (i.e., externalizing behavior) that leads to peer dislike and rejection. Externalizing behavior has well-documented effects on peer preferences, as children overwhelmingly prefer well-behaved children over children with externalizing behaviors (Hinshaw & Melnick, 1995; Mrug et al., 2007).

The present study demonstrated that not only are externalizing behaviors associated with peer dislike, they fully statistically account for the relation of social self-control to peer liking. Not surprisingly, children in the present study with higher rates of externalizing behaviors were disliked more than children with lower rates of externalizing behavior. These effects suggest that externalizing behavior may represent a critical factor in the development

of social impairment across settings by providing a social-environmental context in which socially negative behavior occurs. For example, externalizing behaviors play a key role in the development of a negative reputation amongst one's peers, which is a powerful predictor of current and future peer disliking even in the absence of continued negative social behavior (Bierman, 2004; Milich, MacAninch, & Harris, 1992). These findings are especially sobering given that children with ADHD-CT are more likely than typically-functioning children to be both rejected by their peers and demonstrate markedly higher rates of disruptive behavior during a developmental period (school age) where children form univalent, stable, and change-resistant impressions of their peers (Hoza, et al., 2005a). The results of the present study provide continuing empirical support to the notion that externalizing behavior may contribute as much (if not more) as social behavioral deficits to the development of poor peer relations among children with ADHD-CT as (see Hoza, 2007 for a review).

Poor peer relations are among the most well-documented and most entrenched areas of impairment among children with ADHD-CT (Hoza, 2007). Social performance interventions have routinely failed to improve children's actual peer relationships despite their widespread use and varying effectiveness in improving the social performance of children with ADHD-CT (Pelham & Fabiano, 2008). Similarly, studies have demonstrated that children with ADHD-CT continue to be disliked by peers following reductions in core symptoms of ADHD (i.e., inattention, hyperactivity; Hoza et al., 2005b). The findings of the current study suggest that externalizing behaviors may play an even greater role in the development and maintenance of poor peer relationships than previously reported, as externalizing behaviors completely accounted for the statistical relation between social self-control and peer liking. It appears that externalizing behavior in itself is a key factor relating to peer functioning, at least for children with combined-type ADHD.

The results of the present study suggest that the role of externalizing behaviors is paramount in the relation between social self-control and peer relations. Given that children with ADHD-CT are rejected within even a short period amongst previously unfamiliar peers (Pelham & Bender, 1982; Erhardt & Hinshaw, 1994) and that initial peer rejection persists regardless of the persistence of negative behavior (Bierman, 2004), early interventions targeting the externalizing behaviors of children with ADHD-CT are imperative in improving peer functioning and decreasing the risk of negative outcomes associated with ADHD-CT and peer rejection. Given the robustness of peer rejection and effects of peer reputation, interventions may also need to focus on ensuring that reductions in externalizing behavior among children with ADHD-CT are noted and assimilated by peers to reduce the effects of past externalizing behavior on current reputation and peer functioning among peers. This argument is consistent with Mrug and colleagues' (2007) findings that improvements in rule-following behavior was among the few variables that predicted improvement in sociometric peer functioning for children with ADHD-CT.

Limitations

The present study presents encouraging support for the mediating role of externalizing behavior; however, there are several limitations that must be noted. Notably, the present

study represented an initial cross-sectional investigation of the relations among concurrent social self-control, externalizing behavior, and peer liking. Thus it was not possible to determine the developmental sequence, temporal direction, or longitudinal outcomes of the relations of the constructs of interest. The relation of peer dislike and disruptive behavior is reciprocal, as studies have indicated that peer rejection both predicts and is predicted by externalizing behaviors and aggression (Dodge, Lansford, Burks, et al., 2003; Murray-Close et al., 2010). Future studies are necessary to determine how the relations of social self-control, externalizing behavior, and peer liking are affected by changes over time and how these changes differ according to treatment groups. However, whereas the present study was not able to assess for the temporal direction of the relations of the constructs of interest, alternative model testing did lend cross-sectional support to the proposed mediation model. Specifically, alternative model testing failed to support social self-control as a mediating rather than mediated variable.

