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Overt and Relational Aggression in Girls With Attention Deficit Hyperactivity Disorder

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We employed a multi-informant approach to examine attention deficit hyperactivity disorder (ADHD) subtype differences, as well as ADHD versus comparison group differences, in overt aggression, relational aggression, and peer regard related to such aggression. Participants included 228 girls (ages 6 to 12 years) diagnosed with either ADHD–Combined (ADHD–C; n = 93), ADHD–Inattentive (ADHD–I; n = 47), or nondiagnosed comparisons (n = 88) who attended research-based summer camp programs. Girls with ADHD–C exhibited higher rates of overt and relational aggression than did girls with ADHD–I, who in turn exhibited higher rates than comparison girls. For the ADHD–C subgroup, aggressive behavior was associated with both negative peer regard and lack of positive peer regard; for the ADHD–I subgroup, aggressive behavior was related to negative peer regard but not to positive peer regard. Controlling for subtype, relational aggression contributed incremental variance in peer regard over and above overt aggression, but effects for the latter were stronger. We discuss the importance of overt versus relational aggression for girls with ADHD as well as disparities in findings according to informant sources.

In the past decade, attention deficit hyperactivity disorder (ADHD) has garnered a tremendous amount of attention in the psychological, psychiatric, and pediatric literatures, as well as in the popular press. This focus is understandable, given that ADHD is perhaps the most commonly diagnosed disorder of childhood (e.g., Robison, Sclar, Skaer, & Galin, 1999; Scahill & Schwab-Stone, 2000), affecting from 3% to 7% of school-age children (American Psychiatric Association [APA], 2000). Overall, the impairment associated with ADHD is severe. In addition to suffering from the core features of ADHD (i.e., inattention, disorganization, hyperactivity, and impulsivity; APA, 2000), children diagnosed with this disorder also show marked impairment in peer relationships (Bagwell, Molina, Pelham, & Hoza, 2001; Hinshaw & Melnick, 1995; Hodgens, Cole, & Boldizar, 2000) and often display associated aggression (Waschbusch, 2002).

The empirical attention that has been directed toward this disorder, however, has suffered from a problem ubiquitous in the social science and biomedical fields—that of male-dominated focus (National Institutes of Health, 1994). Although recent reviews of current literature on girls with ADHD have been valuable (e.g., Arnold, 1996; Gaub & Carlson, 1997; Gershon, 2002), extant investigations typically focus on sex differences per se (i.e., comparisons of boys vs. girls; Biederman et al., 2002; Greene et al., 2001) as opposed to examining variability that exists among girls with this disorder (e.g., Hinshaw & Blachman, in press). Efforts in our research group have attempted to redress this lack of in-depth focus on girls with ADHD. For example, Hinshaw (2002) provided a descriptive overview of this sample, detailing subgroup differences across a wide range of measures, including assessment of social functioning. This investigation expands on Hinshaw by providing fine-grained, multi-informant analyses of two aspects of social functioning: aggression and peer regard. Our goal is to examine the range of ADHD symptomatology and secondary aggression for girls with this disorder, as well as to examine negative peer regard associated with such primary and secondary symptoms.

Previous studies suggest that the ratio of boys to girls with the disorder ranges from 4:1 to 9:1 in clinic settings, and from 2:1 to 3:1 in nonclinical samples (APA, 2000; Gaub & Carlson, 1997; Hinshaw & Blachman, in press), with the strong implication that girls are less apt to exhibit the externalizing symptoms that are likely to account for the disproportionate clinic referral for boys. Overall, girls with ADHD who are referred for assessment and treatment appear to display

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equivalent types and degrees of impairment to referred boys, across multiple domains of functioning (Gaub & Carlson, 1997; Gershon, 2002; Hartung et al., 2002). Among adolescents with ADHD, there is even the suggestion that girls can show greater impairment (particularly related to internalizing symptomatology and self-perceptions) than do boys (Rucklidge & Tannock, 2001).

An ongoing theoretical and empirical debate in ADHD research involves how best to subtype the heterogeneous group of symptoms that compose ADHD (see Milich, Balentine, & Lynam, 2001). In the current nomenclature (*Diagnostic and Statistical Manual of Mental Disorders,* 4th ed., text rev. [*DSM–IV–TR*], APA, 2000), ADHD is subtyped into either (a) predominantly hyperactive–impulsive type (ADHD–H–I), (b) predominantly inattentive type (ADHD–I), or (c) combined type (ADHD–C). ADHD–H–I, characterized by excessive talking, fidgetiness, and excessive motoric activity, is especially pertinent for preschool children (Lahey et al., 1998). Because the focus of our investigation is on school-age girls and because of our desire to preserve maximum statistical power for key Inattentive versus Combined type contrasts, we excluded girls meeting criteria for ADHD–H–I. Children with ADHD–I display marked difficulties with sustained attention, disorganization, forgetfulness, and distractibility (APA, 1994); they have also been described as more socially withdrawn (Edelbrock, Costello, & Kessler, 1984) or "shy" (Hodgens et al., 2000) in peer interactions than children with ADHD–C or ADHD–H–I. Girls with ADHD are more likely to be diagnosed with ADHD–I than with the other two ADHD subtypes (Hinshaw & Blachman, in press).

Children who meet criteria for ADHD–C are more likely than those with ADHD–I to have behavior problems marked by oppositionality, defiance, and aggression (Hinshaw, 1994). From investigations of predominantly male samples, it is known that children with ADHD–C display high comorbidity rates with oppositional defiant disorder (ODD) and conduct disorder (CD; Biederman, Newcorn, & Sprich, 1991). Furthermore, although interpersonal problems are characteristic of each subtype of ADHD, boys with ADHD–C have been found to be more likely to be actively disliked by their peers (as opposed to merely neglected) than are boys with ADHD–I (Carlson & Mann, 2000; Hinshaw, 1994).

