




Contributions of Friends' Problem Behaviors to Friendship Quality in a Sample of Children with ADHD

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ABSTRACT

Objective: It is often assumed that children with attention-deficit/hyperactivity disorder (ADHD) experience friendship difficulties because of their own problem behaviors. However, friendships are dyadic relationships between two children. This study sought to understand the incremental contributions of friends' problem behaviors to dyadic friendship quality in a clinically diagnosed sample of children with ADHD.

Method: One hundred and sixty-five dyads consisting of a target child with ADHD and social impairment (age 6–11; 67% male; 72% white) and a reciprocated, real-life friend were recruited. Parents and teachers rated the ADHD symptom severity, externalizing problems, and callous-unemotional (CU) traits of target children and friends. Friendship quality in the dyad was measured with: (a) questionnaires independently completed by target children, their parents, their friends, and the parents of their friends; and (b) observations of child-friend interactions.

Results: The severity of ADHD symptoms and externalizing problems (but not CU traits) in target children was associated with more negative friendship quality reported on questionnaires. Adjusting for the corresponding problem behavior in target children, each type of friends' problem behaviors incrementally predicted less positive friendship quality (on questionnaires). Friends' ADHD symptoms and CU traits also incrementally predicted more negative friendship quality (on questionnaires and observations).



Conclusions: Considering problem behaviors in friends of children with ADHD (in addition to those in children with ADHD) may be important for identifying dyads at risk for lower quality friendships. These findings could possibly lead to new directions when designing and evaluating treatments targeting the friendship problems of children with ADHD.

Although it is well documented that children with attention-deficit/hyperactivity disorder (ADHD) have poorer interpersonal skills and are more disliked by peers compared to typically developing children, much less is known about their friendships (Gardner & Gerdes, 2015). Friendship is a mutual, dyadic relationship between two children. Importantly, friendships vary in quality, as defined by their positive (e.g., supportive, intimate) and negative (e.g., conflictual, antagonistic) features (Bagwell & Schmidt, 2011). For children with ADHD, who are often rejected by the larger peer group, friendships may provide valuable opportunities to develop interpersonal skills necessary to becoming well-adjusted adults (Bagwell & Schmidt, 2011). There is accumulating evidence supporting the developmental significance of friendships for children with ADHD symptoms. In a community sample of elementary school children, Lee et al. (2021) found that having more reciprocated friends buffered

against the associations between children's ADHD symptoms and later poorer peer functioning. Low friendship quality was also recently identified as a pathway through which ADHD symptoms are associated with subsequent depressive symptoms in a large representative school-based sample (Powell et al., 2021). Among children with or at-risk for ADHD, the presence of friendship (Cardoos & Hinshaw, 2011), particularly if the friendship is high in quality (Becker et al., 2013), is associated with less social problems over time, as well as reduced peer victimization. Thus, good friendships may protect children with ADHD from negative outcomes, yet surprisingly little is known about what factors relate to friendship quality in this population.

Friendship Quality in Children with ADHD

Children with ADHD are suggested to have fewer reciprocated friends than do typically developing children,

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a tendency which is exacerbated when friendships are restricted to classroom peers (Gardner & Gerdes, 2015). Additionally concerning, however, is that the friendships of children with ADHD are of lower quality – that is, marked by more negative and fewer positive features (Blachman & Hinshaw, 2002; Normand et al., 2011, 2013, 2019). Understanding individual differences in friendship quality, and identifying risk factors associated with lower quality friendships, may support the adjustment of children with ADHD. Although knowledge in this area is limited, there is some evidence from community and non-ADHD clinical samples that ADHD symptom severity, externalizing problems, and callous-unemotional (CU) traits could be associated with worse friendship quality.

First, the core symptoms of ADHD may constitute an obstacle for friendship quality. The severity of inattention may get in the way of building bonds, and hyperactivity/impulsivity could engender conflicts between friends. In a community sample (age 8–13, 45% male), ADHD symptom severity rated by teachers was correlated with children's self-reports of less positive and more negative friendship quality (Haas et al., 2018) with a medium effect size (ES). Evidence from clinical samples also shows that children with an ADHD diagnosis have poorer friendship quality relative to peers without ADHD on questionnaires and observations (Blachman & Hinshaw, 2002, age 6–12, 100% female; Normand et al., 2011, 2013, 2019, age 7–13, 76% male; medium to large ESs). However, these studies did not examine whether ADHD symptom severity (as measured dimensionally) was an incremental risk factor for poor friendship quality, above and beyond the ADHD diagnosis.

Externalizing problems, which co-occur with ADHD at high rates (American Psychiatric Association, 2013), may also relate to poor friendship quality. Temper outbursts or aggression can disrupt intimacy and elicit conflict. In their community sample, externalizing problems rated by teachers correlated with children's self-reports of more negative friendship quality (Haas et al., 2018; small ES). Similarly, in a clinical sample of youth (ages 9–18, 46% male) with and without disruptive behavior disorders, Ackermann et al. (2019) found associations between externalizing problems and less positive as well as more negative friendship quality reported on questionnaires (small ES). Using the current study's sample, Normand et al. (2020) found that the friendships of children with ADHD and a comorbid diagnosis of an externalizing disorder were characterized by poorer friendship quality on questionnaires than the friendships of children with ADHD and no externalizing disorder (small to medium ESs); friends' behaviors were not examined, nor were observational measures of friendship quality included.

Third, beyond externalizing problems, the ways children emotionally connect to peers also could affect their friendship quality. Callous-unemotional (CU) traits include callousness, uncaring behavior, and low empathy. These traits are associated with children's self-reports of less positive and more negative friendship quality on questionnaires in community (Haas et al., 2018; small to medium ES) and clinical samples of youth with externalizing disorders (Ackermann et al., 2019; small ES). Although no study has investigated these questions in a clinical sample of children with ADHD, Haas et al. (2018) found that CU traits were associated with lower levels of child-reported friendship quality (i.e., intimacy) in a community sample, covarying for child age, gender, ADHD symptoms, and externalizing problems (small ES). Taken together, evidence from community and clinical samples suggests that ADHD symptoms, externalizing problems, and CU traits are associated with poor friendship quality; however, outcome measures of friendship quality have been mostly constrained to questionnaires.

Friends' Problem Behaviors

Although it is often assumed that children with ADHD experience poor friendship quality because of their own problem behaviors, friendship is a dyadic process that is influenced by the behaviors of each member, and the reactions of the other member to those behaviors, in a reciprocal cycle over time (Bagwell & Schmidt, 2011). In community samples, the contribution of both members of the dyad to friendship outcomes is well-accepted, even to the point that the behavioral characteristics of the friend are a key aspect in conceptual models of friendship. For example, in his multidimensional model, Hartup (1995) outlines the "three faces of friendship," which are friendship presence, friendship quality, and crucially, the characteristics of the friends. Bagwell and Schmidt (2011) specifically underscore the utility of considering the behavioral characteristics of each child in the dyad in their assessment model of friendship experiences.

The available empirical evidence from community samples also supports the importance of the characteristics of friends for friendship quality. For instance, studies have found that the problem behaviors of both members have associations with lower friendship quality in the dyad (Cillessen et al., 2005 15–17 years old, 63% female; Lansford et al., 2003; Grades 5 to 7, 51% male; Salvat et al., 2011 2–8 years, 48% male, small ESs). However, to our knowledge, no studies have tested the incremental contributions of one member's problem behaviors, after accounting for the other member's behaviors, to dyadic friendship quality. This omission is surprising, given the strong theory arguing for the importance of friends'

characteristics (e.g., Bagwell & Schmidt, 2011). Further, no studies have tested these questions in ADHD samples. Yet, the influence of friends' behaviors may be especially relevant for children with ADHD, who are likely to befriend peers with ADHD and externalizing problems themselves (Blachman & Hinshaw, 2002; Normand et al., 2011). These friends' behaviors could play a part in explaining the displayed problems in friendship quality that are documented in ADHD populations.

