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How Do Children with ADHD (Mis)manage Their Real-Life Dyadic Friendships? A Multi-Method Investigation

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Abstract This multimethod study provides detailed information about the friendships of 87 children (76% boys) with ADHD and 46 comparison children aged 7–13 years. The methods included parent and teacher ratings, self-report measures and direct observation of friends' dyadic behaviors in three structured analogue tasks. Results indicated that, in contrast with comparison children, children with ADHD had friends with high levels of ADHD and oppositional symptoms; they perceived fewer positive features and more negative features, and were less satisfied in their friendships. Observational data indicated that children with ADHD performed both more legal and more illegal maneuvers than comparison children in a fast-paced competitive game. While negotiating with their friends, children with ADHD made more insensitive and self-centered proposals than comparison children. In dyads consisting of one child with ADHD and one typically developing child, children with ADHD were often more dominant than their friends.

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Since the late 1970s, a plethora of studies have documented that the peer relationships of children with ADHD are pervasively and persistently impaired, according to parents, teachers, peers, and independent observers (see Campbell and Paulauskas 1979 and Whalen and Henker 1985, for early authoritative reviews). Children with ADHD are very frequently rejected by their peers (Hoza et al. 2005b) with negative peer perceptions towards children with ADHD sometimes developing within minutes (e.g., Pelham and Bender 1982). Not following activity rules, complaining, whining, teasing, and inattention during activities have been found to characterize peer rejection in children with ADHD (Mrug et al. 2007). Children with ADHD are also known to be bossy, insensitive to others, and have difficulty regulating their emotions (Pelham and Bender 1982; Walcott and Landau 2004). These problematic social behaviors may be more severe for children with the Combined subtype of ADHD (children experiencing difficulties with both inattention and hyperactivity/impulsivity; see McQuade and Hoza 2008, for a review). Current state-of-the-art multimodal treatments of ADHD fail to *normalize* the peer relationships of children with ADHD (Hoza et al. 2005a). As the goal of reversing well-ingrained negative reputations in peer groups may be unrealistic, enhancing close friendship may be a viable intervention goal (e.g., Hoza et al. 2003).

The Developmental Importance of Close Dyadic Friendships

Friendship is a voluntary bond co-created by two friends who expect to share intimate, mutually rewarding experience, with

commitment, support and validation of each other's selves (Schneider et al. 1994). Children expect their friends to be good companions who share things appropriately, display sensitivity to feelings, and provide enjoyable companionship (e.g., Schneider et al. 1994). Fairness in play and respect for the rules of a game are among the features that make for enjoyable company (Fonzi et al. 1997). Friendship skills are thought to prepare children and adolescents for intimate relationships as adults according to Sullivan's influential theory (Sullivan 1953) and some longitudinal data (Bagwell et al. 2001b). Although having a close friend mitigates the consequences of peer rejection (Parker and Asher 1993) and is associated with important indicators of overall well-being (Newcomb and Bagwell 1995), these outcomes may be influenced by the quality of the friendship in question (Ladd et al. 1996). Berndt (1996) defines friendship quality as the sum of positive (e.g., intimacy, caring and support) and negative (e.g., conflict and aggression) features that characterize a friendship. Friendship quality is negatively related to internalizing problems and victimization, and positively related to academic performance and overall adjustment (Waldrip et al. 2008). It is also positively related to satisfaction in relationships and friendship maintenance (Ladd et al. 1996). According to *equity theory* (Hatfield et al. 1979), satisfaction with a friendship is threatened when one friend fails to sustain the exchange of mutually positive rewards.

Previous Studies on the Friendships of Children with ADHD

Most published studies to date deal with the *existence* of friendships among children with ADHD, but do not address friendship quality, real-life friendship interactions, or the characteristics of the friend (see Mikami 2010 and Normand et al. 2007, for recent reviews on the friendships of children with ADHD). The results invariably indicate that children with ADHD have fewer mutual friendships than non-diagnosed children (e.g., Blachman and Hinshaw 2002; Hoza et al. 2005b). The friends they do have may not be models of prosocial behavior. Some authors have described children with ADHD as "negative social catalysts" because of the negative social behaviors that they elicit from their peers (Whalen and Henker 1985). These same authors found that the peers nominated most often as "liked" by children with ADHD were also more likely to receive ratings of "causes trouble" from their classmates. Preliminary evidence suggests that girls with ADHD are more likely to befriend other girls with ADHD (Blachman and Hinshaw 2002), whereas adolescents with ADHD report that their friends are more likely to engage in substance abuse (Bagwell et al. 2001a). Friends who are inclined towards disruptive behavior influence each other, often resulting in the friends becoming more similar over time (e.g., Dishion et al. 1996). This process can lead to deleterious negative outcomes such as substance abuse, delinquency and violent behavior (e.g., Dishion et al. 1997). Therefore, it is critical to consider the behavioral characteristics of the friends children with ADHD do have.

The few extant studies that include the ratings of friendship by children with ADHD reveal that the friendships of youth with ADHD are characterized by more negative features as compared with their non-disordered counterparts (in an all-female sample, Blachman and Hinshaw 2002). Unfortunately, these researchers reported neither observational data nor friendship ratings by the *friends* of children with ADHD. The exclusive reliance on self-reports is particularly problematic when studying children with externalizing disorders such as ADHD. Researchers typically find minimal concordance between ratings of friendship by children with ADHD and other reliable sources of information (e.g., Bagwell et al. 2001a). The only detailed observational data on children with ADHD *interacting with their real-life friends* come from a comparison by Tyler (1993) of 12 unmedicated ADHD dyads of school-age friends and 12 control dyads. Tyler found that the friendships of children with ADHD are characterized by less intimacy and reciprocity, and that their play is less associative and cooperative, as compared with their non-diagnosed peers.

Study Hypotheses

The main objective of the present study is to explore in detail the friendships of children with ADHD, emphasizing the perspectives of both members of the friendship dyad.