One of the most serious areas of impairment for children with ADHD concerns peer relationships. Their intrusive style of social interaction and lack of ability to read social cues contributes to high rates of peer rejection (Hinshaw & Melnick, 1995; Hodgens et al., 2000). Because it is normative for girls to display less physical activity than boys, the social costs for girls with ADHD can be particularly problematic. In fact, they can incur higher rates of rejection than boys with the disorder (Berry, Shaywitz, & Shaywitz, 1985; Greene et al., 2001). Furthermore, the frequent comorbidity of ADHD with aggression has been shown to have an even stronger impact on peer rejection (Bagwell et al., 2001; Milich & Landau, 1988) than does ADHD alone. This direct association with peer rejection is problematic because it has been shown to be a robust predictor of negative long-term outcomes such as school dropout, criminality, and adult psychopathology for boys (McDougall, Hymel, Vaillancourt, & Mercer, 2001; Parker & Asher, 1987). Long-term studies of overt aggression in girls with ADHD have yet to be conducted. The cross-sectional data presented here represent a first step in this important line of research.

The literature on aggression similarly has focused on boys and men, although expanded efforts toward understanding aggression in girls and women are increasingly evident (e.g., Björkqvist & Niemelä, 1992; Moffitt & Caspi, 2001). In general, girls are less likely than boys to exhibit overtly aggressive behavior (Crick, Casas, & Mosher, 1997; Lahey et al., 2000). Importantly, however, girls appear to be more inclined to use relational rather than physical aggression, with relational aggression defined as harming others by purposefully damaging or manipulating their peer relationships, such as by gossiping, spreading rumors, or excluding others from the peer group (Crick & Grotpeter, 1995). Patterns of relational aggression in female peer groups begin to occur as early as preschool (Crick et al., 1997) and appear to continue into the teenage and young adult years (Linder, Crick, & Collins, 2002; Werner & Crick, 1999). Indeed, female patterns of excluding—gossiping, rivalry, and jealousy—are thought to be salient from childhood throughout adulthood, although over time these behaviors take on different forms depending on developmental norms (Apter & Josselson, 1998). Although girls' overt aggression has been found to be robustly correlated with negative outcomes such as peer rejection, girls' relational aggression has been shown to predict future social maladjustment *beyond* what is predicted by overt aggression (Crick, 1996).

To our knowledge, the question of the extent to which girls with ADHD exhibit relational aggression—as well as the effects of such aggressive behavior on their peer relationships—has not been given empirical attention. We therefore can only speculate about the relation between relational aggression and the characteristic social deficits in girls with ADHD, recognizing that this relation depends largely on how behaviors that constitute relational aggression are conceptualized. For example, if we conceptualize relationally aggressive behaviors (e.g., social scheming; manipulating others for one's own gain) as organized and well planned, implicating a fair amount of control and skill in their execution, we would therefore expect this construct to have an inverse relation with ADHD

(in particular, the Combined subtype), a disorder that is characterized by disorganization and social deficits. If, however, we conceptualize manipulative, scheming behaviors as impulsive and driven by charged emotional reactivity, then we would expect a plethora of relational aggression in girls with ADHD as well as a strong and positive relation between relational aggression and negative peer regard.

Overall, our key objective is to examine the social behavior of girls with ADHD in a naturalistic context (i.e., a summer camp), in which ADHD symptomatology and social behavior can be observed with ecological validity. The all-girl sample afforded the opportunity to observe exclusively female social groups, which have been shown to differ in their dynamics from boys or mixed-sex groups (Maccoby, 1998). Our sample, one of the largest preadolescent sample of girls with ADHD of which we are aware (see also Biederman et al., 1999), was administered a thorough and rigorous evaluation battery that differentiated participants into either ADHD–I or ADHD–C subtypes. Our assessments at the summer programs included objective measurements (e.g., ratings of aggression) and featured multimethod, multi-informant approaches.

We hypothesized the following: (a) the degree of overt aggression will be higher for girls diagnosed with ADHD–C type than either for ADHD–I or comparison girls; (b) the degree of relational aggression will be higher for girls with ADHD, regardless of subtype, than for nondiagnosed girls; and (c) both types of aggression will have a negative effect on peer regard across subtypes. Finally, although we predicted that overt aggression will show a stronger association to peer regard than relational aggression, we hypothesized that relational aggression will still contribute incremental variance in peer sociometric indicators when the influence of overt aggression is statistically controlled. We made the latter prediction on the basis of evidence such as that of Crick (1996), in which relational aggression was found to provide unique predictive power for girls.

Method

Overview

Data were collected during three research summer day camps conducted in 1997 (n = 79), 1998 (n = 77), and 1999 (n = 72). For each year, we collected data in three phases. In the first phase, participants were recruited from multiple sources, and screening measures were sent to parents (and their children's grade-school teachers) who inquired about our program. In the second phase, children were administered a thorough assessment battery, and their parents completed questionnaires and were interviewed. During the third phase, our participants were observed while they participated at a summer camp, during which staff counselors completed behavior ratings, and each participant provided peer sociometric nominations for her classmates. Girls with ADHD and comparison girls interacted together; with few exceptions, the girls were unfamiliar with one another prior to the summer programs. The overall objective was to have a program blending naturalism and rigor. Hinshaw (2002) presented a wide range of descriptive data on externalizing and internalizing behaviors and comorbidities, cognitive and academic performance, parenting practices, and background on the same sample of children utilized in this study. Herein, we expand on this descriptive analysis by providing a nuanced, multi-informant analysis of aggression and peer regard in ADHD subtypes and by examining the predictive relations between overt versus relational aggression and peer regard. Other recent publications on this sample include Hinshaw, Carte, Sami, Treuting, and Zupan (2002), which describes neuropsychological performance; Thurber, Heller, and Hinshaw (2002), which investigates social goals and cognitions; and Blachman and Hinshaw (2002), which examines friendship formation and quality across the 5-week summer programs.

Participants

To recruit girls with ADHD, we sent mailings to medical settings (e.g., health maintenance organizations), mental health centers, pediatric practices, and local school districts; advertisements were placed in local newspapers and parenting newsletters; and talks were given to parents at ADHD self-help groups such as Children and Adults with ADHD. To recruit comparison girls, similar mailings were sent to school districts and local community centers, and advertisements were placed in newspapers and parenting newsletters. In these ads and mailings, the wording "summer enrichment program" was used instead of "summer enrichment program of girls with attentional problems," but recruitment materials were otherwise identical. Across 3 years of recruitment, 1,200 families responded to our mailings and advertisements. Of these, approximately one third made inquiries about programs for boys or requested services for children outside our program's age range and were therefore immediately excluded and provided referrals.