The Current Study

Research in ADHD samples has focused on behaviors of the children with ADHD – but not their friends' – for understanding how problem behaviors relate to friendship outcomes. The unique objective of the current study was to understand the incremental contributions of ADHD symptoms, externalizing problems, and CU traits in friends (collectively termed as problem behaviors) to dyadic friendship quality, above and beyond the similar problem behaviors in children with ADHD. We examined these questions in a sample of children diagnosed with ADHD (referred to as target children) who were participating in a larger randomized trial to treat social impairment, and their real-life reciprocated friends. This study also extends previous work by assessing friendship quality with multiple informants and methods. Children with ADHD tend to rate their friendship as more positive and less negative than other informants, underscoring the utility of considering the perspectives of different informants, and of observational data, when assessing friendship quality (Normand et al., 2013, 2020).

Our first hypothesis was that after adjusting for demographic covariates, the severity of ADHD symptoms, externalizing problems, and CU traits in target children would relate to less positive friendship quality and more negative friendship quality in the dyad (measured on questionnaires and observations). Our second hypothesis was that after adjusting for demographic covariates and corresponding problem behaviors in target children, the severity of ADHD symptoms, externalizing problems, and CU traits in friends would incrementally predict less positive and more negative friendship quality (on questionnaires and observations).

Method

Participants

Participants were 165 target children with ADHD and social impairment who were taking part in a larger randomized trial evaluating interventions for friendship problems (Mikami et al., 2020). The current study used

data from the baseline assessment, before participants were randomized to intervention, and it includes those who met study eligibility criteria regardless of whether they received intervention. Each target child participated with one friend, who was invited by the family of the target child, for a total of 165 child-friend dyads.

Demographic information about the sample is in Table 1. Target children (111 male, 54 female) were an average of 8.59 years old ($SD = 1.49$; range 6–11) and their friends (96 male, 69 female) were an average of 8.54 years old ($SD = 1.58$; range 5–13). Parents of target children and friends retrospectively perceived the friendships as quite stable, despite some variability (parents of targets: $M = 3.77$ years, $SD = 2.61$ years; parents of friends: $M = 3.91$ years, $SD = 2.43$ years). Children's racial/ethnic breakdown was: White (119 targets; 119 friends), Asian (9 targets; 15 friends), Latinx (2 targets; 5 friends), Black (0 targets; 4 friends), and mixed (32 targets; 18 friends); data were missing for 3 targets and 4 friends. Target children and their friends had similar demographic characteristics: 88% were of the same-gender, 69% were of the same race/ethnicity, and 88% were within 1 year of age. Socioeconomic data, only available for target children, showed a median family income of \$106,500 CAD, and 59% of primary caregivers had completed a bachelor's or more advanced degree. Target children were recruited from hospitals, clinics, and schools in two Canadian urban regions: Vancouver and Ottawa/Gatineau. We asked clinicians and teachers to pass information about the study to families of children with suspected or diagnosed ADHD, and the family contacted the study team if they were interested in participating.

All target children met Diagnostic and Statistical Manual of Mental Disorders (DSM-5) diagnostic criteria for ADHD (American Psychiatric Association, 2013). If children met screening criteria (parent and teacher endorsement of \geq four symptoms of inattention and/or hyperactivity/impulsivity on the Child Symptom Inventory ADHD subscale [CSI; Gadow & Sprafkin, 2002] as "often" or "very often"), the family was invited to an initial lab visit. For 15 children (9%), all of whom had an existing ADHD diagnosis made by a professional, we relied solely on parent report on the CSI because the child was medicated at school ($n = 12$) or the parent endorsed symptoms at school and explained that the teacher was not an appropriate informant for the child's symptoms ($n = 3$). During the lab visit, parents were administered the Kiddie-Schedule for Affective Disorders and Schizophrenia (K-SADS; Axelson et al., 2009). To meet final inclusion criteria, target children needed \geq six inattention and/or hyperactivity/impulsivity symptoms endorsed by parent report on the K-SADS or teacher report on the CSI using the "or" algorithm. ADHD presentations of target children

Table 1. Pearson correlations among the main study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Study site	n																
2. T gender	165	.15*															
3. T age	165	.05	-.08														
4. T education	164	.03	-.02	-.04													
5. T income	152	-.04	.07	.03	.41***												
6. T IQ	165	-.07	.06	.10	.05	.04											
7. T race	162	-.20*	-.16*	-.08	-.06	-.07	-.07										
8. T med	165	-.16*	.01	.12	-.08	-.04	.20*	.05									
9. T ADHD	165	.03	.20*	-.22**	-.06	.11	.08	.05	.42***								
10. T ext	164	-.12	-.11	-.24**	-.07	.10	.03	.08	.08	.30***							
11. T CU	163	.03	-.07	-.01	.07	.09	-.00	.08	.02	.08	-.02						
12. F ADHD	164	.07	.26***	.00	-.13	-.05	-.04	.06	.20*	.08	-.06	.53***					
13. F ext	162	-.19*	.11	.05	-.22**	-.10	-.06	.22**	.12	.13	-.06	.53***	.56***				
14. F CU	163	-.08	.30***	-.01	-.10	-.04	-.05	.25**	.12	.04	-.03	.53***	-.15	-.24**			
15. PFQ-Q	165	-.21**	-.13	.07	.02	.19*	.23**	-.05	-.03	.03	-.05	-.21**	-.15	-.24**	-.47***		
16. NFQ-Q	165	.05	.06	-.12	-.09	-.20**	.02	.10	.16*	.21**	.09	.24**	.18*	.18*	-.15	-.18*	
17. PFQ-O	164	-.27***	-.20**	.25**	.03	.12	-.16*	-.13	-.13	.10	-.02	-.10	.03	-.08	.18*	-.15	-.14
18. NFQ-O	164	-.14	.13	-.39***	.05	-.14	.03	.04	.07	.04	-.09	-.20*	.10	.23**	-.18*	.15	-.14

ADHD = Attention-Deficit/Hyperactivity Disorder symptoms (parent/teacher composite); CU = Callous-unemotional traits (parent report); education = primary caregiver's education level, 1 = 8th grade or less, 4 = some college/university, 7 = advanced post-university degree); ext = Externalizing problems (targets, parent-teacher composite); friends, parent report); F = Friend; income = family income; gender, 0 = female, 1 = male; med = ADHD medication; NFQ-Q = Negative friendship quality on questionnaires; NFQ-O = Negative friendship quality on observations; PFQ-Q = Positive friendship quality on questionnaires; PFQ-O = Negative friendship quality on observations; race = race/ethnicity, 0 = nonwhite, 1 = white; Study site, 0 = Ottawa/Gatineau, 1 = Vancouver; T = Target. There were no site differences on most demographic and problem behavior variables. However, Vancouver site target children and friends were less likely to be girls (Vancouver, targets: 25%, friends: 32%; Ottawa/Gatineau, targets: 39%, friends: 50%), and White (Vancouver, targets: 63%, friends: 61%; Ottawa/Gatineau, targets: 81%, friends: 84%). Vancouver site target children were also less likely to be medicated (Vancouver: 49%; Ottawa/Gatineau: 65%) and Vancouver site friends had lower levels of externalizing problems on parent reports (Vancouver: *M* = 48.68; Ottawa/Gatineau: *M* = 52.82). Whereas no site differences were noted on negative friendship quality on questionnaires and on observations, Vancouver dyads had lower levels of positive friendship quality on questionnaires (Vancouver: *M* = 2.35, *SD* = 0.48; Ottawa/Gatineau: *M* = 2.55, *SD* = 0.45) and on observations (Vancouver: *M* = 0.37, *SD* = 0.12; Ottawa/Gatineau: *M* = 0.45, *SD* = 0.16).
 * *p* < .05; ** *p* < .01; *** *p* < .001.

were: 69% Combined, 27% Inattentive, and 4% Hyperactive-Impulsive.