Although the results of the study indicated that externalizing behaviors fully account for the relation of social self control to peer liking, the effect size of the mediation model of peer liking was relatively small. Many factors affect peer perceptions and peer liking (see Hoza, 2007 for a review), and the model accounted for only a limited amount of the variance in peer liking. Poor peer functioning is among the most entrenched areas of impairment and is often maintained by peer perceptions and reputations (Milich et al., 1992). Accordingly, substantial improvement in peer functioning will likely require other intervention in addition to reductions in externalizing behavior. Indeed, as previously noted, children in the MTA study continued to demonstrate poor peer functioning following treatment despite notable reductions in externalizing behavior (Hoza et al., 2005b). However, the results of this study suggest that reduction of externalizing behavior is a necessary (if not sufficient) precursor to improving peer functioning of children with ADHD.

An additional limitation concerns the measure of social self-control employed by the present study. Cavell's (1990) tripartite model establishes distinctions between social *skills* and social *behavior*, and suggests that each construct may have differential effects on social adjustment. The SSRS provides a broad assessment of self-control of behavior in social interactions (i.e., resisting reactivity to conflict, controlling impulsivity), but does not measure either implicit social skills (e.g., making eye contact, reading social cues, etc.) or explicit knowledge of social skill behaviors (e.g., initiating social interactions, prosocial behavior, etc.). It is possible that implicit or explicit social skill knowledge demonstrates a different pattern of relation to externalizing behavior and peer functioning than that demonstrated by social self-control. However, numerous studies have suggested that the social deficits observed among children with ADHD-CT reflect poor self-control of social behavior rather than social skills deficits (Semrud-Clikeman, 2010), suggesting that poor social self-control may be more relevant to the poor peer functioning of children with ADHD-CT than social skills. Similarly, this study only assessed the effects of social self-control and externalizing behavior on peer liking, not on other sociometric variables. Accordingly, this study only assessed how much children with ADHD-CT were liked by their peers, which may not reflect the degree to which they are actually nominated as social partners or friends by their classmates. However, studies have demonstrated correlation

between peer ratings of like/dislike and peer measures of social preference (Hoza et al., 2005a), suggesting that peer liking provides a valid proxy for peer social preference.

Finally, the sample selected for this study presented limitations. This study was conducted in the context of a large multi-site study of children with ADHD-Combined Type, thus the findings of this study cannot be assumed to generalize to children with other subtypes of ADHD or typically-functioning children. Similarly, participants in this study were overwhelmingly male. While the ratio of boys to girls was consistent with previous samples of children with ADHD-CT (MTA, 1999a), it limited the ability to assess for gender effects within model testing. Specifically, while model invariance testing supported a gender-invariant model and supplemental model testing produced a similar pattern of results for boys as for mixed-gender children, the small sample size did not allow for comparative testing of the model for girls. Given gender differences in externalizing behavior (Crick & Grotpeter, 1995), further research is recommended to determine how gender affects the role of externalizing behavior as a mediator of the relation of social skills performance to social status.

Conclusion

Poor peer relationships have tremendous negative effects on children's academic, behavioral, and emotional well-being. The current study represents a critical step forward in understanding the role of externalizing behaviors in the social impairment of children with ADHD. A wealth of literature has documented the negative impact of externalizing behavior on peer relationships for children with ADHD. The findings of the present study provide empirical support for the direct effect of externalizing behavior on peer perceptions and the mediating role of externalizing behaviors in the relation of social self-control to peer liking. It is critical that interventions incorporate behavioral, social, and peer components to address the pernicious and pervasive social difficulties experienced by children with ADHD.