The remaining families were sent information about our summer program. Of those, 709 expressed interest in participating by calling our program office, at which point they were given brief telephone intakes and were mailed a screening packet of questionnaires. In this packet, parents were asked to complete the Swanson, Nolan, and Pelham Checklist–Fourth Edition (SNAP–IV; Swanson, 1992), and the Child Behavior Checklist (CBCL; Achenbach, 1991). The child's primary grade

school teacher from the current academic year was requested to complete the SNAP–IV and the Teacher Report Form (TRF) of the CBCL (Achenbach, 1991). For girls receiving medication, parents and teachers were asked to rate unmedicated behavior patterns. All parents were able to do so, but 35% of teachers were unable to because they had observed girls exclusively on medication. For these cases, we used parental information only. Of the 709 screening packets that were sent to families, 450 were returned. For participants with ADHD to advance to the next assessment phase, their parents and teachers had to endorse at least five of nine Inattention items on the SNAP–IV—that is, endorse items at a level of 2 (*pretty much*) or 3 (*very much*) on the 0–3 Likert scale—and *T* scores on the CBCL and TRF Attention Problem scale had to be at least 60 (a cutoff validated by Chen, Faraone, Biederman, & Tsuang, 1994). These cutoffs (five SNAP–IV symptoms; CBCL > 60) were intentionally set low so that we did not eliminate potentially eligible girls on the basis of initial rating scales. For comparison girls, scores had to be below these cutoffs. Of the completed packets, 278 girls met screening criteria for either ADHD or comparison status and were invited for diagnostic assessments.

At the onset of the diagnostic assessment visits, consent and assent forms were completed. Next, parents were administered the Diagnostic Interview Schedule for Children–Fourth Edition (DISC–IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) and completed a medical and developmental history questionnaire. Girls were administered the Wechsler Intelligence Scale for Children–Third Edition (WISC–III; Wechsler, 1991). Currently medicated girls were unmedicated for these sessions, and their parents responded to DISC questions with regard to their daughter's unmedicated behavior. Girls with a Full Scale IQ less than 70; overt neurological damage, psychosis, or pervasive developmental disorder; or medical or physical conditions that precluded participation in a recreational summer camp were excluded from the study and were provided appropriate referrals. Approximately 10 girls met criteria for ADHD–H–I and were excluded as well. Additional measures were completed by both parents and children but are not pertinent to this study. For complete description of all precamp assessment measures, see Hinshaw (2002) and Hinshaw et al. (2002).

For eligibility in the ADHD group, the girl had to meet full criteria for ADHD (either Combined or Inattentive subtype) on the DISC–IV and parent SNAP–IV ratings (i.e., at least six symptoms of inattention for ADHD–I or at least six inattention and six hyperactivity–impulsivity symptoms for ADHD–C). For comparison girls, a DISC–IV diagnosis of ADHD needed to be absent. Fifty girls did not meet either the ADHD or comparison criteria and were excluded from the study. In an effort to obtain a generalizable ADHD sample, girls who met criteria for common comorbidities (ODD, CD, anxiety disorders, and depression) were not excluded. In addition, not to have a "supernormal" comparison sample, comparison girls who met criteria for mild ODD or internalizing disorders were also not excluded (see Kendler, 1990).

These procedures yielded a total sample of 228 participants ($n = 140$ ADHD; $n = 88$ comparison), ranging in age from 6 to 12. The wide range of referral sources and the heterogeneity of our location ensured that the sample was diverse ethnically (53% White, 27% African American, 11% Hispanic, 9% Asian American) and socioeconomically (i.e., families who receive public assistance to those in the highest income bracket). We cannot claim that this ADHD sample is truly representative of the population of girls with ADHD, as our methods were not epidemiological in nature. We note, however, that the ethnic and socioeconomic diversity in our sample exceeds those reported in comparable clinical (e.g., Biederman et al., 1999) and community (e.g., August, Realmuto, Crosby, & MacDonald, 1995; Scahill et al., 1999) samples.

ADHD Subtypes

Participants with ADHD were subtyped according to *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed. [*DSM–IV*], APA, 1994) criteria, utilizing only DISC and SNAP data and using the following algorithm.

1. If the number if DISC H–I symptoms was six or more, an ADHD–C diagnosis was given; otherwise, ADHD–I was assigned.
2. If the number of DISC H–I symptoms was four or five, parent and teacher SNAP–IV H–I ratings were examined. If they were both at six or more symptoms, the participant was designated ADHD–C. If parent and teacher SNAP–IV endorsements of H–I symptoms were less than six, ADHD–I was assigned.

Using this algorithm, 93 of the ADHD-diagnosed girls met criteria for ADHD–C, and 47 met criteria for ADHD–I. Hinshaw (2002) described subsequent procedures by which senior staff judgments were used to supplement the SNAP–IV and DISC–IV symptom counts for girls at or near the subtype boundary. Our results hold firm whether or not the algorithmic subtype designation or the staff consensus designations are used.

Table 1 presents demographic information about the ADHD subsamples and the comparison sample. Groups were comparable on demographic variables. As has been found in previous research (e.g., Barkley, DuPaul, & McMurray, 1990; Faraone, Biederman, Weber, & Russell, 1998), IQ did not differ for the two ADHD subtypes, but both ADHD–C and ADHD–I groups had significantly lower IQ scores than did comparison girls.