1. We expected the friends of referred children with ADHD would receive higher parent and teacher ratings of ADHD and oppositional symptoms and higher levels of peer problems than the friends of comparison children.
2. We also expected that participants with ADHD would report more negative friendship features, less positive friendship features, and less overall satisfaction with their friendship than comparison children.
3. Similarly, we expected that the friends of children with ADHD would report more negative friendship features, less positive friendship features, and less overall satisfaction with their friendship than the friends of referred comparison children.
4. In a fast-paced competitive car-race task, we expected that referred children with ADHD would commit more rule violations than comparison children.

5. During card-negotiation and game-choice tasks with their friend, we expected that referred children with ADHD would exhibit more self-centered and insensitive proposals, would make fewer inquiries of their friend's preferences, would refuse more their friend's proposals, and would be more likely to be involved in dyads where the power is unequally balanced than would comparison children.
6. We expected that children with ADHD would also be more likely to demonstrate more intense positive and negative emotional reactions than would comparison children in all of these three observational tasks, as they involve situations of potential conflict.
7. We predicted that children with Combined-type ADHD (displaying both impairing levels of inattention and hyperactivity/impulsivity symptoms) would have the most marked difficulties in their interactions with friends.
8. In situations where a child with ADHD has a non-ADHD friend, we predicted that the friend without ADHD would be more likely to be dominated by his friend, would display more negative affect and would report more negative friendship features, less positive friendship features, and less satisfaction with the relationship than the child with ADHD.

Method

Participants

Participants included 133 referred children and their respective 133 invited friends. Of the referred children, 87 children had been assigned a diagnosis of ADHD (67 boys) and 46 without diagnosis constituted our comparison group (34 boys). All referred children were aged between 7 and 13 years old (90.6% Caucasian). We asked the referred children in each group to invite his/her best friend, with parent permission, to participate in the study. Thus, including the friends, there were a total of 266 participating children. All participants were recruited from the Ottawa-Gatineau region in Canada. We refer throughout to four groups of participants: (1) "children with ADHD" denotes children with ADHD who were directly referred to the study; (2) "comparison children" denotes children without ADHD who were also referred to the study; (3) "friends of children with ADHD" were invited by children with ADHD; and (4) "friends of comparison children" were invited by children without ADHD.

Children with ADHD were recruited from various pediatric and/or ADHD clinics and community schools. Both informed parental consent and child assent were required for participation. There were two inclusion criteria for the ADHD group, adapted from procedures used by Ohan and Johnston (2007): First, children had to have been diagnosed with ADHD by a qualified health care professional (e.g., psychologists, pediatricians, psychiatrists and family physicians). Parents of children with ADHD granted access to the clinical charts and the first author verified all the diagnoses. Second, *both* parents' and teachers' *T*-scores on the Conners Rating Scale-Revised: Long Form (CRS-R: L DSM-IV ADHD subscales; Conners et al. 1998a, b) had to be equal to or higher than 65 (Conners 2000). We used the same cut-off in supplementary analyses of subtypes and comorbidities. Because many medicated children with ADHD continue to show impairment in their peer relationships (Hoza et al. 2005a), these children were not excluded from the study or asked to suspend their medication. In our clinical sample, 82% of children with ADHD were medicated during the research session. We recruited the comparison group from local schools and community organizations (e.g., Scouts) from the same catchment areas served by the clinics. Study brochures were sent to parents via the school/organization; interested parents contacted the researchers for more details and to arrange for a first session. For inclusion in the comparison group, parents' and teachers' *T*-scores had to be below 60 on the DSM-IV ADHD subscales.

Exclusion criteria for both referred groups included previously-administered Full Scale IQ less than 80 (available for 77% of the children with ADHD), pervasive developmental disorder, psychosis, not being enrolled in a regular classroom, and not having a friend who was willing to participate. Twenty-nine potential members (27 children with ADHD and 2 comparison children), not included in the 133 participants reported above, could not participate because they reported that they had no friends. Common ADHD comorbidities (e.g., oppositional defiant disorder, learning disabilities, anxiety disorders) were not excluded to promote generalizability.

We calculated the socioeconomic status (SES) index score from the 1981 socioeconomic index for occupations in Canada (Blishen et al. 1987). Each SES score represents the average parental SES score for each child. Median annual family incomes were obtained using postal codes and the Census Tract Profiles, 2006 Census (Statistics Canada 2010). As indicated in Table 1, there were no significant differences between the referred ADHD and comparison groups in most demographic variables. However, children with ADHD were slightly more likely than comparison children to be instructed in English and to live in single-parent families.

Procedure

The referred children and their friends were initially separated while assent was obtained and while different

Table 1 Descriptive statistics for demographic data and conners ratings: means and SDs (in parentheses)