Because the intervention being tested in the larger trial was for friendship problems, target children also needed to receive a score of ≥ 3 on parent and teacher reports on the Strengths and Difficulties Questionnaire – Peer Problems Subscale (Goodman, 2001) using the “or” algorithm; this corresponds to ≥ 1 *SD* above the mean. ADHD medication (taken by 58% of children) and common comorbidities such as externalizing (31%) and internalizing disorders (29%) were not exclusionary. Target children were excluded if they had a full scale IQ < 75 , autism spectrum disorder, or severe condition (e.g., psychosis, suicidality) requiring immediate intervention.

Measures

ADHD Symptoms

The ADHD subscale of the CSI (Gadow & Sprafkin, 2002) contains 18 items describing inattentive and hyperactive/impulsive symptoms parallel to those in the DSM-5. Items are rated on a 4-point scale (0 = *never*; 1 = *sometimes*; 2 = *often*; 3 = *very often*). Parents and teachers of target children completed this subscale about target children; similarly, parents and teachers of friends completed this subscale about the friends. Children received a score from each rater representing the total number of endorsed symptoms (from 0 to 18), where a symptom was counted as present if occurring often or very often. Our measure of ADHD symptom severity reflected the average of the symptom count scores from parents and teachers. We decided a priori to use this combination approach for different reasons. First, multi-informant scores have been reported to give better estimates for ADHD than single-informant scores (e.g., Tripp et al., 2006). Second, some scholars have recommended averaging across raters when integrating information from multiple informants (Martel et al., 2015). Third, we wished to limit the number of analyses conducted. Internal consistency of parent and teacher ratings was good to excellent in our sample (18 items; $\alpha = .83-.91$ for target children; $\alpha = .94-.95$ for friends).

Externalizing Problems

Dimensionally assessed externalizing problems were measured through parent- and teacher-report on the broadband Externalizing Problems subscale of the Child Behavior Checklist (CBCL) and Teacher Report Form (TRF; Achenbach & Rescorla, 2001). Items are rated on a 3-point metric (0 = *not true*; 2 = *very true or often true*). We converted raw scores to *T*-scores based on norms from the manual, in the current study. These widely used subscales have robust psychometric properties, including

strong internal consistency, test-retest reliability, criterion validity, and construct validity (Achenbach & Rescorla, 2001). CBCLs were collected for both target children and friends from their respective parents. TRFs were only collected about target children from their teachers (to reduce teacher burden for friends).

CU Traits

Parents of target children and parents of friends completed the Inventory of Callous-Unemotional Traits (ICU; Frick, 2004) about their child. The ICU is a 24-item scale that assesses callousness, uncaring, and unemotional characteristics. Items are rated on a 4-point metric (0 = *not at all true*; 3 = *definitely true*). CU traits were measured by the sum of all items (with 12 items being reverse scored). The parent-report form has demonstrated reliability and validity as a measure of CU traits (Deng et al., 2019). Internal consistency in our sample was $\alpha = .82$ for target children and $\alpha = .81$ for friends.

Friendship Quality on Questionnaires

The target child, the friend, the parent of the target child, and the parent of the friend each independently completed the Friendship Quality Questionnaire – Short Version (FQQ-S; Glick & Rose, 2011) about the friendship quality in the dyad. The FQQ is a widely used measure of friendship quality, with strong psychometric properties, including internal consistency, and criterion validity (Parker & Asher, 1993). It has been administered to children with ADHD as young as 6 years of age (Blachman & Hinshaw, 2002; Normand et al., 2011). The FQQ-S contains 22 items on six subscales. Items are rated on a 5-point scale (0 = *not at all true*; 4 = *really true*). As in previous research (see Berndt & McCandless, 2009; Glick & Rose, 2011), positive friendship quality reflected the mean of the validation and caring, companionship and recreation, conflict resolution, intimate exchange, and helping subscales (15 items; e.g., “this friend is fun to do things with”; $\alpha = .86-.91$). Negative friendship quality was measured by the score on the conflict and betrayal subscale (seven items; e.g., “this friend argues a lot”; $\alpha = .74-.85$).

We created composite scores for positive and negative friendship quality on questionnaires by averaging reports from target children, friends, parents, and friends’ parents on the FQQ-S at baseline. Notably, these same composites were also used as the primary outcome measures of the interventions tested in the larger trial (at post-treatment and follow-up assessment points; Mikami et al., 2020). Because parents of elementary-school-age children are typically involved in arranging and supervising children’s playdates with friends (Mikami et al., 2020), we thought parents could provide valuable and complementary insights about

their child's friendship quality. Incorporating parental reports may be particularly useful for children with ADHD who, unlike typically developing children, tend to have overly inflated positive perceptions of their friendship quality (Normand et al., 2013, 2020). Previous factor analytic evidence from the current sample also supports a two-factor model of friendship quality (positive and negative friendship quality) with four indicators per factor (reports from target children, their parents, their friends, and the parents of their friends as informants), $\chi^2 [13, N = 165] = 15.55, p = .27$; CFI = 0.991; TLI = 0.980; RMSEA = 0.034 (Normand et al., 2020). By creating composite scores in this way, we are consistent with our prior work, and we capitalize on the multiple informant design while also limiting the number of analyses conducted, as examining informants separately would have increased our models for the FQQ-S by four times the amount.

Friendship Quality on Observations

We filmed the dyad in two tasks, counterbalanced for order, designed to mirror the real-world interactions of friends, and used in previous research to measure friendship quality in ADHD samples (see Normand et al., 2011, 2013). These tasks, originally developed to measure friendship patterns in typically developing children (Fonzi et al., 1997), have since been adapted for children with ADHD (Normand et al., 2011, 2013). In the toy sharing task (Fonzi et al., 1997), dyads were presented with 15 toys appealing to both genders and different ages (e.g., Legos®, Trash Pack® figurines, Silly Bandz® bracelets). The dyad was asked to select five toys that they both liked from the initial 15. They were allowed to take these five toys home; however, they had to decide together how they would share the toys. In the car-race task (Fonzi et al., 1997), which simulated a fast-paced, engrossing game, dyads were told that the goal was for each child to be quicker than the other in transporting five blocks in a toy truck down a track. Only one truck could fit in the track at a time, and a winner was declared. The videotapes of the two tasks were later coded by a team of 13 undergraduate students kept unaware of study hypotheses. Coders were provided with a manual and a minimum of 120 hours of training, which included review of the coding rules, reliability checks, and feedback on accuracy. Once a criterion of 80% agreement was reached, formal coding started using Noldus Observer XT (Version 11.5). To minimize drift, ongoing monthly meetings occurred and inter-rater reliability between coders was checked weekly.

In line with the friendship quality literature (Berndt & McCandless, 2009), we created composite scores for positive and negative friendship quality on observations at baseline by averaging the codes that were conceptually and empirically related to one another. We engaged in this procedure a priori, when deciding upon our primary

outcome measures for the interventions tested in the larger randomized trial (at post-treatment and follow-up assessment points; Mikami et al., 2020). We also averaged scores across the toy sharing and car-race tasks.

Positive friendship quality consisted of the codes of closeness and positive affect; these codes were highly correlated ($r = 0.70$). Closeness was scored on a global rating scale ranging from 0 to 5 (0 = *No evidence of this behavior*; 5 = *Very strong evidence of this behavior*) and reflects the extent to which the child and friend are affectionate, comfortable, and warm with each other. Two randomly selected members of the coding team were assigned to score each videotape on closeness, and the final score for the dyad reflects the average of the two coders' scores. Inter-rater reliability for closeness, calculated using the intraclass correlation coefficient (ICC), was high [ICC(2, 2) = .91]. Each child's affect ($\kappa = .81$) was also coded at 5-second intervals as either positive, neutral, or negative (only positive and negative affect were used in the current study). All videotapes were scored for affect by one coder, and a randomly selected 20% of videotapes were double coded; the final score for each child reflected the first coder's score. Inter-rater reliability for affect, calculated using kappa, was also high ($\kappa = .81$). The proportion of variance at the dyad level, calculated using ICC for this purpose, between the two children for positive (.64) and negative affect (.37) in the larger trial indicate that the affect of the child and friend were non-independent. In line with past research (Normand et al., 2019), we considered positive and negative affect at the dyadic level, by using the means of the combined proportion scores of the child and friend. Positive affect reflected the proportion of intervals in which the members of the dyad displayed affection, laughs, or smiles. We divided closeness by 5 and took the mean of closeness and positive affect to create a composite score of positive friendship quality (as a proxy of dyadic affection, comfort, warmth, and positive affect between friends).

