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A Multiple Indicators Multiple Causes (MIMIC) Model of Friendship Quality and Comorbidities in Children With Attention-Deficit/Hyperactivity Disorder

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BRIEF REPORT

A Multiple Indicators Multiple Causes (MIMIC) Model of Friendship Quality and Comorbidities in Children With Attention-Deficit/Hyperactivity Disorder

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The unique objectives of the current investigation were: (a) to assess the fit of a multiinformant 2-factor measurement model of friendship quality in a clinical sample of children with attention-deficit/hyperactivity disorder (ADHD); and (b) to use a multiple indicators multiple causes approach to evaluate whether comorbid externalizing and internalizing disorders incrementally predict levels of positive and negative friendship quality. Our sample included 165 target children diagnosed with ADHD (33% girls; aged 6–11 years). Target children, their parents, their friends, and the parents of their friends independently completed a self-report measure of friendship quality about the reciprocated friendship between the target child and the friend. Results indicated that a multiinformant 2-factor measurement model with correlated positive friendship quality and negative friendship quality had good fit. The friendships of children with ADHD and a comorbid externalizing disorder were characterized by less positive friendship quality and more negative friendship quality than the friendships of children with ADHD and no externalizing disorder after controlling for the presence of a comorbid internalizing disorder. However, the presence of a comorbid internalizing disorder did not predict positive or negative friendship quality. These findings suggest that soliciting reports from parents in addition to children and friends, and measuring comorbid externalizing disorders, may be valuable evidence-based strategies when assessing friendship quality in ADHD populations.

Public Significance Statement

This study suggests that the friendship quality of children with attention-deficit/hyperactivity disorder is characterized by global dimensions of positive and negative friendship features, such as companionship and conflict. Soliciting reports from parents in addition to children and friends, and measuring associated oppositional and conduct problems, may represent valuable science-based strategies when assessing friendship quality in children with attention-deficit/hyperactivity disorder.

Keywords: attention-deficit/hyperactivity disorder, friendship quality, comorbidities, multiple indicators multiple causes modeling

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Achieving close friendships (i.e., voluntary, mutual relationships between two children) is an important developmental task in childhood that is associated with positive outcomes such as better self-esteem and adjustment to school and less loneliness and depression (Bagwell & Bukowski, 2018). Children with attention-deficit/hyperactivity disorder (ADHD) experience significant friendship difficulties, including lower friendship quantity (Hoza et al., 2005), poorer friendship stability (Blachman & Hinshaw, 2002), and friendships characterized by less intimacy and more conflict than those of typically developing children (i.e., friendship quality; Normand et al., 2011). Although each type of friendship difficulty is distinct, there are important reasons to focus on friendship quality. Crucially, the effect of a friendship on adjustment depends on its qualitative features and not just on friendship presence (Bagwell et al., 2018). Positive friendship quality has been specifically found to mitigate the negative longitudinal relationship between children's ADHD symptoms and peer problems (Becker, Fite, Luebbe, Stoppelbein, & Greening, 2013). Yet poor friendship quality appears to worsen over time in ADHD samples (Normand et al., 2013), highlighting the need to effectively assess this construct in this population.

Researchers invariably have found a two-factor structure of friendship quality in typically developing samples of children, reflecting positive (e.g., companionship) and negative (e.g., conflict) friendship features (Berndt & McCandless, 2009). Many types of relationships are characterized by positive and negative features (e.g., teacher-student relationships, romantic partnerships, sibling relationships, parent-child relationships), and we might expect that the factor structure of friendship quality to be similar in children with ADHD. Nonetheless, no work has confirmed this two-factor structure in ADHD samples, which is necessary to fully understand and conduct research on the construct of friendship quality in ADHD.

Although historically children (and sometimes their friends) have self-reported on their friendship quality (Berndt et al., 2009), parents may nonetheless provide valuable and complementary insights about their child's relationship quality with a friend. Parents of elementary school-age children are typically involved in arranging and supervising children's playdates with friends, making the parents of both children in the dyad potential informants about the features of the friendship. 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 social competence (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007). Indeed, significant literature finds that many children with ADHD overestimate their social functioning relative to other informants, including impartial observers (Linnea, Hoza, Tomb, & Kaiser, 2012). This may be why Normand et al. (2013) found that the friends of children with ADHD reported deterioration in friendship quality over the course of 6 months, but the children with ADHD did not. Thus, using parental reports of friendship quality may be especially promising with this population.

Children with ADHD also commonly have comorbid conditions. Externalizing (i.e., oppositional defiant disorder [ODD]; conduct disorder [CD]) and internalizing disorders (i.e., anxiety; major depression) are especially prevalent, affecting 67–80% of clinic-referred children, although other comorbidities associated with ADHD include obesity, sleep problems, and learning disorders (Pliszka, 2015). Much research distinguishes between children with ADHD with versus without externalizing and internalizing comorbidities in terms of family functioning, cognition, genetics, neuroimaging, prognosis, and even mortality rates (Pliszka, 2015). Thus, externalizing and internalizing comorbidities are highly relevant in the ADHD literature.