	Referred ADHD (n=87)	Referred Comparison (n=46)	Friend of ADHD (n=87)	Friend of Comparison (n=46)	F or X^2 (3,266)[a]	Effect sizes[b]
Demographic variables[c]						
Age (years)	10.30 (1.85)	10.41 (1.72)	10.39 (2.22)	10.22 (1.68)	0.11	0.00
Grade (years)	4.32 (1.87)	4.28 (1.86)	4.39 (2.02)	4.33 (1.77)	0.04	0.00
Children's sex (% Boys)	77.0	73.9	74.7	69.6	0.89	0.06
Parents' sex (% Mothers)	88.5	82.6	84.8	87.4	1.07	0.06
Language of instruction (% French)	80.5_a	95.7_b	88.0_{ab}	93.5_b	8.40*	0.18
Ethnicity (% Caucasian)	92.0	87.0	90.8	91.3	7.34	0.10
Two-parent household (%)	73.6_a	91.3_b	77.1_a	89.1_b	8.89*	0.18
SES score	47.97 (11.98)	50.21 (12.22)	50.65 (9.68)	52.15 (10.93)	1.60	0.02
Median annual family income (in 000s)	79.75 (17.01)	79.16 (15.78)	82.76 (19.35)	79.19 (15.82)	0.72	0.01
Rating-scale data[c]						
CPRS-R:L (T-scores)						
DSM-IV Inattention	$73.86\ (8.65)_a$	$46.96\ (5.64)_b$	$55.78\ (11.90)_c$	$48.96\ (7.21)_b$	123.71***	0.59
DSM-IV Hyperactivity	$71.37\ (13.67)_a$	$47.76\ (4.44)_b$	$55.04\ (12.42)_c$	$49.57\ (7.78)_b$	64.80***	0.43
Opposition	$68.11\ (12.94)_a$	$49.70\ (6.86)_b$	$54.65\ (12.90)_b$	$49.89\ (10.15)_b$	39.42***	0.31
Peer Problems	$68.75\ (13.93)_a$	$48.87\ (5.40)_b$	$53.83\ (11.76)_b$	$48.93\ (6.19)_b$	52.25***	0.38
CTRS-R:L (T-scores)						
DSM-IV Inattention	$64.66\ (10.94)_a$	$46.42\ (5.02)_b$	$53.92\ (11.15)_c$	$46.75\ (6.57)_b$	51.58***	0.40
DSM-IV Hyperactivity	$61.82\ (13.75)_a$	$45.71\ (4.17)_b$	$52.01\ (9.47)_c$	$46.80\ (5.46)_b$	35.08***	0.31
Opposition	$61.08\ (15.09)_a$	$48.16\ (7.45)_{bc}$	$53.30\ (11.73)_b$	$47.25\ (5.10)_c$	19.11***	0.20
Peer Problems	$59.56\ (15.96)_a$	$49.42\ (6.56)_b$	$52.38\ (11.79)_b$	$47.36\ (5.21)_b$	12.97***	0.14

[a] One-way ANOVA for continuous variables; Pearson chi-square statistic (in italics) for categorical variables.

[b] Effect size type: Partial η^2 for continuous variables; Cramer's V for categorical variables.

[c] For the parent questionnaires (demographic questionnaire and CPRS-R:L), data was available for only 83 friends of children with ADHD instead of 87. For the teacher questionnaire (CTRS-R:L), data was available for 80 referred children with ADHD, 45 referred comparison children, 71 friends of children with ADHD, and 44 friends of comparison children.

Entries with different subscripts differ significantly.

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

research assistants administered the friendship nominations and the friendship-quality questionnaire. In order to ensure comprehension of the questionnaire, the research assistants read aloud each question to both participants. We administered all measures in either French or English. The first author translated the Friendship Qualities Measure into French, which was then re-translated back into English by the second author. Parents and teachers completed a questionnaire about the children's behavior; parents also completed a questionnaire with demographic information. Referred children and their friends were then videotaped while performing observational tasks together. We conducted pilot sessions in order to verify that these tasks were appropriate for children 7–13. Our observational measures have been used successfully in previous research on the dyadic interactions of delinquent adolescents (e.g., Dishion et al. 1997), socially anxious early adolescents (Schneider 2009), aggressive children (Dane 2001), and "normal" school-aged children (e.g., Fonzi et al. 1997). These tasks, designed to mirror the real-world interactions of friends, were conducted in random order in a room either at the University of Ottawa or at a local school. The children's negotiation tasks (card-sharing and game-choice tasks) were transcribed for coding purposes.

The videos were coded by trained graduate and undergraduate students, blind to the identity and diagnosis of the participants. The car-race task and the affect categories of all three observational tasks were coded using the Observer XT (Version 7) software from Noldus Information Technology (www.noldus.com). A random sample of 20% of the sessions was recoded independently by other coders blind to the identity and diagnosis of the participants in order to establish inter-rater reliability. Category definitions and their respective inter-rater reliability statistics are reported in Tables 2 and 3.

Table 2 Definitions of car-race task categories

Category (kappa)	Definition (Intra-class correlation)
Compliance with rules	
Legal maneuvers (0.87)	All legal maneuvers including: Avoiding contact with the partner's car legally (e.g., pulling one's car backwards; waiting the partner before entering the runway); making contact with the partner's car without breaking any rules; car and blocks in proper position at times of loading and unloading. (0.29)
Illegal maneuvers (0.82)	All illegal maneuvers including: Avoiding contact with the partner's car by breaking the rules (e.g., lifting one's car in the air); making contact with the partner's car while one's own car is in an illegal position (e.g., driving up the sides of the runway); infraction of rules during loading or unloading. (0.15)
Affect	
Positive (0.80)	The extent to which members of the dyad expresses nonverbal and verbal positive affect, including positive facial expressions and laughter. 1–3 rating [1=*the child is smiling for most of the segment*; 3=*thoroughly positive with extended bouts of giggling or laughter*]. (0.57)
Negative (0.81)	The extent to which partners express negativity toward one another or toward the task in their facial affect and speech. Includes orders, threats, reprimands, visible tension and nervousness. 1–3 rating [1=th*e child is complaining or exhibit some frustration toward the friend or the task*; 3=*extensive negative affect expressed vocally or physically at any point in the segment*]. (0.05)
Neutral (0.88)	The extent to which partners manifest neutral affect for most of the segment. (0.57)

Measures

Conners Parent and Teacher Rating Scales-Revised—Long Forms (CPRS-R:L and CTRS-R:L) The well-validated CPRS-R-L and CTRS-R:L (Conners et al. 1998a, b) were used to assess symptoms of ADHD, other disruptive behaviors, and general peer problems in referred children and their friends.[1] Following the procedure used by Blachman and Hinshaw (2002), we used only parental ratings in situations where teachers had seen children exclusively on medication (n=24 or 27.6% of the ADHD sample).