Acknowledgments

Supported in part by NIMH: R01 MH62583

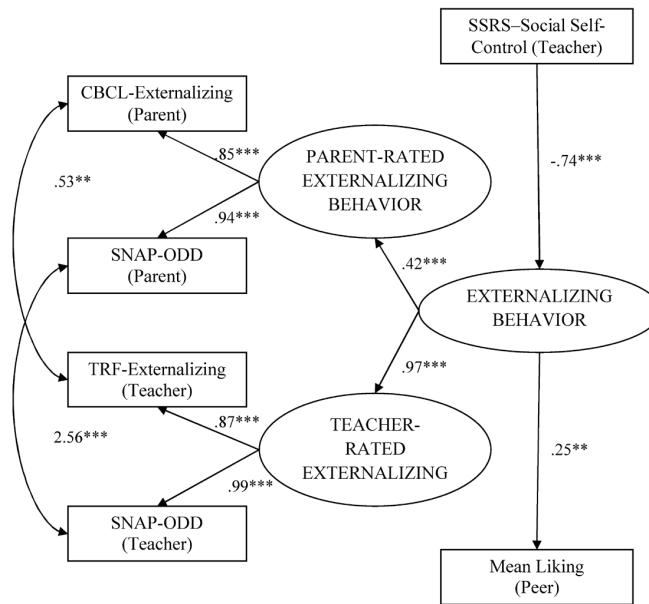
References

- Achenbach, TM. Integrative guide for the 1991 CBCL/4–18, YSR, and TRF profiles. University of Vermont, Department of Psychiatry; Burlington, VT: 1991.
- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. Fourth Edition - Text Revision. American Psychiatric Association; Washington, DC: 2000.
- Bierman, K. Peer Rejection: Developmental Processes and Intervention Strategies. Guilford; New York, NY: 2004.
- Cavell TA. Social adjustment, social performance, and social skills: A tri-component model of social competence. *Journal of Clinical Child Psychology*. 1990; 19(2):111–122.
- Chang L. The role of classroom norms in contextualizing the relations of children's social behaviors to peer acceptance. *Developmental Psychology*. 2004; 40(5):691–702.
- Crick NR, Grotpeter JK. Relational aggression, gender, and social-psychological adjustment. *Developmental Psychology*. 1995; 66:710–722.
- Dodge K. Behavioral antecedents of peer social status. *Child Development*. 1983; 54:1386–1399.

- Dodge K, Lansford JE, Burks VS, Bates JE, Pettit GS, et al. Peer rejection and social information processing factors in the development of aggressive behavior problems in children. *Child Development*. 2003; 74(2):374–393. [PubMed: 12705561]
- Erhardt D, Hinshaw SP. Initial sociometric impressions of attention-deficit/hyperactivity disorder and comparison boys: Predictions from social behavior and nonsocial variables. *Journal of Consulting and Clinical Psychology*. 1994; 62:833–842. [PubMed: 7962888]
- Greene RW, Biederman J, Faraone SV, Oulette CA, Penn C, Griffin SM. Toward a new psychometric definition of social disability in children with Attention-Deficit/Hyperactivity Disorder. *JAACAP*. 1996; 35(5):571–578.
- Gresham, FM.; Elliott, SN. *Social Skills Rating System - Parent, Teacher, and Child Forms*. American Guidance Systems; Circle Pines, MN: 1989.
- Hinshaw SP. Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin*. 1992; 111(1):127–155. [PubMed: 1539086]
- Hinshaw SP, Melnich SM. Peer relationships in boys with attention-deficit/hyperactivity disorder with and without comorbid aggression. *Development and Psychopathology*. 1995; 70:1086–1098.
- Hinshaw SP, March JS, Abikoff H, Arnold LE, Cantwell DP, et al. Comprehensive assessment of childhood ADHD in the context of a multisite multimodal clinical trial. *Journal of Attention Disorders*. 1997; 1(4):217–234.
- Hoza B. Peer functioning in children with ADHD. *Journal of Pediatric Psychology*. 2007; 32(6):655–663. [PubMed: 17556400]
- Hoza B, Gerdes AC, Mrug S, Hinshaw SP, Burkowski WM, et al. Peer-assessed outcomes in the Multimodal Treatment Study for Children with Attention-Deficit/Hyperactivity Disorder. *Journal of Clinical Child and Adolescent Psychology*. 2005a; 34:74–86. [PubMed: 15677282]
- Hoza B, Mrug S, Gerdes AC, Hinshaw SP, Bukowski WM, et al. What aspects of peer relationships are impaired in children with Attention-Deficit/Hyperactivity Disorder? *Journal of Consulting and Clinical Psychology*. 2005b; 73(3):411–423. [PubMed: 15982139]
- James LR, Stanley SA, Brett JM. A tale of two methods. *Organizational Research Methods*. 2006; 9:233–244.
- Kline, RB. *Principals and practice of structural equation modeling*. 2nd ed.. Guilford; New York, NY: 2005.
- Kolko DJ, Kazdin AE. Emotional/behavior problems among clinic and nonclinic children: Correspondence among child, parent, and teacher reports. *Journal of Child Psychology and Psychiatry*. 1993; 34(6):991–1006. [PubMed: 8408380]
- Langberg JM, Epstein JN, Loren REA, Simon JO, Arnold LE, et al. Parent agreement on ratings of children's Attention Deficit/Hyperactivity Disorder and broadband externalizing behaviors. *Journal of Emotional and Behavioral Disorders*. in press.
- Leflot G, van Lier PAC, Verschueren K, Onghena P, Colpin H. Transactional associations among teacher support, peer social preference, and child externalizing behavior: A four-wave longitudinal study. *Journal of Clinical Child and Adolescent Psychology*. 2011; 40(1):87–99. [PubMed: 21229446]
- Loehlin, JC. *Latent variable models: An introduction to factor, path, and structural equation analysis*. 4th edition. Erlbaum; Mahwah, NJ: 2004.
- MacKinnon, DP. *Introduction to Statistical Mediation Analysis*. Taylor & Francis; New York, NY: 2008.
- MacKinnon DP, Lockwood CM, Williams J. Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*. 2004; 39:99–128. [PubMed: 20157642]
- Maegden JW, Carlson CL. Social functioning and emotion regulation in the Attention Deficit Hyperactivity Disorder subtypes. *Journal of Clinical Child Psychology*. 2000; 29(1):30–42. [PubMed: 10693030]
- Matson JL, Wilkins J. Psychometric testing methods for children's social skills. *Research in Developmental Disabilities*. 2009; 30:249–274. [PubMed: 18486441]