Table 1. *Demographics, Cognitive, Internalizing, and Externalizing, and ODD and CD Comorbidity Information by Subgroup*

	Comparison (n = 88)		ADHD–Inattentive (n = 47)		ADHD–Combined (n = 93)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Mean age (in months)	113.2	19.8	118	20.2	114.4	20.2
Family income	$60,000–$70,000		$50,000–$60,000		$50,000–$60,000	
% White	46.6		57.4		55.9	
% on public assistance	11.4		14.9		15.1	
Mean WISC–III Full-Scale IQ	112.0_a	12.7	99.8_b	14.3	99.6_b	13.2
Mother CBCL Internalizing Mean *T* Score	47.4_a	11.2	60.2_b	10.2	60.8_b	10.3
Mother CBCL Attention Problems Mean *T* Score	52.1_a	4.5	74.0_b	9.1	74.8_b	8.7
Mother CBCL Externalizing Mean *T* Score	45.9_a	8.2	58.6_b	11.0	68.7_c	8.2
% DISC–IV ODD	6.8_a		46.8_b		71.0_c	
% DISC–IV CD	0.0_a		10.6_a		26.9_b	

Note: Means in the same row that have different subscripts differ at $p < .05$, by Tukey comparisons. ODD = oppositional defiant disorder; CD = conduct disorder; ADHD = attention deficit hyperactivity disorder; WISC–III = Wechsler Intelligence Scale for Children (3rd ed.); DISC–IV = Diagnostic Interview Schedule for Children–Version IV; CBCL = Child Behavior Checklist.

CBCL Internalizing scores, CBCL Attention Problems scores, CBCL Externalizing scores, rates of ODD, and rates of CD are located in Table 1 as well to provide additional descriptive information about the subtypes. As would be predicted, girls with both subtypes of ADHD had higher *T* scores on all CBCL scales than comparison girls. It is noteworthy that CBCL Attention Problems and Internalizing scores were nearly identical for ADHD–I and ADHD–C girls, but CBCL Externalizing scores were significantly higher for girls with ADHD–C, indicating that ADHD–C girls differed from their ADHD–I diagnosed counterparts only on the key variable of externalizing behavior. As would be predicted, girls with ADHD–C had higher rates of ODD and CD than comparison girls or those with ADHD–I.

Summer Camp Program

The summer camp programs, which were free to participants, were held at the campus of a local school. Classes of 25 to 26 girls (60% with ADHD and 40% comparison), grouped by age (6 to 8 years, 8.5 to 10.5 years, and 10.5 to 12 years), participated together for each day's activities. Girls were supervised by a staff that consisted of a head teacher (state certified) plus four to six counselors (who were either advanced undergraduate students or bachelor's-level psychology or education graduates) as they participated in a series of classroom, art, drama, and sporting activities. All staff members were unaware of participants' diagnostic status and any evaluative data gathered on the participants. Only senior staff (e.g., the principal investigator, project coordinator, and advanced graduate students) had access to participants' evaluation information. In addition, peer sociometric interviews were administered, and daily behavior ratings were completed by staff members. Most parents of previously medicated girls had their daughters take a "medication holiday" for the summer. For those families wishing an evaluation of stimulant medication (n = 27), we provided a single-blind medication trial, such that for approximately one third of the summer they were unmedicated, for approximately one third they received a low dose, and for one third they received a higher dose of whichever stimulant medication had been prescribed by their personal care physician or pediatrician. We note that on precamp measures (e.g., WISC–III, CBCL, TRF), these 27 girls do not show significant mean differences from the other ADHD-diagnosed girls. Although staff ratings for these 27 girls were collected every day of the camp, for the purpose of data analyses we use only those data from unmedicated days.

Predictor Measures

CBCL and TRF (Achenbach, 1991). Participants' *T* scores on the CBCL and the TRF Externalizing scale were used to assess parent (maternal) and teacher perceptions of overt aggression. These scales were completed during precamp assessments. The broadband Externalizing scale consists of the narrowband Aggressive Behavior and Delinquent Behavior scales. The CBCL and TRF are used widely as indicators of externalizing behavior, and their internal consistency, test–retest reliability, and validity have been well established (Achenbach, 1991).

Relational Aggression Scale. To assess teacher and parent (maternal) perceptions of girls' relational aggression, we used five relational aggression items (e.g., "My child spreads rumors or gossips," "My child tries to exclude certain peers") adapted from the Children's Social Behavior Scale–Teacher Form (Crick, 1996). This measure utilizes a 5-point metric from 1 (*never true*) to 5 (*almost always true*). Mothers and teachers completed this scale during our precamp assessment. Mean Relational Aggression Scale teacher and parent scores for each participant were computed.

For these five items, the alpha coefficient for maternal ratings was .83, and for teacher ratings the alpha was .92.

Daily Behavior Ratings (DBR) of overt and relational aggression. To assess staff impressions of participants' behavior, staff counselors (who, as noted previously, were blind to participants' diagnostic status) completed one of two different DBR scales on each child with whom they had worked on that particular day. The data presented herein reflect an average of three to four ratings per child per day, amalgamated across the entire summer. Both an Overt Aggression and Relational Aggression DBR were constructed. On the Overt Aggression DBR, staff rated four items (on a 0–3 metric scale from 0 [*never happened*] to 3 [*happened frequently and–or with high intensity*]) that assessed overt aggression (e.g., hit, kicked, bit, or physically threatened peers–adults; swore at or verbally attacked peers–adults). These four items were drawn from rating scales used at similar boys' summer camps (e.g., Hinshaw, Zupan, Simmel, Nigg, & Melnick, 1997) and were embedded within a larger rating scale that assessed ADHD-related behaviors. On the Relational Aggression DBR, staff members rated five relational aggression items that were embedded in a rating scale that assessed a variety of social behaviors; these five items were drawn from Crick's (1996) Children's Social Behavior Scale–Teacher Form and are the same five items that were utilized for the parent and teacher Relational Aggression Scale (see previous discussion). Staff rated each girl on the same 0 to 3 scale used on the Externalizing Behavior DBR. Both the Overt Aggression and the Relational Aggression DBRs were found to be internally consistent (i.e., alphas computed separately for each scale = .81). Interrater reliability for DBR measures is difficult to ascertain, as staff members were grouped together differently each day. When we were able to calculate reliabilities, however, interrater correlations averaged above $r = .5$.

Peer nominations of aggression. Peer nominations both of overt and relational aggression were obtained during private interviews. These interview questions were embedded within a larger sociometric interview (see the Child Criterion Measures section). Each girl was asked to nominate three girls in her group who met each of the following descriptions: (a) the type who hit, bit, or pushed other kids (i.e., was overtly aggressive); (b) the type who would get even with people by keeping them from being in her group of friends, such as by telling lies about them; and (c) the type who will ignore people or stop talking to them when she is mad at them or when they do not do what she says. For each of these items, a proportion score was created for each child (i.e., number of nominations received, divided by the number of girls providing nominations). A mean relational aggression score was created from questions (b) and (c) for each participant.