Friendship Nominations In order to confirm the presence of a reciprocal friendship and to document when and where the friendship started, children and their friends completed a friendship nomination form (Parker and Asher 1993). Referred children in all groups retrospectively perceived their friendships as quite stable (Children with ADHD: M= 4.33 years, SD=2.99 years; Comparison children: M= 4.80 years, SD=3.12 years). The majority of referred children participated in the research session with their very best friend (Children with ADHD: 83.9%; Comparison children: 89.1%). The majority reported starting these friendships at school (Children with ADHD: 58.6%; Comparison children: 58.7%).

Dyads in which one or both participants failed to nominate his or her partner as a friend were not included in the final analyses (n=11 dyads; 7 ADHD dyads and 4 comparison dyads). As the parents of the friend were contacted by the referred child's parents, these 11 dyads of children may have been only neighbors or the children of the parents' friends. These children were slightly younger than children in reciprocal friendships. However, children with ADHD with and without reciprocal friendships did not differ significantly in terms of ADHD symptoms or SES.

The *Friendship Qualities Measure (FQM;* Grotpeter and Crick 1996) is a 43-item instrument developed to assess the quality of children's best friendship. Scores on the response scale ranged from 1 (*Not at all true*) to 5 (*Almost always true*). The original subscales were: Validation/Caring; Companionship/Recreation; Help/Guidance; Intimate Exchange; Conflict Resolution; Overt Aggression within the Friendship; Overt Aggression towards Others; Relational Aggression within the Friendship; Relational Aggression towards Others; Subject Desire for Exclusivity; Friend Demand of Exclusivity; and Conflict. Based on previous theoretical and empirical evidence (see Berndt 1996, for rationale), we reduced the original 12 subscales to two global factors: Positive friendship features (18 items, α= 0.83) and negative friendship features (25 items, α=0.80). The correlation between these dimensions was moderately high (r=−0.33, p<0.01), indicating that they may be related but independent aspects of friendship quality. In order to gauge overall friendship satisfaction, we added two additional items (*How is this friendship going? How happy are you with this friendship?*). Scores on the response scale ranged from 1 (*It's going really badly; Very unhappy*) to 5 (*It's going really well; Very happy*).

[1] We substituted the Conners Rating Scales-Revised subscales (DSM-IV inattention, DSM-IV hyperactivity, Opposition, and Peer Problems) with the corresponding Conners-3 (Gallant et al. 2007), versions for a small number of referred children (parent version, n=18; teacher version, n=9) and friends (parent version, n=22; teacher version, n= 16). Because the Conners 3 version became available during the course of the present study and that some parents/teachers had already completed this version during the past months.

Table 3 Definitions of negotiation categories for card sharing and game choice tasks

Category (kappa: Card Sharing/ Game Choice)	Definition (Intra-class correlation)
Proposals	
Self/other-interest-based (0.96/n.a)	The extent to which a proposal made by a child favors himself/herself or his/friend in terms of the number of cards negotiated during this specific proposal. −1 to 1 rating [−1=self-centered proposal; 0=neutral proposal; 1=altruistic proposal] (0.45/n.a.)
Sensitivity (0.79/0.81)	The extent to which a proposal made by a child acknowledges and responds to his/her friend's social cues, needs, and preferences. −1 to 1 rating [−1=*insensitive proposal*; 0=*new proposal*; 1=*sensitive proposal*] (0.64/0.57)
Preference	
Expression (0.86/0.79)	Disclosure of personal preferences about the outcome of the negotiations. (0.62/0.43)
Inquiry (0.83/0.89)	Inquiry about friends' personal preferences about the outcome of the negotiations. (0.18/0.17)
Responses	
Acceptance (0.77/0.89)	Unqualified acceptance of a proposal. (0.25/0.46)
Refusal (0.80/0.77)	Total rejection of a proposal. (0.47/0.19)
Balance of power[a] (0.83/n.a.)	The degree to which one partner in the dyad possesses more influence or control during the interaction. Indications of controlling behaviors include choice of cards/game, speech turn-taking, and leader/ monitor roles. 0–1 rating 0=[*equal balance between the children*; 1=*unequal balance between the children*] (n.a./n.a.)
Affect	
Positive (0.78/0.77)	The extent to which members of the dyad expresses nonverbal and verbal positive affect, including positive facial expressions and laughter. 1–3 rating [1=*the child is smiling for most of the segment*; 3=*thoroughly positive with extended bouts of giggling or laugh*ter]. (0.70/0.62)
Negative (0.80/1.00)	The extent to which partners express negativity toward one another or toward the task in their facial affect and speech. Includes orders, threats, reprimands, visible tension and nervousness. 1–3 rating [1=*the child is complaining or exhibit some frustration toward the friend or the task*; 3=*extensive negative affect expressed vocally or physically at any point in the segment]*. (0.84/0.45)
Neutral (0.95/0.95)	The extent to which partners manifest neutral affect for most of the segment. (0.93/0.73)

n.a. = Not applicable.

[a] The coding produced one score per dyad for this category.

The *Car-Race Task* (Fonzi et al. 1997) simulates interaction between children in a fast-paced, engrossing game. This game requires no previous training and does not favor children with any particular type of ability. The goal of the game is to be quicker than the opponent in transporting five 4×3.5×5.5 cm wooden blocks from one end of the game table to the other. Participants do this by transporting the blocks one at a time in trunk of a 33×21× 15 cm toy truck. The truck must travel down a 180×36 cm runway with walls 4.5 cm high from a starting mark to a finish line and back. The runway cannot accommodate both trucks side by side, and the rules prohibit the players from lifting their wheels from the runway. A player can thus: (1) compete energetically but without breaking the rules, e.g., by blocking or pushing against the opponent's car; (2) compete in violation of the rules, e.g., by lifting one's own car over the partner's; and (3) avoid conflicts with their opponents even if this reduces their own chances of winning, e.g., by going in reverse, allowing one's partner to proceed. Scoring procedures were similar to those used by Fonzi et al. (1997). Definitions of the car-race categories, data on inter-rater reliability, and the intraclass (i.e., between dyad members) correlations appear in Table 2. Fonzi et al. (1997) found that this task successfully discriminated friendships that would continue 6 months later from friendships that would terminate.