Although little research has specifically examined the influence of comorbidities on friendship quality, there is a larger literature documenting their influence on peer functioning (a broader construct encompassing aspects such as acceptance/rejection, friendship, and social skills; see Becker, Luebbe, & Langberg, 2012 for a review). Interestingly, comorbid externalizing disorders are incrementally associated with poorer parent- and teacher-rated social skills (Booster, Dupaul, Eiraldi, & Power, 2012; Mikami, Ransone, & Calhoun, 2011) and greater peer rejection (Mikami et al., 2011) above and beyond the influence of ADHD. Similar findings are reported for comorbid internalizing disorders, which are also associated with poorer parent- and teacher-rated social skills (Karustis, Power, Rescorla, Eiraldi, & Gallagher, 2000; Mikami et al., 2011) and greater peer rejection (Mikami et al., 2011) above and beyond ADHD. There is evidence that anxiety may only increase social skills difficulties when coupled with comorbid ODD/CD (Booster et al., 2012), highlighting the need to simultaneously examine the relative contributions of both externalizing and internalizing disorders on peer functioning.

Specific to friendship, one longitudinal study does support an exacerbation effect of externalizing comorbidities on friendship problems (Bagwell, Molina, Pelham, & Hoza, 2001); however, comorbid internalizing symptoms (i.e., anxiety) have not necessarily been found to relate to children's number of friends (Hoza et al., 2005). Only one study to our knowledge has examined the effect of comorbidities on friendship quality in children with ADHD (Normand et al., 2011). This study found no effect of either externalizing or internalizing comorbid symptoms on friendship quality; however, they did not use a standardized diagnostic interview to confirm ADHD or comorbid disorders, so children may not have had clinical levels of psychopathology. In summary, although little work has examined the effects of comorbidities on friendship quality specifically, substantive research finds that externalizing and internalizing comorbidities impact peer functioning overall in ADHD, suggesting that this effect may extend to friendship quality.

The Present Study

Using a clinically diagnosed sample of children with ADHD, our aims were: (a) to assess the fit of 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); and (b) to use a Multiple Indicators Multiple Causes (MIMIC) model to evaluate whether comorbid externalizing and internalizing disorders incrementally predict the two latent factors of friendship quality. A MIMIC model is a type of structural equation model that allows testing of the relative influence of observed covariates on multiple latent variables (DiStefano, Ene, & Leighton, 2016). Whereas the measurement part of the MIMIC model (i.e., the relations between the factors and their indicators) represents the usual factor model, this approach also partitions out

unique and shared method variance because of the type of informant or correlation among informants (Kline, 2015). We hypothesized that the two-factor model of friendship quality with four informants would approximate the latent structure well (Hypothesis a). We further expected that including externalizing and internalizing disorders as predictors of the two latent factors of friendship quality would yield a model with good approximate fit (Hypothesis b). Finally, we anticipated that comorbid externalizing and internalizing disorders would each be associated with less positive and more negative friendship quality (when taking into account the contribution of the other comorbidity; Hypothesis c).

Method

Participants

Participants were 165 target children with ADHD (33% girls), taking part in a clinical trial evaluating interventions for peer problems (Mikami et al., 2019). All data collection for the present study occurred before participants were randomized to intervention conditions or began treatment. Each child participated with a friend, invited by the family of the target child.

Target children were on average 8.59 years old (SD = 1.51; range = 6–11) and were 73% White, 6% Asian American, 1% Latino, and 20% mixed/more than one race. Their ADHD presentations were 69% combined, 27% inattentive, and 4% hyperactive-impulsive. Regarding comorbidities, 20.6% (n = 34) had an externalizing disorder, 18.8% (n = 31) had an internalizing disorder, and another 10.3% (n = 17) had both an externalizing and an internalizing disorder. Target children were recruited from hospitals, clinics, and schools in Vancouver and Ottawa/Gatineau, Canada. No site differences existed in child age, family income, full-scale intelligence quotient, ADHD presentation, externalizing or internalizing comorbidity, and severity of ADHD symptoms or peer problems. Vancouver children were less likely to be girls, $\chi^2(1, N = 165) = 3.87$, $p = .049$, White, $\chi^2(1, N = 162) = 6.58$, $p = .010$, or medicated, $\chi^2(1, N = 165) = 4.97$, $p = .026$.