Child Criterion Measures

Peer regard was ascertained from private, individual sociometric interviews conducted during the last week of the camp (see also Blachman & Hinshaw, 2002). Each girl was asked to nominate three girls in her group whom she liked the most (positive nominations) and three girls in her group whom she liked the least (negative nominations). Because of the theoretical and clinical importance of considering both positive and negative aspects of peer regard (see Newcomb, Bukowski, & Pattee, 1993), we calculate separate proportion scores for positive nominations (i.e., total number of positive nominations received from classmates divided by number of classmates) and negative nominations (i.e., total number of negative nominations received from classmates divided by number of classmates). We raise here the issue that our atypical ratio of ADHD to comparison participants could lead to biased sociometric measures if girls with ADHD have different social perceptions. As discussed in Hinshaw (2002), however, analyses performed separately by ADHD versus comparison source of sociometric nominations reveal small differences in findings. If anything, our atypically high ratio of girls with ADHD to comparison girls can serve to dilute the degree of peer rejection experienced by the ADHD sample.

Data Reduction of Predictor Variables

To enhance reliability and to preserve power for our regression analyses, we formed composite indexes for overt and relational aggression. We first examined closely the characteristics of the overt and relational aggression measures, finding that the individual measures for each domain were significantly correlated (see Table 2). To verify the interrelatedness of our measures in each domain, we also conducted two principal components factor analyses (i.e., one with the four overt aggression measures and one with the four relational aggression measures). As expected, the factor analysis of the overt aggression measures revealed a single factor (eigenvalue = 2.8) that accounted for 70% of the variance; factor loadings ranged from .80 to .87. Similarly, a single factor (eigenvalue = 2.3, accounting for 58% of the variance) emerged from the factor analysis of the relational aggression measures; factor loadings ranged from .60 to .87. We therefore combined the four overt and four relational aggression variables into two separate composite indexes. Participants' scores on these measures were standardized and summed into single, aggregate indexes. As such, maternal, teacher, peer, and staff ratings of overt aggression composed our overt aggression composite index (coefficient al-

Table 2. *Intercorrelations for Overt Aggression and Relational Aggression Measures*

	Overt Aggression Measures			
	CBCL (Mother Report)	**TRF (Teacher Report)**	**DBR (Staff Report)**	**Peer Nominations**
CBCL (mother report)	1.00			
TRF (teacher report)	.71**	1.00		
DBR (staff report)	.48**	.52**	1.00	
Peer nominations	.53**	.59**	.80**	1.00
	Relational Aggression Measures			
	Mother RAS	**Teacher RAS**	**DBR (Staff Report)**	**Peer Nominations**
Mother RAS	1.00			
Teacher RAS	.33**	1.00		
DBR (staff report)	.36**	.45**	1.00	
Peer nominations	.32**	.42**	.74**	1.00

Note: CBCL = Child Behavior Checklist; TRF = Teacher Report Form; DBR = Daily Behavior Ratings; RAS = Relational Aggression Scale.
**$p < .01$.

pha = .86). In parallel, our relational aggression composite index (alpha = .75) comprised maternal, teacher, peer, and staff ratings of relational aggression.

Because of the more marginal alpha reliability for the relational aggression index, we prepared a reduced relational aggression index using only peer and staff report of relational aggression (for this new index, coefficient alpha = .85). Our rationale for this recalculation was that peer and staff ratings showed the strongest intercorrelations and factor loadings, and thus we determined that they could provide the most reliable index. Thus, for our analyses that require the use of a composite index of relational aggression, we conduct parallel analyses with (a) the composite of all four informant sources (referred to hereafter as the *complete relational aggression index*), constituting an index that is analogous in composition to our overt aggression composite index; and (b) the composite comprising peer and staff sources only (the *peer–staff relational aggression index*).

Data Analytic Strategy

To test our first two hypotheses regarding differential rates of overt versus relational aggression in girls with ADHD versus comparisons, we utilized analyses of variance and post hoc contrasts to examine subgroup differences across all of the overt and relational aggression measures and in peer sociometrics. We recognized that subgroup differences in aggression could be confounded with comorbidity of ODD or CD. Thus, significant contrasts were recomputed with ODD and CD diagnoses as covariates. These diagnoses had also been ascertained via structured interviews with parents on the DISC–IV (Shaffer et al., 2000). Next, we utilized the composite indexes of overt and relational aggression to test our hypotheses about the associations between ADHD, both types of aggression, and peer regard. That is, we performed correlational analyses to examine the strength of the association of the two types of aggression with peer regard by subgroup, again covarying for ODD–CD diagnoses. Because of the finding that ADHD participants' IQ scores were significantly lower than comparisons', IQ was also used as a covariate. We report on effect sizes for all of these analyses, utilizing Cohen's *d,* a ratio of differences in subtype means divided by the pooled standard deviation. Finally, we employed hierarchical multiple regression analyses, utilizing the overt and relational aggression indexes as predictors of peer status, to evaluate the incremental value of each form of aggression (as the final step in the equation) in predicting variance in overall peer rejection, once again covarying ODD–CD diagnoses and IQ.