Card-Sharing and Game-Choice Tasks We presented each dyad with a selection of 15 trading cards. We selected cards that were appealing to children of both sexes and different ages, featuring a variety of sports personalities, cartoon characters and popular artists. We asked the participants to select 5 cards from the initial 15 that they both agreed that they liked. We then instructed them to decide together how they would share the 5 cards. The friends were allowed to share them any way that they chose, so long as both parties agreed. During the game-choice task, we asked the participants to choose together what games they would play at the end of the session. No time limits were imposed in either task. To code both these tasks, we used categories similar to those used in a negotiation task used by Fonzi et al. (1997) to describe the quality of the negotiations (see

Tables 2 and 3 for category definitions, inter-rater reliability, and intraclass correlations). Independent raters also coded the video data for the affect displayed by each participant at 5-second intervals during the three tasks, using a scale ranging from positive to neutral to negative; definitions and reliability data appear in Tables 2 and 3. The affect indices represent the rate per minute of each affect category multiplied by its intensity (1, 2 or 3).

Results

Data Analytic Strategy

The average intraclass correlations (i.e., between the two friends) for the car-race, the card-sharing, and the game-choice tasks were 0.33, 0.56, and 0.45 respectively, indicating that the behaviors of each friend were not extensively influenced by the behavior of the other friend. We therefore conducted the main analyses at the individual level first, allowing for maximum power. We subsequently examined potential age, subtype and comorbidity, and medication-effect differences at the individual level. We then performed a second wave of data analyses at the dyadic level using the means of the combined data of each dyad. Although preliminary analyses indicated significant gender differences in the categories pertaining to the referred children's perceived friendship positive features, expression of preferences, and inquiries of personal preferences (see Table 4), there were no significant sex X ADHD status interaction effects. Thus, even though boys and girls differed on these three variables (referred children's perception of friendship positive features, expression of preferences, and inquiries of personal preferences), there were no gender differences within the referred ADHD group in any of our friendship variables. We nevertheless decided to enter both sex and ADHD status as fixed factors in the MANOVAs and ANOVAs (with Tukey post hoc comparisons). Finally, we re-analyzed the friendship-questionnaire and friendship-observation data first without the girls (n=32) and then without the cross-gender friendships data (n=8). As the overall pattern of results was virtually identical to the one with all the referred participants, results reported below included all these cases.

Behavioral and Social Characteristics of the Invited Friends (Hypothesis #1)

Descriptive statistics for the behavioral and social characteristics of all participants are presented in the lower part of Table 1. The subscales that appear in this table were from the CRS-R:L because 1) they were directly related to our hypotheses and 2) their content was identical or very similar across the two Conners versions (CRS-R:L and Conners-3), thus allowing for more statistical power. The overall multivariate F values were significant both for parent $F4,255=16.98$; $p<0.001$, Partial $\eta^2=0.21$, and teacher ratings, $F4,233=10.07$; $p<0.001$, Partial $\eta^2=0.15$. As detailed in Table 1, follow-up analyses and post-hoc tests revealed significant differences between the friends of children with ADHD and the friends of comparison children on the parent and teacher DSM-IV ADHD subscales; the friends of children with ADHD being rated as more inattentive and hyperactive/impulsive than the friends of comparison children. As displayed in Table 1, effect sizes for differences between the ADHD and comparison groups were greater for parents' than teachers' ratings on all Conners subscales. For both parents' and teachers' ratings used in the analyses of differences between the ADHD and comparison groups, there were larger effect sizes for DSM-IV inattention and hyperactivity subscales than all other subscales. Interestingly, 22 (25.2%) of the 87 friends of children with ADHD also displayed ADHD symptoms in the clinical range (T-scores>65 on the Conners parent *and* teacher DSM-IV ADHD scales). None of the friends of comparison children had clinically elevated ADHD symptoms. Teachers also rated the friends of children with ADHD as higher in oppositionality than the friends of comparison children. The parents' ratings of opposition symptoms (p=0.066) and peer problems (p=0.059) tended to be slightly higher for the friends of children with ADHD than the friends of comparison children but these differences did not correspond to conventional levels of statistical significance. Teachers' ratings did not reveal group differences in the friends' peer problems.

Friendship Quality (Hypotheses #2 and #3)

We conducted one-way MANOVA (by ADHD status), with the FQM positive and negative dimensions as the dependent variables. Results, detailed in Table 4, indicated several significant differences between the perceptions of friendship quality of (1) children with ADHD and comparison children and of (2) the friends of children with ADHD and the friends of comparison children. Only differences that remained significant after Bonferoni correction are discussed in this paragraph. With regard to the referred children's ratings, there was a significant multivariate effect for ADHD status $F2, 128=4.20$; $p<0.05$ for both the positive and negative subscales. Children with ADHD perceived less positive features and more negative features than comparison children. The analyses also revealed a multivariate ADHD-status effect for the invited friends' ratings: $F2, 127=6.08$; $p<0.01$. Univariate analyses showed

Table 4 Descriptive statistics for friendship questionnaire data (means with SDs in parentheses)

Category	Referred ADHD (n=87)	Referred Comparison (n=46)	Sex [a] $F(3,133)$	Sex Partial η^2	ADHD Status [a] F (3, 133)	ADHD Status Partial η^2
Friendship Qualities Measure						
Referred children's ratings						
Positive friendship features	3.88 (0.61)	4.19 (0.57)	11.50**	0.08	6.54*	0.05
Negative friendship features	1.75 (0.44)	1.54 (0.38)	0.41	0.00	4.23*	0.03
Friends' ratings						
Positive friendship features	4.03 (0.60)	4.41 (0.50)	3.29	0.03	12.07**	0.09
Negative friendship features	1.74 (0.48)	1.62 (0.42)	1.29	0.01	1.04	0.01
Friendship Satisfaction						
Referred children's ratings	4.70 (0.60)	4.93 (0.23)	0.04	0.00	7.50**	0.06
Friends' ratings	4.73 (0.48)	4.96 (0.18)	0.08	0.00	6.98**	0.05