We measured negative friendship quality with the scores of reverse-coded cooperation and of negative affect; these codes were moderately correlated ($r = 0.32$). Cooperation was coded at the dyadic level on a global rating scale of 0 to 5 (0 = *Very strong evidence of antagonism*; 5 = *Very strong evidence of cooperation*). All videotapes were also scored for cooperation by two randomly selected members of the coding team, and inter-rater reliability was high [ICC(2,2) = .91]. Negative affect was the proportion of intervals in which the members of the dyad displayed tension, frustration, irritation, anger, and sadness. We divided reverse-coded cooperation by 5 to put the two variables on the same scale, and then calculated the mean of reverse-coded cooperation and negative affect to indicate negative friendship quality (as a proxy of lack of cooperation, and of antagonism, conflict, and negative affect between friends).

Procedure

Full details about the study procedure are in Mikami et al. (2020), which describes the larger randomized trial. This trial evaluated a novel intervention for friendship problems in children with ADHD in which parents learned to coach their children in targeted friendship behaviors that are lacking in children with ADHD and that help children develop good quality friendships. Participants in the larger trial were randomized to the friendship-focused intervention or to an active comparison intervention to control for common therapy factors. The study was conducted with ethics approval from the participating universities and hospitals at both sites. Parents and teachers (of target children and friends) gave consent, and target children and friends assented to participate. Parents and teachers received a small amount of monetary compensation for completing study measures, and families of target children also received treatment.

The current study uses data from the baseline (pre-intervention) assessment of the larger trial, which were collected over two lab visits. In the first visit, families of target children identified as likely to have ADHD in screening (i.e., through parent- and teacher-report on CSI) were invited to the lab where target children completed intelligence testing and their parents were administered the K-SADS. After this initial visit, a total of 213 children met DSM-5 diagnostic criteria for ADHD and other study inclusion criteria for the larger trial. They were invited to return for a second baseline visit with “the friend who was closest to them”; 167 did so. The target child and the friend were independently asked to report whether they were “best friends,” “close friends,” “just ok friends,” “occasional companions,” or “strangers.” Researchers have posited that friendship is too often considered dichotomously (“best of friends” versus “not friends at all”; Berndt & McCandless, 2009). Thus, as recommended, we included the dyads where both children mutually endorsed being at least “just ok friends” to increase representativeness and limit ceiling effects, which resulted in 165 dyads. This reduction from the potential 213 participants is comparable to other studies requiring reciprocated friendships (e.g., Glick & Rose, 2011; Parker & Asher, 1993). There were no significant differences between target children with versus without reciprocated friends in any demographic (e.g., age, gender, ethnicity, parent education, family income) or clinical variables (e.g., IQ, ADHD presentations, comorbidities, symptom severity, general social problems, medication).

In 83 dyads (50%) both children reported they were “best friends,” one child reported being “best friends” while the other reported being “close friends” in 43 dyads (26%), both children reported being “close friends” in 14 dyads (8%), and in 25 dyads (15%) one child reported being “just ok friends” while the other assessed the friendship as being closer or gave

the same rating. In separate rooms, the target child, the friend, the parent of the target child, and parent of friend completed questionnaires about the friendship quality in the dyad. To collect data from target children and friends, research assistants read the questions aloud in individual, private interviews to ensure comprehension, and recorded the answers. Afterward, dyads did the toy-sharing and car-race tasks. Parents of target children and of friends completed questionnaires about their child’s ADHD symptoms, externalizing problems, CU traits, and demographics. Teacher reports about target children and friends were collected by phone, e-mail, mail, or fax.

Missing Data

Table 2 presents information about the number of participants with missing data on our main study variables. Overall, missing data were infrequent. In cases where a participant was missing data from one informant (e.g., had parent report but not teacher), we used the data from the available informant to create the composite score (see Table 2). Little’s missing completely at random test was conducted on our main study variables and failed to reject the null hypothesis, indicating that our data are missing completely at random: $\chi^2(82, N = 165) = 75.93, p = .67$. We used Full Information Maximum Likelihood (FIML) estimation to handle missing data.

Data Analytic Plan

An a priori statistical power analysis was performed when designing the larger trial. With $\alpha = .05$ and power = 0.80, the projected sample size needed to detect a small ES ($f^2 = 0.0725$) is $N = 137$ for regressions with a total of 8 predictors and two tested predictors. An anticipated small ES is appropriate for the current analyses based on data from previous published studies ($M r = .25$, Ackermann et al., 2019; $M r = .27$; Haas et al., 2018).

Hierarchical multiple regressions were conducted in Mplus version 8.0 (Muthén & Muthén, 2017) using FIML with robust standard errors to test all hypotheses. The assumptions for multiple regression (i.e., linearity, absence of multicollinearity, independence of residuals, homoscedasticity, absence of univariate outliers) were met. There were two multivariate outliers as identified by Mahalanobis distances. As the overall pattern of results was identical with or without these two participants, we include the full sample. All continuous predictor variables were centered, and all outcome variables were z-scored to aid interpretation. Demographic variables that significantly correlated with any friendship quality outcome measure at the bivariate level (see Table 1) were: site, target child gender, age, family income, IQ, and race/ethnicity (0 = *nonwhite*, 1 = *White*). These covariates were then included on Step 1 in the

Table 2. Descriptive statistics among the main study variables.

	Target			Friend			Friendship quality			
	ADHD	Ext	CU	ADHD	Ext	CU	PFQ-Q	NFQ-Q	PFQ-O	NFQ-O
M	11.88	64.46	30.39	3.41	51.01	19.28	2.46	0.66	0.41	0.18
SD	2.95	7.77	8.50	3.74	10.92	7.94	0.47	0.44	0.15	0.13
Min	3.50	45.50	9.00	0.00	33.00	4.00	1.08	0.04	0.15	0.00
Max	18.00	82.50	57.00	17.00	79.00	44.00	3.50	2.46	0.90	0.53
Skewness	-0.27	-0.04	0.18	1.22	0.32	0.63	-0.27	1.29	0.53	0.66
Kurtosis	-0.23	-0.22	0.01	0.95	-0.24	0.28	-0.26	2.17	0.11	-0.23
Missing <i>n</i>	0	1	2	1	3	2	0	0	1	1

Attention-Deficit/Hyperactivity Disorder symptoms (parent/teacher composite); CU = Callous-unemotional traits (parent report); Ext = Externalizing problems (parent/teacher composite for target children; parent report for friends); NFQ-Q = Negative friendship quality on questionnaires; NFQ-O = Negative friendship quality on observations; PFQ-Q = Positive friendship quality on questionnaires; PFQ-O = Negative friendship quality on observations. When data were missing from one informant (e.g., teacher but not parent), we relied solely on the data from the available informant to create the composite scores. Among target children, this procedure was done for 0 missing only parent data and 2 missing only teacher data; among friends, it was done for 2 missing only parent data and 29 missing only teacher data. The missing data on observations were attributable to a video malfunction for one dyad that did the tasks but were not recorded. There were significant group differences in target children's ADHD symptoms ($t(163) = 25.33, p < .001$), externalizing problems ($t(160) = 13.57, p < .001$), and callous-unemotional traits ($t(160) = 11.87, p < .001$), compared to friends.

regression analyses testing the outcome with which they were correlated. Child ADHD medication status and parent education were not associated with any outcome variable. The available demographic characteristics for friends were strongly related to those of target children (gender: $\phi(1) = .78, p < .001$; age: $r(162) = .82, p < .001$; race: $\phi(1) = .36, p < .001$). Therefore, to avoid multicollinearity issues, only target child demographics were included.