Results

Subgroup Differences Among Measures

Predictor measures. For each of the predictor measures, omnibus analyses of variance were computed to detect overall differences between the diagnostic groups (i.e., ADHD–I, ADHD–C, and comparison). All analyses of variance revealed significant overall differences among the groups across all dependent measures ($p < .001$ for all analyses). As shown in Table 3, post hoc contrasts were computed to determine the nature of the subgroup differences across the measures; a Tukey correction for Type I error was used. For the overt aggression measures, significant differences between each pair of groups emerged for the maternal CBCL Externalizing scores, teacher TRF Externalizing scores, and peer nominations of overt aggression. The only divergence from this pattern was found on the staff DBR ratings of externalizing behav-

Table 3. *Predictor and Criterion Variable Omnibus Analyses of Variance and Post Hoc Contrasts*

			1. Comparison (n = 88)		2. ADHD–Inattentive (n = 47)		3. ADHD–Combined (n = 93)		Effect Sizes (Cohen's d)		
	df	*F**	*M*	*SD*	*M*	*SD*	*M*	*SD*	1 vs. 2	2 vs. 3	1 vs. 3
Predictor measures											
Measures of overt aggression											
CBCL Externalizing *T* score (mother report)	(2, 225)	150.79	45.93_a	8.15	58.60_b	10.96	68.67_c	8.18	1.44	1.14	2.58
TRF Externalizing *T* score (teacher report)	(2, 224)	132.24	48.39_a	6.98	59.81_b	8.80	69.24_c	9.82	1.32	1.10	2.42
Externalizing DBR (staff report)	(2, 225)	27.37	$.05_a$	.07	$.18_a$	.38	$.71_b$	.94	.21	.85	1.06
Aggression Nominations (peer report)	(2, 225)	37.15	$.01_a$	.03	$.07_b$	.12	$.22_c$	.25	.36	.90	1.25
Measures of relational aggression											
Mother RAS Rating	(2, 222)	11.39	11.78_a	3.51	14.02_b	4.79	15.30_b	6.03	.45	.26	0.71
Teacher RAS Rating	(2, 222)	18.98	10.44_a	4.75	14.70_b	7.55	16.36_b	7.43	.65	.25	0.91
Relational Aggression DBR (staff report)	(2, 225)	65.47	$.22_a$	.26	$.45_b$	.44	1.14_c	.77	.41	1.24	1.65
Relational Aggression Nominations (peer report)	(2, 225)	51.38	$.02_a$	.04	$.07_b$	.07	$.19_c$	.17	.36	1.09	1.47
Criterion measures											
Negative Peer Nominations (proportion scores)	(2, 225)	35.74	$.02_a$	.04	$.10_b$	.11	$.22_c$	.22	.49	.76	1.25
Positive Peer Nominations (proportion scores)	(2, 225)	10.76	$.16_a$	.10	$.10_b$	.08	$.10_b$	.10	.61	.04	.64

Note: Means in the same row that have different subscripts differ at $p < .05$, by Tukey comparisons. ADHD = attention deficit hyperactivity disorder; CBCL = Child Behavior Checklist; TRF = Teacher Report Form; RAS = Relational Aggression Scale; DBR = Daily Behavior Ratings.
*All p values < .001.

ior, for which the ADHD–C group was rated as significantly more overtly aggressive than the ADHD–I and comparison groups, but with no significant difference between the latter subgroups. Large effect sizes (between 1.06 and 2.58) were observed for all contrasts except for the staff and peer contrasts between the comparison and ADHD–I groups, which were small. To test whether diagnoses of ODD or CD were confounding these results, univariate analyses of covariance were computed, first with ODD and then with CD entered as covariates. With control of ODD and CD, all significant differences observed across subgroups remained significant, and changes in effect sizes were nominal.

A slightly different pattern emerged for the measures of relational aggression. For parent and teacher ratings on the Relational Aggression Scale, the ADHD–C and ADHD–I groups were rated as significantly more relationally aggressive than the comparison group (with large effect sizes for these contrasts), but significant differences between the two ADHD subgroups on this scale did not emerge. In contrast, for the two summer camp measures (i.e., staff and peer ratings), the ADHD–C group was rated as more relationally aggressive than the ADHD–I and comparison groups, and the ADHD–I group was rated as significantly more relationally aggressive than the comparison group. Large effect sizes (i.e., ranging from 1.09 to 1.65) were observed for contrasts between the ADHD subgroups for staff and peer ratings of relational aggression, although contrasts between the comparison and ADHD–I groups for staff and peer ratings were small to medium (i.e., .36 and .41). Univariate analyses of covariance with ODD as a covariate revealed that ODD exerted an effect only for parent Relational Aggression Scale ratings. That is, controlling for ODD with respect to the parent Relational Aggression Scale, significant differences that had been observed between the ADHD subgroups and the comparison group were not retained. With CD as a covariate, subgroup contrasts maintained significance.

Criterion measure. Group differences across the measures of peer sociometric nominations are also displayed in Table 3 (see also Hinshaw, 2002). The ADHD–C group received significantly more negative nominations than the ADHD–I group, which received significantly more negative peer nominations than the comparison group. Medium to large effects were observed for all three of these contrasts. For positive nominations, the comparison group received a significantly greater number than the ADHD–C and ADHD–I groups (medium effect sizes), which did not differ. All observed differences between subgroups remained significant when controlling for ODD and CD, and effect sizes were essentially unchanged.

Relations Between Predictors and Peer Sociometrics by Subgroup

We computed correlations between the aggression composite indexes and peer positive and negative sociometric nominations separately for each diagnostic group. In addition, Fisher's *r* to *z* transformations afforded examination of differences between correlations. As displayed in Table 4, overt aggression was significantly and positively correlated with negative peer nominations within all three groups. For both subgroups of ADHD, this effect was significantly stronger than for comparisons. It was only for girls with ADHD–C, however, that the overt aggression index was significantly and negatively correlated with positive nominations. For positive nominations, the only significant difference observed between correlations was for the ADHD–C and comparison groups.

A similar pattern was observed for relational aggression with use of the complete relational aggression index. For all three diagnostic subgroups, relational aggression was significantly related to negative peer nominations, yet it was only for the ADHD–C group that relational aggression was related (negatively) to positive peer nominations. Because peer nominations were used both as the criterion variable and as a component of the overt and relational aggression indexes, we also conducted these correlational analyses with peer nominations of overt and relational aggression excluded from computation of the indexes. For all but one of the correlations, only nominal decreases in strength were observed, and statistical significance was still achieved. The exception was the correlation between positive peer nominations and relational aggression for the ADHD–C group. When peer nominations of relational aggression were excluded in the calculation of the relational aggression index, the correlation dropped from $r = -.27$ ($p < .01$) to $r = -.17$ (*ns*). See the Discussion section for implications of this analysis.

As Table 4 indicates, significant differences were not observed among any of the complete relational aggression index correlations. When these correlations were recomputed using the peer–staff relational aggression index, findings changed only slightly (e.g., the correlation between ADHD–C and negative nominations was .71, $p < .01$, using the complete index, and was .69, $p < .01$ using the peer–staff index).