[a] One-way ANOVA

*p<0.05; ** p<0.01; *** p<0.001

that this difference was specific to the positive friendship features: The friends of children with ADHD perceived less positive friendship features in their relationship than did the friends of comparison children. As detailed in Table 4, there was a larger effect size in the analysis of differences between the ADHD and comparison groups for the positive friendship features perceived by the invited friends than for all other friendship quality subscales. Both children with ADHD and their invited friends were significantly less satisfied in their friendships than were comparison children and their respective friends (see Table 4).

Observation Data (Hypotheses #4, #5, and #6)

Car-race task Multivariate analysis of variance indicated a significant difference between the ADHD and comparison children in compliance with rules F2,128=10.07; p<0.001; see Table 5. Follow-up univariate ANOVAs indicated that children with ADHD exhibited both more legal and illegal maneuvers during the car-race task than comparison children. Children with ADHD made fully twice as many illegal moves as comparison children. There were no significant findings with regard to the affect displayed by the two groups on this task. As detailed in Table 5, there was a larger effect size in the analysis of differences between the ADHD and comparison groups for illegal maneuvers performed by referred children than all other car-race categories.

Card-sharing task MANOVA indicated significant between-group differences in terms of sensitivity and self vs. other interest (F5,125=5.22; p<0.001; see Table 5). Univariate follow-up analyses indicated that children with ADHD made more insensitive and self-centered proposals but fewer sensitive proposals than comparison children. In contrast, there were no significant univariate differences between referred groups in the number of altruistic, neutral, or new proposals. There was also a significant multivariate effect in terms of communication regarding personal preferences F2,128=10.60; p<0.001; children with ADHD asked their friends' preference for trading cards to be shared less frequently than did the comparison children. There was no univariate difference in the number of preference statements expressed. In the analysis of differences between the ADHD and comparison groups, there were larger effect size for balance of power, preference inquiry, and self-centered proposals than for all other card-sharing categories.

Chi-square tests indicated significant differences in the balance of power: Children with ADHD were more likely than comparison children to be involved in a friendship where the power was unequally balanced (see Table 5). Finally, there were no significant differences between the groups in terms of affect. It is interesting to note that 7 of the 133 dyads did not reached a final agreement as to how divide the five liked cards with their friend; 100% of these dyads involved a child with ADHD and his/her friend ($\chi^2$1,133=3.91; p<0.05).

Game-choice task MANOVA revealed a significant difference in the number of sensitive proposals (F3,127=2.69; p<0.05) made by children with ADHD versus comparison children (see Table 5). Univariate follow-up analyses indicated that children with ADHD made more insensitive proposals than comparison children. In contrast, there were no significant univariate differences between groups in the number of sensitive and new proposals. There was a significant multivariate between-group effect in terms of acceptance/refusal (F2,128=3.18; p<0.05); children with ADHD refused their friends' proposals more often than did

Table 5 Descriptive statistics for friendship observation data (means with SDs in parentheses)

Category	Referred ADHD (n=87)	Referred Comparison (n=46)	Sex[a] F (3,133)	Sex Effect Sizes[b]	ADHD Status [a] F or χ^2 (3, 133)	ADHD Status Effect Sizes[b]
Care-Race Task						
Compliance with rules						
Total legal maneuvers	69.72 (15.93)	64.39 (12.86)	0.36	0.00	7.71**	0.06
Total illegal maneuvers	10.68 (6.81)	5.41 (5.45)	0.00	0.00	12.66**	0.09
Affect						
Positive	9.65 (6.28)	10.70 (4.71)	0.86	0.01	0.44	0.00
Negative	0.26 (0.84)	0.02 (0.11)	0.33	0.00	2.87	0.02
Neutral	5.70 (3.21)	4.94 (2.70)	0.21	0.00	0.95	0.01
Card-Sharing Task						
Types of proposals						
Self/other-interest-based						
Altruistic proposals	1.55 (1.57)	2.33 (1.61)	0.03	0.00	0.10	0.00
Neutral proposals	2.43 (2.42)	2.96 (2.48)	3.69	0.03	1.98	0.02
Self-centered proposals	4.38 (3.73)	1.96 (1.73)	0.03	0.00	14.33***	0.10
Sensitivity						
Sensitive proposals	0.62 (0.78)	0.98 (1.22)	0.01	0.00	6.07*	0.05
New proposals	6.08 (4.04)	5.35 (2.86)	2.81	0.02	0.46	0.00
Insensitive proposals	2.21 (3.03)	0.50 (1.21)	0.82	0.01	9.56**	0.07
Preference						
Expression	3.54 (3.52)	3.11 (3.45)	16.79***	0.00	0.05	0.00
Inquiry	0.64 (1.35)	1.65 (1.77)	8.72**	0.00	17.13***	0.12
Responses						
Acceptance	1.07 (1.05)	1.26 (1.22)	2.70	0.02	1.90	0.01
Refusal	0.87 (1.43)	0.50 (0.84)	0.26	0.02	1.79	0.01
Balance of power (% of unbalanced dyads)	51.7	30.4	0.00	0.00	5.53*	0.21
Affect						
Positive	3.96 (3.82)	4.53 (3.32)	1.97	0.02	0.17	0.00
Negative	0.07 (0.29)	0.00 (0.00)	0.46	0.00	0.91	0.01
Neutral	9.93 (2.94)	9.26 (3.09)	1.84	0.01	2.63	0.02
Game-Choice Task						
Types of proposals						
Sensitivity						
Sensitive proposals	0.48 (0.85)	0.67 (1.06)	2.81	0.02	0.95	0.01
New proposals	0.94 (1.24)	0.78 (1.00)	0.16	0.00	0.00	0.00
Insensitive proposals	0.89 (1.95)	0.09 (0.28)	0.06	0.00	7.17**	0.05
Preference						
Expression	1.51 (1.72)	1.61 (1.79)	0.95	0.00	1.25	0.01
Inquiry	0.43 (0.79)	0.33 (0.67)	0.29	0.01	0.79	0.01
Responses						
Acceptance	0.75 (0.85)	0.83 (0.88)	0.49	0.00	0.16	0.00
Refusal	0.48 (1.02)	0.07 (0.25)	1.00	0.01	6.23*	0.01
Affect						
Positive	4.62 (4.63)	6.74 (5.16)	0.89	0.01	3.41	0.03
Negative	0.08 (0.32)	0.00 (0.00)	0.41	0.00	2.12	0.02
Neutral	8.64 (5.41)	8.29 (4.23)	0.85	0.01	0.23	0.00