- Mikami AY, Huang-Pollock CL, Pfiffner LJ, McBurnett K, Hangal D. Social skills differences among Attention-Deficit/Hyperactivity Disorder types in a chat room assessment task. *Journal of Abnormal Child Psychology*. 2007; 35:509–521. [PubMed: 17354064]
- Mikami AY, Jack A, Emeh CC, Stephens HF. Parental influence o children with Attention-Deficit/Hyperactivity Disorder: I. Relationships between parent behaviors and child status. *Journal of Abnormal Child Psychology*. 2010; 38:721–736. [PubMed: 20339912]
- Milich R, McAnninch CB, Harris MJ. Effects of stigmatizing information on children's peer relations: Believing is seeing. *School Psychology Review*. 1992; 21:400–409.
- Mrug S, Hoza B, Gerdes AC, Hinshaw SP, Arnold LE, et al. Discriminating between children with ADHD and classmates using peer variables. *Journal of Attention Disorder*. 2009; 12(4):372–380.
- Mrug S, Hoza B, Pelham WE, Gnagy EM, Greiner A. Behavior and peer status in children with ADHD: Continuity and change. *Journal of Attention Disorders*. 2007; 10:359–371. [PubMed: 17449835]
- Murray-Close D, Hoza B, Hinshaw SP, Arnold LE, Swanson J, et al. Developmental processes in peer problems of children with attention-deficit/hyperactivity disorder in The Multimodal Treatment Study of Children with ADHD: Developmental cascades and vicious cycles. *Development and Psychopathology*. 2010; 22:785–802. [PubMed: 20883582]
- MTA Cooperative Group. A 14 month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry*. 1999a; 56:1073–1086. [PubMed: 10591283]
- MTA Cooperative Group. Moderators and mediators of treatment response for children with attention-deficit/hyperactivity disorder: the Multimodal Treatment Study of Children with Attention-Deficit/Hyperactivity Disorder. *Arch Gen Psychiatry*. 1999b; 56:1088–1096. [PubMed: 10591284]
- Nixon E. The social competence of children with ADHD: A review of the literature. *Child Psychology & Psychiatry Review*. 2001; 6(4):172–180.
- Pelham WE, Bender ME. Peer relationships in hyperactive children: Description and treatment. *Advances in Learning & Behavioral Disabilities*. 1982; 1:365–436.
- Pelham WE, Fabiano GA. Evidence-based psychosocial treatments for Attention-Deficit/Hyperactivity Disorder. *Journal of Clinical Child & Adolescent Psychology*. 2008; 37(1):184–214. [PubMed: 18444058]
- Rosen PJ, Milich R, Harris MJ. Dysregulated negative emotional reactivity as a predictor of chronic peer victimization in childhood. *Aggressive Behavior*. 2012; 38(5):414–427. [PubMed: 22707083]
- Selig, JP.; Preacher, KJ. Monte Carlo method for assessing mediation: An interactive tool for creating confidence intervals for indirect effects [Computer software]. Jun. 2008 Available from <http://quantpsy.org/>
- Semrud-Clikeman M. The role of inattention and social perception and performance in two subtypes of ADHD. *Archives of Clinical Neuropsychology*. 2010; 25:771–780. [PubMed: 20926493]
- Shrum W, Cheek NH, Huner SM. Friendship in school: Gender and racial homophily. *Sociology of Education*. 1988; 61(4):227–239.
- Solanto MV, Pope-Boyd SA, Tryon WW, Stepak B. Social functioning in predominantly inattentive and combined subtypes of children with ADHD. *Journal of Attention Disorders*. 2009; 13(1):27–35. [PubMed: 19372497]
- Stromshak EA, Bierman KL, Brushci C, Dodge KA, Coie JD, Conduct Problems Prevention Research Group. The relation between behavior problems and peer preference in different classroom contexts. *Child Development*. 1999; 70(1):169–182. [PubMed: 10191521]
- Struaro C, van Lier PAC, Cuijpers P, Koot HM. The role of peer relationships in the development of early school-age externalizing problems. *Child Development*. 2011; 82(3):758–765. [PubMed: 21410917]
- Swanson, JM. *School-Based Assessments and Interventions for ADD Students*. K. C. Publications; New York, NY: 1992.
- Van der Oord S, Van der Meulen EM, Prins PJM, Oosterlaan J, Buitelaar JK, Emmelkamp PMG. A psychometric evaluation of the social skills rating system in children with attention deficit hyperactivity disorder. *Behaviour Research and Therapy*. 2005; 43:733–746. [PubMed: 15890166]
- Vazsonyi AT, Huang L. Where self-control comes from: On the development of self-control and its relationship to deviance over time. *Devt. Psychology*. 2010; 46(1):245–257.