Because of the finding that the two ADHD subgroups differed significantly from the comparison group on IQ, we recomputed all correlational analyses controlling for IQ. All partial correlations remained strong and significant at $p < .01$, indicating that the relations among ADHD subgroups, overt and relational aggression, and peer regard are not accounted for by the IQ differences between the ADHD and comparison groups. Similarly, when all correlations were recomputed as partial correlations controlling for ODD and CD, no changes in the findings occurred.

Differential Association of Overt Versus Relational Aggression With Respect to Peer Regard

To test our last hypothesis regarding the independent contributions of overt versus relational aggression to predicting variability in peer regard, we computed sets of two hierarchical regressions, predicting to negative and positive peer nominations as criteria. To control for ADHD status, we entered subgroup (i.e., ADHD–I, ADHD–C, comparison) on the first step, followed by (a) the overt aggression composite index on the second step and the complete relational aggression composite index third, as well as (b) relational aggression second and overt aggression third. Note that entering a variable last in a hierarchical regression determines its predictive value independent of the other predictors (Pedhazur & Schmelkin, 1991). As displayed in Table 5, overt aggression made significant contributions in the prediction of negative or positive peer regard when entered second or third. On the other hand, whereas relational aggression added significant incremental variability in predicting negative peer nominations, beyond what was predicted by overt aggression and with subgroup status held constant, its effect size was small. Furthermore, in the prediction of positive nominations, relational aggression did not add incremental variability beyond what was contributed by overt aggression. Thus, overt aggression is a substantially stronger predictor of peer regard than is relational aggression. Both of these regressions were recomputed using the peer–staff relational aggression composite index, with nearly identical findings. Finally, when we recomputed all regression analyses

Table 4. *Correlations (Pearson's r) Between Aggression Indexes and Peer Nominations by Subgroup*

	Overt Aggression Index		Complete Relational Aggression Index	
Subgroup	**Negative Nominations**	**Positive Nominations**	**Negative Nominations**	**Positive Nominations**
Comparison	$.31_a$**	$-.02_a$	.44**	–0.14
ADHD–Inattentive	$.62_b$**	$-.13_{a,b}$	.54**	–0.20
ADHD–Combined	$.71_b$**	$-.40_b$**	.57**	–0.27**

Note: Correlations in the same column that have different subscripts differ at $p < .05$.
*$p < .05$. **$p < .01$.

Table 5. *Summary of Hierarchical Regression Analyses Predicting Negative and Positive Peer Nominations From Complete Aggression Indexes*

	Beta		Incremental R^2		Total $R^2\Delta$	
Predictor	**Neg.**	**Pos.**	**Neg.**	**Pos.**	**Neg.**	**Pos.**
Step 1: Diagnostic subgroup	.49	–.27	.24***	.08***	.24***	.08***
Step 2: Overt aggression	.85	–.34	.35***	.06***	.59***	.13***
Step 3: Relational aggression	.21	–.09	.02**	.00	.60**	.13
Step 1: Diagnostic subgroup	.49	–.27	.24***	.08***	.24***	.08***
Step 2: Relational aggression	.59	–.24	.23***	.04**	.46***	.11**
Step 3: Overt aggression	.69	–.27	.14***	.02*	.60***	.13*

Note: Neg. = negative peer nominations from sociometric interviews; Pos. = positive peer nominations from sociometric interviews.
*$p < .05$. **$p < .01$. ***$p < .001$.

with the covariates of IQ, ODD, and CD entered on the second step, findings were unchanged.

Discussion

We employed a multimethod, multi-informant approach to investigate overt aggression, relational aggression, and peer regard in preadolescent girls who had either ADHD–C, ADHD–I, or no diagnosis of ADHD. Our first hypothesis was confirmed, in that girls with ADHD–C were rated as more overtly aggressive than girls with ADHD–I or comparison girls by all four informant sources. Also, levels of relational aggression were higher for girls with ADHD (either Combined or Inattentive subtype) than for comparison girls, across all informants. Modest support for our third hypothesis was found. That is, both types of aggression were significantly correlated with negative sociometric nominations for all subgroups, and both relational aggression and overt aggression explained incremental variance (over the other) regarding these negative nominations. The independent effect for relational aggression was smaller than that for overt aggression, however. As for positive sociometric nominations, it was only in the ADHD–C subgroup that either form of aggression was associated with these indicators of peer acceptance, and only overt aggression incremented explained variance in our hierarchical regression models. Of note is that statistical control of IQ, ODD, and CD left findings unchanged, with one exception.

Results underscore the heterogeneous nature of ADHD, highlighting subgroup differences in two domains of aggressive behavior. According to parent, teacher, and peer report, we found that girls with ADHD–C were more overtly aggressive than their ADHD–I and nondiagnosed counterparts. This finding is in concert with studies that report similar findings for ADHD–C and aggression in boys (e.g., Maedgen & Carlson, 2000; Nolan, Volpe, Gadow, & Sprafkin, 1999). Our findings regarding overt aggression and ADHD–C are bolstered by the use of peer nominations of this construct, data that are independent from diagnostic information provided by parent and teacher report. Our peer nomination data also indicate that girls with ADHD–I were perceived as more overtly aggressive than nondiagnosed girls, which is somewhat surprising given that this subtype of ADHD is generally associated with social withdrawal (Edelbrock et al., 1984; Hinshaw, 2002).

For ratings of relational aggression, our hypothesis that girls with either type of ADHD would receive higher ratings than comparison girls was supported, but with the caveat that findings differed according to informant source. Parent and teacher ratings indicated no significant differences between ADHD–C and ADHD–I subgroups, but staff and peer nominations of these constructs indicate that girls with ADHD–C exhibited significantly higher levels of relational aggression than their ADHD–I counterparts. This finding have two implications. First, the fact that only staff and peers rated the ADHD–C subgroup as significantly more relationally aggressive could suggest that it is within the context of day-to-day observations of a variety of behaviors (e.g., unstructured play, structured classroom activities, lunch and snack-time socialization) that this subtle form of aggression can be validly appraised. Unlike teachers, who typically do not sit with their students during lunch or play with them on the sports field, our staff ate, played, and interacted side-by-side with the girls throughout the day. It is likely that our staff were privy to more of the gossip and "girl talk" that transpired at the camp than is the case for the typical adult teacher or supervisor. In addition, our finding that the relation between relational aggression and positive peer nominations was weakened when peer assessments of relational aggression were dropped from the analysis also serves to highlight the importance of peer report in capturing and studying this subtle social behavior.