[a] One-way ANOVA for continuous variables; Pearson chi-square statistic for categorical variables.

[b] Effect Size type: Partial η^2 for continuous variables; Cramer's V for categorical variables.

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

comparison children. Finally, there were no significant multivariate group differences in the number of preference expressions/inquiries or in the affect indices. All effect sizes were small for this task.

Supplementary Analysis

Age differences We re-analyzed the friendship-questionnaire and friendship-observation data adding a variable pertaining to age differences, with age dichotomized into two blocks, 7:0 to 10:11 and 11:0 to 13:11 years. There were no significant age differences.

ADHD subtypes (Hypothesis #7) We determined subtypes by blending the Conners parent and teacher rating scales *T*-scores (with a cut-off at 65) of the DSM-IV Inattention and DSM-IV Hyperactivity-impulsivity subscales. Among the ADHD group, there were 66 children (19 girls) with the ADHD-Combined subtype, 18 children (1 girl) with the ADHD-Predominantly Inattentive subtype and 3 children with ADHD-Hyperactive subtype (eliminated from the analysis). Analyses conducted with matched groups of equal size indicated no significant differences in terms of subtype on any of the dependent measures.

Comorbidities We compared children with ADHD whose Conners parent *and/or* teacher ratings indicated comorbid anxiety and/or oppositionality (*T*-score>65) with children with ADHD only (having high scores on the ADHD scales only). We first looked at comorbidity with anxiety; our sample consisted of 45 children with ADHD-only (10 girls), 42 children with ADHD+anxiety (10 girls) and 46 comparison children (12 girls). Of the 32 variables, there were only two significant differences between the two ADHD-status groups, in self/other-interest-based proposal during the card-sharing task ($F6,252=4.44$; $p<0.001$) and in compliance with rules in the car race task ($F4,254=6.06$; $p<0.001$). Follow-up univariate analyses indicated that children with ADHD-only made more self-centered proposals than children with ADHD+anxiety in the card-sharing task (ADHD-only: $M=5.49$, $SD=4.11$; ADHD+anxiety: $M=3.19$, $SD=2.87$; $F2,127=11.06$, $p<0.01$) and more legal maneuvers in the car-race task (ADHD-only: $M=73.36$, $SD=16.39$; ADHD+anxiety: $M=65.83$, $SD=14.64$; $F2,127=5.68$; $p<0.05$).

We then looked at comorbid opposition behavior. There were 24 children with ADHD-only (10 girls) and 63 children with ADHD+opposition (15 girls). There were no significant differences between these two ADHD-status groups.

Medication status We offered no hypothesis regarding medication effects, which we could not manipulate. Nevertheless, for heuristic purposes, we compared the 27 children with ADHD who were not on medication with the 60 children with ADHD who were on medication during the research session. There were no significant differences.

Dyadic Analyses

In order to test Hypothesis #8, referring to differences between dyads that comprise two children with ADHD ($n=22$, 7 girls) versus "mixed" dyads ($n=65$, 13 girls) in which only the referred child had ADHD, we compared subgroups of 22 dyads each, matched for age and sex. The MANOVA and ANOVA results indicated no significant differences between these two types of ADHD dyads in any of the dependent variables. We examined the data from the 65 mixed-dyads only to determine whether there was a significant difference between the ADHD and non-ADHD members in terms of balance of power, affect, friendship quality, and satisfaction with the friendship. In the card-sharing task, power was balanced unequally in 34 of the 65 mixed dyads (52.3%); in 25 of these 34 (73.5%), the child with ADHD was dominant. The ADHD members of the mixed dyads displayed higher levels of positive affect ($M=9.44$, $SD=6.19$) than the non-ADHD members [$M=5.70$, $SD=2.93$; $t(65)=6.75$, $p<0.001$] in the car-race task, counterbalanced by somewhat but non-significantly ($p=0.08$) more negative affect. In the card-sharing task, there was more negative affect on the part of the non-ADHD members than the ADHD members, although again not at conventional levels of statistical levels of significance ($p=0.06$). Contrary to predictions, the non-ADHD members perceived significantly more positive features in the relationship ($M=3.97$, $SD=0.59$) than children with ADHD [$M=3.79$, $SD=0.58$; $t(65)=2.30$, $p<0.05$]. There were no statistically significant differences in terms of friendship satisfaction.

Discussion

This multimethod study provides detailed information about the friendships of children with ADHD using analogue tasks specifically designed to mirror the real-world interactions of friends and to elicit a variety of social interactions. Furthermore, it is one of the first known reports on the behavioral characteristics of the friends of children with ADHD and about the *friends'* perception of the relationships. Taken together, these results suggest that children with ADHD mismanage their friendships in several different ways.

Who Are the Friends of Children with ADHD?