To test Hypotheses 1 and 2, we conducted three hierarchical multiple regressions (one for each problem behavior: ADHD symptoms, externalizing problems, and CU traits) to predict each of our four friendship quality variables (positive friendship quality on questionnaires, negative friendship quality on questionnaires, positive friendship quality on observations, negative friendship quality on observations). Thus, there were a total of 12 regressions. The target child problem behavior was placed in Step 2 in the different models, whereas the corresponding friend problem behavior was placed on Step 3. We created separate models for each problem behavior because our research questions focus on the incremental effects of friends' problem behavior on friendship quality, after accounting for the similar behavior in target children with ADHD. Given that very little is known about this topic, we thought the clearest test of this question would be to look at the problem behaviors separately. If each of the friends' problem behaviors are determined to relate to friendship quality, this will allow future studies to test their relative contributions in the same model. Further, bivariate correlations between problem behaviors were medium, especially in friends (see Table 1), raising concerns about multicollinearity if including them in the same model. Finally, we conducted supplementary regression analyses to examine potential teacher versus parent report differences of ADHD symptoms in predicting friendship quality; teacher reports of CU traits and externalizing problems were not available for friends.

Results

Descriptive Statistics

Bivariate correlations in Table 1 show that CU traits ($r = .30, p < .001$) and ADHD symptoms ($r = .42, p < .001$) were moderately positively correlated with externalizing problems in target children. However, target children's CU traits were not related to their ADHD symptoms. CU traits, externalizing problems, and ADHD symptoms were moderately positively correlated in friends ($r = .53-.56, ps < .001$). Although there was a small positive association between target child and friend ADHD symptoms ($r = .20, p = .010$), there were no associations between target child and friend CU traits, or target child and friend externalizing problems.

Table 1 also shows that higher ADHD symptoms and CU traits in friends were correlated with less positive friendship quality on questionnaires, but not on observations, at the bivariate level. Higher ADHD symptoms and externalizing problems in target children were correlated with more negative friendship quality on questionnaires, whereas higher ADHD symptoms and CU traits in friends were correlated with more negative friendship quality on questionnaires and observations. Friends' externalizing problems were also associated with more negative friendship quality on questionnaires but not on observations. As a group, target children had higher problem behaviors compared to friends (all $ps < .001$; Table 2).

Contributions of Target Child and Friend Problem Behaviors to Friendship Quality

The results of the regressions testing Hypotheses 1 and 2 are in Table 3.

Positive Friendship Quality on Questionnaires

ADHD symptoms, externalizing problems, and CU traits in target children were not associated with positive friendship quality on questionnaires after covarying for demographic characteristics. However, after adjusting for demographic covariates and for the corresponding behavior in target children, friends' ADHD symptoms ($B = -0.05$, $SE(B) = 0.02$, $\beta = -.17$, $p = .013$), externalizing problems ($B = -0.01$, $SE(B) = 0.01$, $\beta = -.13$, $p = .043$) and CU traits ($B = -0.03$, $SE(B) = 0.01$, $\beta = -.22$, $p = .001$) each incrementally predicted less positive friendship quality, explaining an additional 2–5% of variance in this outcome.

Negative Friendship Quality on Questionnaires

As expected, higher ADHD symptoms ($B = 0.06$, $SE(B) = 0.02$, $\beta = .17$, $p = .008$) and externalizing problems ($B = 0.03$, $SE(B) = 0.01$, $\beta = .21$, $p = .002$) in target children were associated with more negative friendship quality on questionnaires after covarying for demographic characteristics, and explained an additional 3–5% of variance in this outcome. CU traits in target children were not associated with

this outcome. However, after adjusting for demographic covariates and for the corresponding symptoms in target children, friends' ADHD symptoms ($B = 0.05$, $SE(B) = 0.02$, $\beta = .20$, $p = .010$) and CU traits ($B = 0.02$, $SE(B) = 0.01$, $\beta = .16$, $p = .027$) incrementally predicted more negative friendship quality, and explained an additional 2–4% of variance in this outcome. Friends' externalizing problems were not related to negative friendship quality on questionnaires.

Positive Friendship Quality on Observations

After adjusting for demographic covariates, none of the target child or friend problem behaviors was associated with positive friendship quality on observations.

Negative Friendship Quality on Observations

Neither ADHD symptoms, nor externalizing problems, nor CU traits in target children were associated with negative friendship quality on observations after covarying for demographic characteristics. However, after adjusting for demographics and the corresponding symptoms in target children, friends' ADHD

Table 3. Regression analyses examining associations between problem behaviors and friendship quality.

Variable	PFQ-Q ^a		NFQ-Q ^b		PFQ-O ^c		NFQ-O ^d	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
All regressions								
Step 1	.17**		.08*		.22***		.15**	
Study site		-.14*		--		-.31***		--
Target gender		--		--		-.18*		--
Target age		--		--		.24***		-.39***
Target income		.22*		-.21**		--		--
Target IQ		.19**		-.20**		--		--
Target race		.23**		--		-.22**		--
Regressions A: ADHD symptoms ^a								
Step 2	.00		.03**		.00		.00	
Target ADHD		-.05		.17**		-.03		-.01
Step 3	.03*		.04*		.00		.05**	
Friend ADHD		-.17*		.20*		-.05		.21**
Regressions B: Externalizing problems								
Step 2	.00		.05**		.01		.00	
Target Ext		-.00		.21**		.11		-.05
Step 3	.02*		.01		.00		.02	
Friend Ext		-.13*		.12		-.06		.13
Regressions C: Callous-unemotional traits								
Step 2	.00		.02		.00		.01	
Target CU		-.07		.11		-.03		-.09
Step 3	.05**		.02*		.00		.05**	
Friend CU		-.22**		.16*		-.08		.23**

All β values are standardized. ADHD = Attention-Deficit/Hyperactivity Disorder; CU = Callous-unemotional traits; Ext = Externalizing problems; gender, 0 = female, 1 = male; income = family income; NFQ-Q = Negative friendship quality on questionnaires; NFQ-O = Negative friendship quality on observations; PFQ-Q = Positive friendship quality on questionnaires; PFQ-O = Negative friendship quality on observations; race = race/ethnicity, 0 = nonwhite, 1 = white; Study site, 0 = Ottawa/Gatineau, 1 = Vancouver.

^aSupplementary regression analyses indicated that higher teacher (but not parent) reports of ADHD symptoms in target children were associated with more negative friendship quality on questionnaires ($B = 0.04$, $SE(B) = 0.02$, $\beta = .19$, $p = .005$) after covarying for demographic characteristics, and explained an additional 4% of variance in this outcome. Conversely, higher parent (but not teacher) reports of ADHD symptoms in friends were associated with less positive friendship quality on questionnaires ($B = -0.05$, $SE(B) = 0.02$, $\beta = -.20$, $p = .004$), more negative friendship quality on questionnaires ($B = 0.04$, $SE(B) = 0.02$, $\beta = .18$, $p = .017$), and more negative friendship quality on observations ($B = 0.06$, $SE(B) = 0.02$, $\beta = .24$, $p < .001$), after adjusting for demographic covariates and for parent reports of ADHD symptoms in target children. Parent reports of ADHD symptoms explained an additional 3–6% of variance in these outcomes.

* $p < .05$; ** $p < .01$; *** $p < .001$.

symptoms ($B = 0.06$, $SE(B) = 0.02$, $\beta = .21$, $p = .003$) and CU traits ($B = 0.03$, $SE(B) = 0.01$, $\beta = .23$, $p = .001$) incrementally predicted more negative friendship quality, explaining an additional 5% of variance in this outcome. Friends' externalizing problems were not incrementally associated with negative friendship quality on observations.