All target children were diagnosed with ADHD according to *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (*DSM–5*) criteria. Children had at least six symptoms of inattention and/or hyperactivity/impulsivity, in which an item was considered present if endorsed on a semistructured diagnostic interview with parents (Kiddie Schedule for Affective Disorders and Schizophrenia [K-SADS]; Axelson, Birmaher, Zelazny, Kaufman, & Gill, 2009) or on a teacher ADHD rating scale (Child Symptom Inventory-IV; Gadow & Sprafkin, 2002). Children also needed to show peer problems (>1 SD above the mean on the parent and/or teacher Strengths and Difficulties Questionnaire Peer Problems subscale; Goodman, 1997). Medication for ADHD (taken by 58% of children) as well as common comorbidities with ADHD (e.g., ODD, CD, anxiety disorders, depressive disorders, learning disabilities) were not exclusionary. Exclusion criteria for the larger investigation were: full-scale intelligence quotient <75, autism spectrum disorder, or severe condition (e.g., suicidality, psychosis, trauma) requiring immediate intervention; these applied to 4.8% of those assessed.

We used a procedure validated in other work to diagnose comorbidities (Mikami et al., 2013), whereby children were determined to have a comorbid externalizing disorder if the parent endorsed ODD or CD on the K-SADS, and teacher ratings corresponded to a T score of 60 or above on the Oppositional Defiant Problems and/or Conduct Problems DSM scales on the Teacher Report Form (TRF; Achenbach & Rescorla, 2001). Children had a comorbid internalizing disorder if the parent endorsed an anxiety or depressive disorder on the K-SADS and either (a) children endorsed a T score 60 or above on the Children's Depression Inventory-2 (Kovacs, 2010), or a T score of 60 or above on the Multidimensional Anxiety Scale for Children-2 (March 2012), or (b) the teacher rated the child as having a T score of 60 or above on the Depressive Problems and/or Anxiety Problems DSM scales on the Teacher Report Form.

Procedure

Full details about the procedure are in (Mikami et al., 2019). This study was approved by the institutional review boards at both sites. Parents and teachers gave consent and children assented to all procedures. Parents and teachers completed the Child Symptom Inventory-IV and the Strengths and Difficulties Questionnaire Peer Problems–Peer Problems scale on target children over the phone or by e-mail. If children showed elevated symptom ratings, they were invited to the laboratory, where we administered the K-SADS to parents and a short form of the Wechsler Intelligence Scale for Children–IV (Wechsler, 2003) or Wechsler Abbreviated Scale of Intelligence (Wechsler, 2011) to children to ensure that inclusion criteria were met. Children and teachers also completed the rating scales to indicate comorbidities.

There were 213 children who met full inclusion criteria for the larger investigation after this initial visit. We asked these families to return with the child's closest friend; 167 did so. The child and friend each reported whether they were best friends, close friends, just okay friends, occasional companions, or strangers during private, individual interviews. As recommended in the literature, we included the 165 dyads in which both children mutually endorsed being at least just okay friends (Berndt et al., 2009). This reduction from the potential 213 participants to the sample of 165 for the current study is comparable to other studies requiring reciprocated friendships (Glick & Rose, 2011; Parker & Asher, 1993). The ratings of friendship quality were collected at this visit.

Measures

Target children, friends, children's parents, and friends' parents independently completed the Friendship Quality Questionnaire (FQQ)–Short Form (Glick et al., 2011) about the friendship between the target child and friend. The original FQQ assesses six features (i.e., validation and caring, conflict resolution, help and guidance, companionship and recreation, intimate exchange, and conflict and betrayal) and is a widely used measure of children's friendship quality with strong psychometric properties, including internal consistency, and criterion validity (Parker et al., 1993). It has been effectively used in samples of children with ADHD as young as 6 years old (Blachman et al., 2002). The short version has 22 items, each scored on a 5-point scale (0 = *not at all true*; 4 = *really true*).

As is standard in the literature, positive friendship quality composites for each informant were created by taking the mean of the items assessing validation and caring, conflict resolution, help and

guidance, companionship and recreation, and intimate exchange (15 items; $\alpha = .86–.91$; e.g., "this friend is fun to do things with"; see Glick et al., 2011). Negative friendship quality composites for each informant reflected the mean of the conflict and betrayal items (seven items; $\alpha = .74–.85$; e.g., "This friend argues a lot"; see Parker et al., 1993). There were few missing data in our sample. Specifically, 98.7% of raw FQQ items on average were complete (99.8% in target children, 99.1% in parents, 99.6% in friends, and 96.4% in friends' parents). Subscale scores were computed if at least one item was present and composite scores if at least one subscale score was present. This situation occurred infrequently and pertained to only one target child, three parents, zero friends, and seven friends' parents (or 1.7% of cases overall). This procedure yielded complete data on the composites for 100% of target children, parents, friends, and 99% of friends' parents.