A second implication is that relational aggression is a problematic behavior associated with both the Combined and Inattentive subgroups of ADHD. This is a noteworthy finding, considering that the ADHD–I subtype (in both girls *and* boys) typically is identified as

more withdrawn and passive (Hodgens et al., 2000; Maedgen & Carlson, 2000) than externalizing in nature. These results could also lend support to the conceptualization of relational aggression as a more impulsive and disorganized than planned and skilled behavior, given its association with ADHD symptomatology. This interpretation is only speculative, and more detailed research of the relation between relational aggression and ADHD is needed. Our findings do underscore the need to broaden our clinical conceptualization of aggressive behavior beyond purely physical acts, to more subtle, socially damaging acts of relational aggression.

As expected, our data demonstrated that participants with both types of ADHD received significantly greater proportions of negative sociometric nominations and lower proportions of positive sociometric nominations than did comparison girls (see Hinshaw, 2002). The finding that peers reject children with ADHD is consistent across numerous studies (Erhardt & Hinshaw, 1994; Hinshaw & Melnick, 1995; Milich et al., 2001). Our data regarding the association between these two different forms of aggression and peer regard in ADHD subtypes is interesting, however. It appears that girls will dislike and not want to befriend other girls (with or without ADHD) who are overtly or relationally aggressive. Although, in terms of being liked, ADHD–I or nondiagnosed girls who are aggressive (overtly or relationally) can still have female peers who want to be their friends. Such was not the case for girls with ADHD–C. For this subgroup only, a strong and significant negative correlation was observed between aggression and positive nominations. That is, these girls had a significant number of female peers who did not want to be their friend (i.e., *negative* sociometric nominations), and they also had an absence of peers who wanted to be their friends (i.e., *positive* sociometric nominations).

This finding leads to further questions regarding the contribution of the H–I spectrum of behaviors to aggression and peer regard. For example, perhaps ADHD–I and nondiagnosed girls are able to be subtle enough with their aggression—or know just when to "cool it"—to still have other girls want to spend time with them. It could also be the case that a certain level of aggression (especially if it is couched in the form of play or teasing) is somewhat acceptable or can even add to popularity in female peer groups, akin to the finding that some aspects of male antisocial behavior are valued within boys' peer groups (Dishion, French, & Patterson, 1995). Girls with ADHD–C, however, with their impulsive and overactive nature, can either (a) lack the ability to detect subtle cues in others that indicate when to curtail aggression or (b) know when to stop but lack the inhibitory skills to control their behavior. A fruitful avenue for further research would appear to be in the arena of emotion regulation in girls with ADHD, which could be contributing to both forms of aggression and negative peer regard (e.g., Cole & Zahn-Waxler, 1992).

Our finding that relational aggression made a significant, incremental contribution to negative peer nominations (over and above overt aggression) is consistent with that of Crick (1996). As would be expected, our data reveal that overt aggression makes a stronger contribution to peer regard variance than does relational aggression. Once again, relational aggression—although perhaps not as problematic as overt aggression—is a behavior that can yield social costs. These findings imply that behavioral and psychosocial interventions targeting ADHD and overt aggression (e.g., Pelham & Fabiano, 2000) should also incorporate relational aggression modules. Additional research is needed, however, to elucidate the nature of relational aggression as it relates to and is influenced by both the core and secondary symptoms of ADHD.

We recognize that the correlational analyses used in this study cannot provide a strong test of the underlying assumption that the overlap of ADHD and aggression causes a child to be actively disliked. Despite the probability of a direct link, it is likely that a complex association of factors, such as personality variables or level of prosocial behavior, also contribute to peer regard. Other methodological limitations are noteworthy as well. Inherent in our design is shared method variance, in that peer nominations were used both as the criterion variable and as a component of the overt and relational aggression indexes. Our significant findings with use of parent, teacher, and staff report—in addition to peer report—lead us to be confident that our results are not an artifact of shared variance; associations between ADHD subtype, overt and relational aggression, and peer regard remained robust when we excluded peer report of aggression from the composite.

In addition, our predictors of peer regard were collected either several weeks prior to the summer camp (i.e., those of parent and teacher) or during the summer camp itself (i.e., staff ratings and peer sociometrics). As such, some of our predictor and criterion variables were collected concurrently, perhaps making our determination of "predictor" versus "criterion" appear somewhat arbitrary. Experimental studies (e.g., Coie & Kupersmidt, 1983; Dodge, 1983) have demonstrated, however, that aggression predicts rejection more so than the reverse, and naturalistic studies (e.g., Erhardt & Hinshaw, 1994) have likewise indicated that ADHD plus comorbid aggression is a key causal factor in relation to peer rejection. As such, our study design in this regard appears justified. Finally, although we are not able to comment on differences between girls and boys in terms of ADHD, aggression, and peer regard, our purpose herein was to characterize thoroughly these processes in girls (Hinshaw, 2002). Similar to cross-cultural research, in which within-culture variability is

important to examine before between-cultural differences can be understood, we as a field are in an early—yet promising—phase of empirical study of girls with ADHD.

In sum, this research supports the contention that girls with ADHD are more overtly and relationally aggressive than girls without ADHD and that these behaviors incur social costs for those with ADHD–C in particular. Our finding that these associations, for the most part, remained robust despite statistical control of ODD and CD serves to highlight the potent combination of ADHD–C and aggression in girls. Although the cross-sectional design of this study was unable examine how the interplay of ADHD and aggression could manifest throughout development, longitudinal research (currently underway) will help to elucidate such developmental processes. Future directions also include examining internalizing problems comorbid with aggression in girls with ADHD, as well as investigating how basic emotional processing (such as emotional reactivity) could underlie both ADHD and various forms of aggression.

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