Supplementary Analyses

The results suggesting the impact of ADHD symptoms on friendship quality were driven by teacher ratings of symptoms for target children, but parent ratings for friends. See Table 3.

Discussion

The objective of the current study was to understand the incremental contributions of the ADHD symptoms, externalizing problems, and CU traits of children with ADHD and their friends to friendship quality. The severity of ADHD symptoms and externalizing problems, but not CU traits, in target children, was associated with more negative friendship quality on questionnaires. Crucially, we found that friends' ADHD symptoms, externalizing problems, and CU traits each incrementally predicted less positive friendship quality on questionnaires, adjusting for demographic covariates and corresponding symptoms in target children. Friends' ADHD symptoms and CU traits, but not externalizing problems, each incrementally predicted more negative friendship quality on both questionnaires and observations. Although target children and their friends shared similar demographic characteristics, the severity of problem behaviors of target children were either weakly (i.e., ADHD symptoms) or not correlated (i.e., externalizing problems and CU traits) with the problem behavior severity of their friends. This unique pattern of results, if replicated, suggests that it may be important to consider how both members in a friend dyad contribute to friendship quality in samples of children with ADHD.

Friendship Quality and Problem Behaviors of Children with ADHD

As hypothesized, the severity of ADHD symptoms in target children was associated with more negative friendship quality on questionnaires, after covarying for demographics. These results replicate those of previous studies on friendship quality done in community samples, where ADHD symptom severity rated by teachers was correlated with children's self-reports of friendship quality (Haas et al., 2018; medium ES). They are also aligned with accumulating evidence from clinical samples showing that children with

an ADHD diagnosis have poorer friendship quality relative to peers without ADHD on questionnaires and observations (e.g., Blachman & Hinshaw, 2002; Normand et al., 2011, 2013, 2019, medium to large ESs). However, our study is the first known report to show that ADHD symptom severity (as measured dimensionally) may be an incremental risk factor for poor friendship quality in clinically diagnosed children with ADHD, above and beyond their diagnosis.

Similarly, externalizing problems in target children were associated with more negative friendship quality on questionnaires, after covarying for demographics. These findings replicate the results of previous studies on friendship quality done with community (Haas et al., 2018; small ES) and non-ADHD clinical samples (Ackermann et al., 2019; small ES). By focusing on friendship quality, they also extend the larger literature on the influence of externalizing problems on poor social skills and greater peer rejection in youth at risk for ADHD (for a review, see Becker et al., 2012), and suggest these problems may additionally contribute to friendship difficulties in ADHD populations. At least among preadolescent children, externalizing problems may particularly interfere with friendship quality because friendships in this age group are built on shared activities, fairness in play, and respect for the rules of a game. For children with externalizing problems who are often poor losers and aggressive problem solvers, this could lead to increased friendship conflict (Salvas et al., 2011).

Contrary to prediction and past research (Haas et al., 2018), however, we did not find associations between CU traits and friendship quality in target children. The discrepancies between our findings and those of Haas et al. (2018) could be attributable to sample characteristics, such as a community versus a clinical sample. The different results may also be attributable to the friendship quality measures used. Intimacy (the specific aspect of positive friendship quality on which results were found in Haas et al., 2018) may be particularly impacted by problem behaviors, as opposed to other aspects of positive friendship quality, such as companionship and recreation. However, scholars also highlight the limitations of using specific friendship quality features, especially as assessed by child reports (Berndt & McCandless, 2009).

Although the above results for target children's problem behaviors were obtained after statistical control of demographics, the demographic characteristics of study site, child gender, child age, income, IQ, and race, were significant predictors of some friendship quality measures, explaining between 8% and 22% of their variance. The existing literature reports similar associations in typically developing samples (e.g., Bagwell & Schmidt, 2011). This is not surprising, considering that friendship is a socially constructed relationship affected by the

norms, expectations, and values of each member, all of which are related to demographic factors. Future research should consider in more depth how these demographic factors, and their intersectionality, pertain to the association between problem behaviors and friendship in ADHD samples.

Friendship Quality and Problem Behaviors of Friends

Covarying for demographic characteristics and ADHD symptoms in target children, friends' ADHD symptom severity incrementally predicted less positive friendship quality (on questionnaires) and more negative friendship quality (on questionnaires and observations). This novel finding highlights that above and beyond the impact of problem behaviors in the target child with ADHD on friendship quality (Blachman & Hinshaw, 2002; Normand et al., 2011, 2013, 2019), the severity of ADHD symptoms in friends may represent an additional risk factor for poor friendship quality. This is an important finding given that children with ADHD are more likely than typically developing children to befriend other children with ADHD (Blachman & Hinshaw, 2002; Normand et al., 2011). We speculate that the severity of ADHD symptoms in friends may contribute to incremental problems with taking turns, having conversations, and attending to rules of the games, thus leading to poorer friendship quality.

Children with ADHD are also more likely than typically developing children to have friends with disruptive behaviors (e.g., Normand et al., 2011). In our sample, externalizing problems in friends were associated with less positive friendship quality on questionnaires, after covarying for demographics and externalizing problems in target children. Externalizing problems in friends, as well as in target children, thus appear to be a risk factor for poor perceptions of friendship quality. It is possible that temper outbursts or aggressive behavior can disrupt positive friendship quality features (i.e., conflict resolution, intimacy; Salvat et al., 2011). However, our findings should be taken with caution given the different informants used to measure externalizing problems in target children (i.e., parents and teachers) versus friends (i.e., parents only, to reduce teacher burden). It is possible that the parent-teacher composite of externalizing problems measured more pervasive externalizing problems across settings.

Adjusting for demographic covariates and CU traits in target children, we found that friends' CU traits incrementally predicted less positive friendship quality (on questionnaires) and more negative friendship

quality (on questionnaires and observations). These results suggest that befriending less empathetic, sensitive, and caring friends may confer additional risk for poor friendship quality in children with ADHD. Although these findings are intuitive – friends who are less emotionally attuned will likely relate less with other children – to the best of our knowledge, this is the first study to demonstrate the incremental contributions of friends' CU traits to friendship quality in a clinical sample of children with ADHD.

The magnitude of the ESs for friends' problem behaviors was small and explained 2–5% of the variance in outcomes. This is the first study of the incremental contributions of friends' problem behaviors (measured dimensionally) to friendship quality in either a community sample or in a clinical sample of children with ADHD, and our findings require replication. However, our results are consistent with those of studies done in community samples (Cillessen et al., 2005; Lansford et al., 2003; Salvat et al., 2011) where the problem behaviors of each member in the dyad were associated with poor friendship quality (also with small ESs).

That friends' ADHD symptoms and CU traits incrementally contributed to poorer friendship quality on both questionnaires (less positive and more negative friendship quality) and observations (more negative friendship quality) strengthens confidence in this finding. Unexpectedly, target children's and friends' problem behaviors were not related to positive friendship quality on observations. Our observational measure of positive friendship quality included shared positive affect, such as shared laughter or jokes. Notably, other research finds that fun and positive affect does not differentiate the friendships of youth with aggressive/antisocial behavior from those of typically developing peers (Bagwell & Coie, 2004). It is possible that intimacy and trust (which were better assessed on the questionnaire measures) are the aspects of positive friendship quality that are more likely to be impaired by the problem behaviors we tested, as opposed to fun and positive affect.

Future studies using adequately powered samples and longitudinal designs should examine whether problem behaviors in each dyad member interact to exacerbate poor friendship quality. Through selection and socialization effects, children may seek out friends who share similar behaviors, and they mutually reinforce each other over time (Bagwell & Schmidt, 2011). Possibly through friendship processes such as contagion and peer coercion (Piehler, 2016), dyads where both members have problem behaviors may face exacerbated challenges in completing activities together, solving conflicts

prosocially, and emotionally connecting to one another. When dyad members disagree, escalating feedback cycles of negative behaviors in both members could reinforce maladaptive behavioral patterns and worsen friendship quality (e.g., escalating aggression rather than compromise or cooperation to resolve conflict). Despite theory for why such an interaction effect might occur, to our knowledge, no research in either community or ADHD samples has tested this question. Perhaps peer contagion processes within friendships are stronger in adolescence than in childhood (Piehler, 2016), leading to further dyadic reinforcement of maladaptive behaviors and worsening of friendship quality in adolescence (Bagwell & Schmidt, 2011; Schneider, 2016). Future research should take a developmental perspective to examine how problem behaviors in youth with ADHD and their friends, incrementally and in interaction, relate to friendship quality over time across a wider age span.