- Whalen CK, Henker B. The social profile of attention-deficit/hyperactivity disorder: Five fundamental facets. *Child & Adolescent Psychiatric Clinics of N. Amer.* 1992; 1:395–410.
- Wheeler J, Carlson CL. The peer functioning of children with ADD with Hyperactivity and ADD without Hyperactivity: A comparison of their peer relations and social deficits. *Journal of Emotional and Behavioral Disorders.* 1994; 2(1):2–12.



Note: Raters are listed in parenthesis. Error terms for all variables were omitted from figure to make the diagram easier to read.

N = 172, * $p < .05$. ** $p < .01$, *** $p < .001$.

Figure 1.
Full mediation model with standardized regression weights.

Table 1

Means and SDs of indicators in structural model.

<i>Measure</i>	<i>M</i>	<i>SD</i>
1. SSRS – Social Self Control (Teacher) *	8.80	3.79
2. CBCL-Externalizing (Parent) *	20.64	9.82
3. SNAP-Oppositional-Defiant (Parent) *	11.82	5.98
4. TRF-Externalizing (Teacher) *	26.95	13.98
5. SNAP-Oppositional-Defiant (Teacher) *	10.27	6.72
6. Mean Liking (Peer)	3.15	0.80

Note: N = 172.* Scores are mean summed totals of raw scores, *not* T scores

Table 2

Correlations of indicators in structural model.

Measure	1	2	3	4	5
1. SSRS – Social Self-Control (Teacher)	.--				
2. CBCL-Externalizing (Parent)	-.24**	--			
3. SNAP-Oppositional-Defiant (Parent)	-.26***	-.79***	--		
4. TRF-Externalizing (Teacher)	-.62***	.42***	.31***	--	
5. SNAP-Oppositional-Defiant (Teacher)	-.70***	.38***	.30***	.87***	--
4. Mean Liking (Peer)	-.20**	.24**	.25***	.17*	.24**

Note: N = 172*
 $p < .05$.**
 $p < .01$,***
 $p < .001$.