Referred children with ADHD had friends with higher levels of ADHD symptoms and oppositional behavior than

did comparison participants. These results complement those of Blachman and Hinshaw (2002) who found that girls with ADHD prefer other girls with ADHD as friends. Some children with ADHD may prioritize social goals such as sensation seeking and fun over compliance with rules and equity. Children with ADHD may share these goals with other children who are disruptive, leading to greater affiliation. Alternatively, children with ADHD may not have access to better models of prosocial behavior. Because children with ADHD tend to be disliked by popular peers (Hoza et al. 2005b) and because parents of potential friends may prevent their children from spending time with children who display disruptive behavior, their pool of potential friends may be limited.

Quality of the Friendships of Children with ADHD

Children with ADHD perceived *both* fewer positive features *and* more negative features than did comparison children. These results clearly indicate that, even according to self-reports, the friendships of children with ADHD tend to be more problematic than those of children without ADHD. This is further underscored by the finding that both children with ADHD and their invited friends were significantly less satisfied in their friendships than comparison children and their respective friends. Interestingly, the friends of children with ADHD perceived fewer positive friendship features *but not* more negative friendship features in their relationships than the friends of comparison children.

Children with ADHD in Interaction with Their Friends

The findings that children with ADHD tend to violate the rules of the competitive game are particularly worrisome given that not following activity rules is an important predictor of peer rejection in children with ADHD (Mrug et al. 2007). A partial explanation for this may lie in the fact that the children with ADHD made more moves of all kinds, both legal and illegal, which may be reflective of their hyperactivity and, for half the sample, comorbid anxiety. Nevertheless, it is important to remember that the children with ADHD made fully twice as many illegal moves as the members of the comparison group. Fairness in play and respect for rules make for enjoyable company (Fonzi et al. 1997). The self-centered and insensitive approach of the children with ADHD in their negotiations with friends is also troublesome. These findings are consistent with other studies showing that children with ADHD have poorer social perspective taking skills than non-diagnosed children (Marton et al. 2009).

Interactions with friends are generally positive. Incongruent with this general finding are the sporadic indications, not always statistically significant, that children with ADHD display more intense emotions than their own friends. Children with ADHD were also often more dominant than their friends. This may indicate that children with ADHD fail to respect the principle of equity in friendship. Perhaps they do not understand that friendships are based on equity or perhaps their impulses at the moment supersede anything they might know in a hypothetical sense. Dominance may also be the consequence of poor perspective taking (Marton et al. 2009), manifest in the failure to effectively integrate the friend's perspectives and occasionally give up some of one's own needs.

Few of the subsidiary analyses (i.e., age, subtypes, comorbidities, and medication differences) revealed significant distinctions within the ADHD sample. However, it must be remembered that these analyses had to be conducted with less statistical power than the main analysis. Interestingly, among the isolated significant results, we found that children with ADHD and high levels of anxiety symptoms made fewer self-centered proposals and fewer legal moves than children with ADHD only. Future studies should clarify the possible protective role of anxiety on the friendships of children with ADHD; social psychologists have found that some types of anxiety are facilitative of performance (Raffety et al. 1997).

Our results are limited by the contrived nature of the closed-field observational tasks, although the situations of interest here are probably not amenable to naturalistic observation. In this study, the parent of the referred child contacted the parent of the child's friend to obtain informed consent and typically brought both the referred child and his/her friend to the research session. Given the demands placed on the parent of the referred child and the presence of both friends, further data collection was not possible. Accordingly, we were unable to include other measures, such as diagnostic interviews, to confirm the diagnostic status of the participants.

Our data do not, of course, elucidate the cause or causes of the friendship problems of the participants with ADHD, which we were able to document using multiple methods. Some of the problem may stem from the core symptoms of ADHD, such as inattention and impulsivity. However, it is also conceivable that faulty modeling may play a role. The friends that children with ADHD select may not provide appropriate modeling of friendship skills. As well, given the high proportion of boys and of children from single-parent homes, the participants with ADHD may not have appropriate male role models of appropriate behavior with same-sex friends.

Applications

Given the friendship problems documented in this report and elsewhere, it is imperative that efforts be made to

ensure that friendship-enhancing interventions be directed in some way at helping children with ADHD make friends with models of adaptive social behavior. Although we do not have conclusive data about the benefits of medication, the medicated participants with ADHD, which accounted for 82% of our total ADHD sample, failed to show any improvements over the unmediated subsample on any of our friendship measures. Despite that it is generally recognized that ADHD medication can help reduce negative social behaviours, it does not seem to lead to a corresponding increase in prosocial behaviours (e.g., Hinshaw et al. 1989) that appear to predict peer liking in children with ADHD (Mrug et al. 2007). For instance, in a double-blind study with direct classroom observations, Hinshaw and colleagues (1989) found no effect of methylphenidate on such prosocial behaviours as initiation of contact, mediation of conflict and prolonged dyadic interaction despite medication-related improvements in negative social behaviour. These positive behaviors play a central role in friendship.

Almost all interventions targeting peer relations have been designed to increase general acceptance by peers (e.g., through social skills training) rather than close friendship. However, as this approach has not yielded promising results with the ADHD population (Landau et al. 1998), enhancing close friendship may be a more viable intervention goal. Hoza and colleagues (Hoza et al. 2003) developed an intervention that involves pairing potential friends as "buddies" who share recreational activities and earn special privileges by interacting positively with each other. The essence of this approach is to provide opportunities for dyadic interaction in a systematic fashion. Unfortunately, as the "buddy" program was camp-wide, the effects of the dyad-specific intervention could not be separated from the effects of the entire special summer program. In a parental friendship coaching approach developed by Mikami and her colleagues, parents were taught to give in-vivo reminders to their children and to arrange a social context in that were optimal for their children to develop good peer relationships (Mikami et al. 2010). It is hoped that the results of the current study will contribute to the development of evidence-based friendship interventions for children ADHD.

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