Overall, a conclusion from this study is that problem behaviors of both members in a dyad, not just those of target children, appear to matter in understanding friendship quality. In our sample of children with ADHD, the diversity in the behavior problems of friends was notable. This highlights that friends are heterogeneous and that not all children with ADHD befriend peers with behavior problems. Better understanding of the factors that predict children with ADHD selecting friends with versus without behavior problems is needed.

We also argue that friends' behaviors may be especially important in the population of children with ADHD. This is because children with ADHD may have limited opportunities for peer socialization, because of peer rejection (Gardner & Gerdes, 2015). Behavior problems of a friend may therefore be even more detrimental to dyadic friendship quality because children with ADHD lack other peer relationships. Without the experience that comes from having many friendships, children with ADHD may not have the ability to put the friends' negative behaviors in perspective, or to respond in a way that diffuses the impact of such behaviors. Thus, when a friend shows behavior problems, this may directly result in poorer friendship quality (e.g., a friend is aggressive and the child with ADHD cannot collaboratively problem solve, so the conflict escalates; Schneider, 2016). Conversely, it is possible that children with ADHD receive unique social provisions in terms of friendship quality from friends who are well adjusted and socially skilled (Hoza et al., 2003), because this friend may represent the primary friendship model for the child with ADHD. Considering whether friends' problem behaviors moderate treatment effects may be an important future direction.

Study Strengths and Limitations

This study extends previous work through the methodology used to assess positive and negative friendship quality with multiple informants (i.e., target children, their parents, their friends, and the parents of their friends) and multiple methods (i.e., questionnaires and observations). Our overall patterns of results showed both unity and diversity depending on the methods used to assess friendship quality. This is in line with several other studies suggesting modest correlations between friendship quality questionnaires and direct observations of children's friendship interactions (e.g., Bagwell & Coie, 2004). Future studies should consider employing such a multi-informant, multi-method approach to obtain a more complete picture of children's friendships relative to relying on only one assessment method (e.g., Berndt & McCandless, 2009; Schneider, 2016). The use of a relatively large sample of clinically diagnosed children with ADHD is another strength. Importantly, we extended past work by gathering data on both target children and their real-life friends, allowing us to identify the incremental contributions of friends' behaviors to friendship quality, in addition to those of target children. We also collected parent- and teacher-report for many of our measures of problem behaviors.

Our findings should be interpreted in the context of study limitations. Several limitations relate to our sample and may reduce the generalizability of our findings to all children with ADHD. First, the sample is restricted to target children who had enough friendship problems to require intervention, and whose parents were seeking treatment for these problems. However, between 50% and 70% of children with ADHD experience friendship problems (Gardner & Gerdes, 2015), and we also included all families who met study inclusion criteria, regardless of whether they received intervention. Second, although the majority of the target child sample (77%) was able to bring a reciprocated friend to the lab, this study may have eliminated some of the children with the most severe friendship problems. However, this methodology is typically employed in the existing literature that examines friendship quality in ADHD (e.g., Normand et al., 2011, 2013, 2019), and we also used a less restrictive definition of reciprocated friendship (where both children had to nominate one another as at least "just ok friends" as opposed to "best friends") to allow a more representative sample (Berndt & McCandless, 2009). There were no significant differences between children with versus without reciprocated friends in terms of demographic and behavioral characteristics. Third, the majority of our participants were White, and target children were from predominantly middle to upper middle class highly educated families. Fourth, our sample was

constituted of 88% of same-gender (and 12% of cross-gender) friendship dyads, which is similar to what is commonly found in typically developing samples (Schneider, 2016). Future studies with larger samples and longitudinal designs should investigate the developmental significance of same- versus cross-gender friendships in children with ADHD.

Other limitations pertain to the study design. First, the cross-sectional design limits testing the directionality between friendship quality and problem behaviors. It also confounds potential selection and socialization effects between target children and friends, as described above. Second, we made the a priori decision to use multi-informant composite scores of ADHD symptoms and friendship quality on questionnaires. Our supplementary analyses examining ADHD symptoms in predicting friendship quality, however, suggested potential informant differences. Future studies should examine how the incremental contribution of problem behaviors to friendship quality may vary by informant, including comparing the relative contributions of one informant (e.g., parents) over the other (e.g., teachers) in the same model.

Clinical Significance

A growing body of evidence supports the developmental significance of close friendships among children with or at-risk for ADHD (Becker et al., 2013; Cardoos & Hinshaw, 2011; Lee et al., 2021; Powell et al., 2021). Paradoxically, these children show persistent and treatment-resistant problems in forming such high-quality friendships (Gardner & Gerdes, 2015; Mikami et al., 2020). Although ESs were small in the current study, it is possible that even small changes in friendship quality may be clinically relevant for children with ADHD. Our findings suggest that children with ADHD and externalizing problems may be at risk of poorer friendship quality, highlighting the need for specific assessment and intervention efforts for this subgroup. Notably, however, friends' ADHD symptoms, externalizing problems, and CU traits had an incremental role in predicting friendship quality in the current study. Clinically, assessing these problem behaviors in friends of children with ADHD could therefore help to identify those at risk for lower quality friendships. Encouraging recent work has found that structured and intensive behavioral parent interventions to improve friendship quality – by providing opportunities and coaching to build friendships with well-adjusted peers – may be efficacious for children with ADHD and externalizing comorbidities (Mikami et al., 2020). In line with other findings that behavioral characteristics of children's friends could be

related to psychosocial treatment outcomes in this population (Hoza et al., 2003), our results suggest intervention efforts could be targeted at helping families of children with ADHD to select friends with few problem behaviors.

Conclusion

This work highlights the importance of considering problem behaviors in children with ADHD *and* in their friends, as these may be important for identifying children with ADHD at risk for lower quality friendships. This study may inform advances in our understanding and treatment of friendship problems for this population.


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References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms and profiles*. Research Center for Children, Youth and Families, University of Vermont.
- Ackermann, K., Martinelli, A., Bernhard, A., Freitag, C. M., Büttner, G., & Schwenck, C. (2019). Friendship quality in youth with and without disruptive behavior disorders: The role of empathy, aggression, and callousness. *Child Psychiatry and Human Development*, 50(5), 776–788. <https://doi.org/10.1007/s10578-019-00880-x>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Author.
- Axelson, D., Birmaher, B., Zelazny, J., Kaufman, J., & Gill, M. K. (2009). *K-SADS-PL 2009 working draft*. Western Psychiatric Institute and Clinic.
- Bagwell, C. L., & Coie, J. D. (2004). The best friendships of aggressive boys: Relationship quality, conflict management, and rule-breaking behavior. *Journal of Experimental Child Psychology*, 88(1), 5–24. <https://doi.org/10.1016/j.jecp.2003.11.004>
- Bagwell, C. L., & Schmidt, M. E. (2011). *Friendships in childhood and adolescence*. Guilford.

- Becker, S. P., Fite, P. J., Luebbe, A. M., Stoppelbein, L., & Greening, L. (2013). Friendship intimacy exchange buffers the relation between ADHD symptoms and later social problems among children attending an after-school care program. *Journal of Psychopathology and Behavioral Assessment*, 35(2), 142–152. <https://doi.org/10.1007/s10862-012-9334-1>
- Becker, S. P., Luebbe, A. M., & Langberg, J. M. (2012). Co-occurring mental health problems and peer functioning among youth with attention-deficit/hyperactivity disorder: A review and recommendations for future research. *Clinical Child and Family Psychology Review*, 15(4), 279–302. <https://doi.org/10.1007/s10567-012-0122-y>
- Berndt, T. J., & McCandless, M. A. (2009). Methods for investigating children's relationships with friends. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups* (pp. 63–81). Guilford.
- Blachman, D. R., & Hinshaw, S. P. (2002). Patterns of friendship among girls with and without attention-deficit/hyperactivity disorder. *Journal of Abnormal Child Psychology*, 30(6), 625–640. <https://doi.org/10.1023/A:1020815814973>
- Cardoos, S. L., & Hinshaw, S. P. (2011). Friendship as protection from peer victimization for girls with and without ADHD. *Journal of Abnormal Child Psychology*, 39(7), 1035–1045. <https://doi.org/10.1007/s10802-011-9517-3>
- Cillessen, A. H., Jiang, X. L., West, T. V., & Laszkowski, D. K. (2005). Predictors of dyadic friendship quality in adolescence. *International Journal of Behavioral Development*, 29(2), 165–172. <https://doi.org/10.1080/01650250444000360>
- Deng, J., Wang, M.-C., Zhang, X., Shou, Y., Gao, Y., & Luo, J. (2019). The inventory of callous unemotional traits: A reliability generalization meta-analysis. *Psychological Assessment*, 31(6), 765–780. <https://doi.org/10.1037/pas0000698>
- Fonzi, A., Schneider, B. H., Tani, F., & Tomada, G. (1997). Predicting children's friendship status from their dyadic interaction in structured situations of potential conflict. *Child Development*, 68(3), 496–506. <https://doi.org/10.2307/1131674>
- Frick, P. J. (2004). *The inventory of callous-unemotional traits*. University of New Orleans.
- Gadow, K. D., & Sprafkin, J. (2002). *Child symptom inventory-4 screening and norms manual*. Checkmate Plus.
- Gardner, D. M., & Gerdes, A. C. (2015). A review of peer relationships and friendships in youth with ADHD. *Journal of Attention Disorders*, 19(10), 844–855. <https://doi.org/10.1177/1087054713501552>
- Glick, G., & Rose, A. (2011). Prospective associations between friendship adjustment and social strategies: Friendship as a context for building social skills. *Developmental Psychology*, 47(4), 1117–1132. <https://doi.org/10.1037/a0023277>
- Goodman, R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40(11), 1337–1345. <https://doi.org/10.1097/00004583-200111000-00015>
- Haas, S. M., Becker, S. P., Epstein, J. N., & Frick, P. J. (2018). Callous-unemotional traits are uniquely associated with poorer peer functioning in school-aged children. *Journal of Abnormal Child Psychology*, 46(4), 781–793. <https://doi.org/10.1007/s10802-017-0330-5>
- Hartup, W. H. (1995). The three faces of friendship. *Journal of Social and Personal Relationships*, 12(4), 569–574. <https://doi.org/10.1177/0265407595124012>
- Hoza, B., Mrug, S., Pelham, W. E., Jr., Greiner, A. R., & Gnagy, E. M. (2003). A friendship intervention for children with attention-deficit/hyperactivity disorder: preliminary findings. *Journal of Attention Disorders*, 6(3), 87–98. <https://doi.org/10.1177/108705470300600301>
- Lansford, J. E., Criss, M. M., Pettit, G. S., Dodge, K. A., & Bates, J. E. (2003). Friendship quality, peer group affiliation, and peer antisocial behavior as moderators of the link between negative parenting and adolescent externalizing behavior. *Journal of Research on Adolescence*, 13(2), 161–184. <https://doi.org/10.1111/1532-7795.1302002>
- Lee, Y., Mikami, A. Y., & Owens, S. S. (2021). Children's ADHD symptoms and friendship patterns across a school year. *Research on Child and Adolescent Psychopathology*, 49(5), 643–656. <https://doi.org/10.1007/s10802-021-00771-7>
- Martel, M. A., Schimmack, U., Nikolas, M. A., & Nigg, J. T. (2015). Integration of symptom ratings from multiple informants in ADHD: A psychometric model with clinical utility. *Psychological Assessment*, 27(3), 1060–1071. <https://doi.org/10.1037/pas0000088>
- Mikami, A. Y., Normand, S., Hudec, K. L., Guiet, J., Jia, M., Na, J. J., Smit, S., Khalis, A., & Maisonneuve, M.-F. (2020). Treatment of friendship problems in children with attention-deficit/hyperactivity disorder: Initial results from a randomized clinical trial. *Journal of Consulting and Clinical Psychology*, 88(10), 871–885. <https://doi.org/10.1037/ccp0000607>
- Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8 ed.). Muthén & Muthén.
- Normand, S., Mikami, A. Y., Savalei, V., & Guiet, J. (2020). A multiple indicators multiple causes (MIMIC) model of friendship quality and comorbidities in children with attention-deficit/hyperactivity disorder. *Psychological Assessment*, 32(7), 698–704. <https://doi.org/10.1037/pas0000824>
- Normand, S., Schneider, B. H., Lee, M. D., Maisonneuve, M.-F., Chupetlovska-Anastasova, A., Kuehn, S. M., & Robaey, P. (2013). Continuities and changes in the friendships of children with and without ADHD: A longitudinal, observational study. *Journal of Abnormal Child Psychology*, 41(7), 1161–1175. <https://doi.org/10.1007/s10802-013-9753-9>
- Normand, S., Schneider, B. H., Lee, M. D., Maisonneuve, M.-F., Kuehn, S. M., & Robaey, P. (2011). How do children with ADHD (mis)manage their real-life dyadic friendships? A multi-method investigation. *Journal of Abnormal Child Psychology*, 39(2), 293–305. <https://doi.org/10.1007/s10802-010-9450-x>
- Normand, S., Soucisse, M. M., Melançon, M. P. V., Schneider, B. H., Lee, M. D., & Maisonneuve, M. F. (2019). Observed free-play patterns of children with ADHD and their real-life friends. *Journal of Abnormal Child Psychology*, 47(2), 259–271. <https://doi.org/10.1007/s10802-018-0437-3>
- Parker, J. G., & Asher, S. R. (1993). Friendship and friendship quality in middle childhood: Links with peer group acceptance and feelings of loneliness and social dissatisfaction.

- Developmental Psychology*, 29(4), 611–621. <https://doi.org/10.1037/0012-1649.29.4.611>
- Piehler, T. F. (2016). Coercion and contagion in child and adolescent peer relationships. In T. J. Dishion & J. J. Snyder (Eds.), *The oxford handbook of coercive relationship dynamics* (pp. 129–139). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780199324552.013.11>
- Powell, V., Riglin, L., Ng-Knight, T., Frederikson, N., Woolf, K., McManus, C., Collishaw, S., Shelton, K., Thapar, A., & Rice, F. (2021). Investigating friendship difficulties in the pathway from ADHD to depressive symptoms. Can parent–child relationships compensate? *Research on Child and Adolescent Psychopathology*, 49(8), 1031–1041. <https://doi.org/10.1007/s10802-021-00798-w>
- Salvas, M.-C., Vitaro, F., Brendgen, M., Lacourse, É., Boivin, M., & Tremblay, R. E. (2011). Interplay between friends' aggression and friendship quality in the development of child aggression during the early school years. *Social Development*, 20(4), 645–663. <https://doi.org/10.1111/j.1467-9507.2010.00592.x>
- Schneider, B. H. (2016). *Childhood friendships and peer relationships: Friends and enemies*. Routledge.
- Tripp, G., Schaughency, E. A., & Clarke, B. (2006). Parent and teacher rating scales in the evaluation of attention-deficit hyperactivity disorder: Contribution to diagnosis and differential diagnosis in clinically referred children. *Journal of Developmental and Behavioral Pediatrics*, 27(3), 209–218. <https://doi.org/10.1097/00004703-200606000-00006>