Analytic Strategy

Confirmatory factor analysis was first used to test a two-factor model of friendship quality. Then comorbid externalizing and internalizing disorders were added within a MIMIC framework to evaluate whether they predicted positive friendship quality and negative friendship quality. Models were estimated using the *lavaan* package (version 0.6-4.1372; Rosseel, 2012) with the full information maximum likelihood estimator to account for the small amount of missing data. Model fit was evaluated using the χ^2 test of exact fit as well as the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI). We considered models to have good approximate fit if RMSEA values were <0.06 and CFI and TLI values were >0.95 (Hu & Bentler, 1999). Modification indices (MI) were also considered. Path coefficients between covariates and factors were examined to determine the relative influence of comorbidities on the friendship quality latent variables.

Results

Bivariate Correlations Among Study Variables

Table 1 (in the online supplemental materials) shows that overall, target children's perceptions of positive and negative friendship quality were modestly related in expected directions to the perceptions of friends, parents, and friends' parents. However, target children with ADHD tended to agree more regarding negative friendship quality with their own parents ($r = .42$) than with friends, $r = .26$; $z = 1.59$, $p = .056$, or with friends' parents, $r = .23$; $z = 1.88$, $p = .030$. Similarly, friends agreed more with their own parents ($r = .57$) than with the target children or the parents of target children (both rs $= .26$; $z = 3.32$, $p < .0001$) in their reports of negative friendship quality. At the bivariate level, a comorbid externalizing disorder in target children was associated with more negative friendship quality according to three informants (and associated with friends' parents' reports of less positive friendship quality). However, a comorbid internalizing disorder in target children was associated with friends' parents' reports only of less negative friendship quality.

As indicated in Table 1 (in the online supplemental materials), the perceptions of positive friendship quality of target children with ADHD did not differ from their friends, $t(164) = -0.14$, $p = .892$. However, target children perceived significantly more positive friendship quality than their parents, $t(164) = 6.12$, $p = .000$, and their friends' parents, $t(162) = 7.86$, $p = .000$. Similarly, target children perceived significantly less negative friendship quality than their friends, $t(164) = -2.62$, $p = .010$, their parents, $t(164) = -4.69$, $p = .000$, and their friends' parents, $t(162) = -6.54$, $p = .000$.

Multiinformant Measurement Model of Friendship Quality

Contrary to prediction in Hypothesis a, the initial two-factor model of friendship quality with four residual correlations to model method effects did not have acceptable fit to the data, $\chi^2(15, N = 165) = 40.29$, $p < .001$; CFI = 0.909; TLI = 0.830; RMSEA = 0.101. We inspected MIs to see how fit could be improved. The largest MIs suggested that target children and their parents (MI = 20.97) and friends and their parents (MI = 19.11) do not provide independent reports for negative friendship quality. Thus, a modified model with two residual correlations between the reports by target children with ADHD and their parents (and between the reports by the friends and their respective parents) for negative friendship quality improved model fit.

As shown in Figure 1 (in the online supplemental materials), the revised two-factor model of friendship quality with four indicators, four residual correlations to model method effects, and two residual correlations to model dependencies between target children or friends and their respective parents for negative friendship quality had good fit, $\chi^2(13, N = 165) = 15.55$, $p = .27$; CFI = 0.991; TLI = 0.980; RMSEA = 0.034. The latent factors of positive and negative friendship quality correlated moderately and negatively, $r = -0.63$, $p = .000$. All FQQ composite scores from each informant had significant, positive loadings on the positive and negative friendship quality latent factors, with standardized loadings ranging from 0.27 to 0.58 (all ps < 0.05).

Friendship Quality and Comorbidities

As predicted (Hypothesis b) and as shown in Figure 1, the MIMIC model of friendship quality and comorbidities in children with ADHD had good fit by exact and approximate fit indices, $\chi^2(25, N = 165) = 29.58$, $p = .24$; CFI = 0.985; TLI = 0.972; RMSEA = 0.033. The covariates of comorbid disorders accounted for roughly 15.1% and 14.9% of the variance in positive friendship quality and negative friendship quality, respectively. The moderate and negative residual correlation, $r = -.52$, $p = .001$, between the two latent friendship quality variables suggest that the shared variance in positive and negative friendship quality is not entirely explained by the presence of comorbid externalizing and internalizing disorders.

The standardized path coefficients in Figure 1 may be interpreted as the effect of a given covariate on friendship quality, holding the other covariate constant (Kline, 2015). Coefficients suggested that the presence of a comorbid externalizing disorder in target children was related to less positive friendship quality and to more negative friendship quality (after controlling for the presence of a comorbid internalizing disorder; supporting Hypothesis c). Having a comorbid internalizing disorder was not related to friendship quality, after controlling for the presence of a comorbid externalizing disorder.

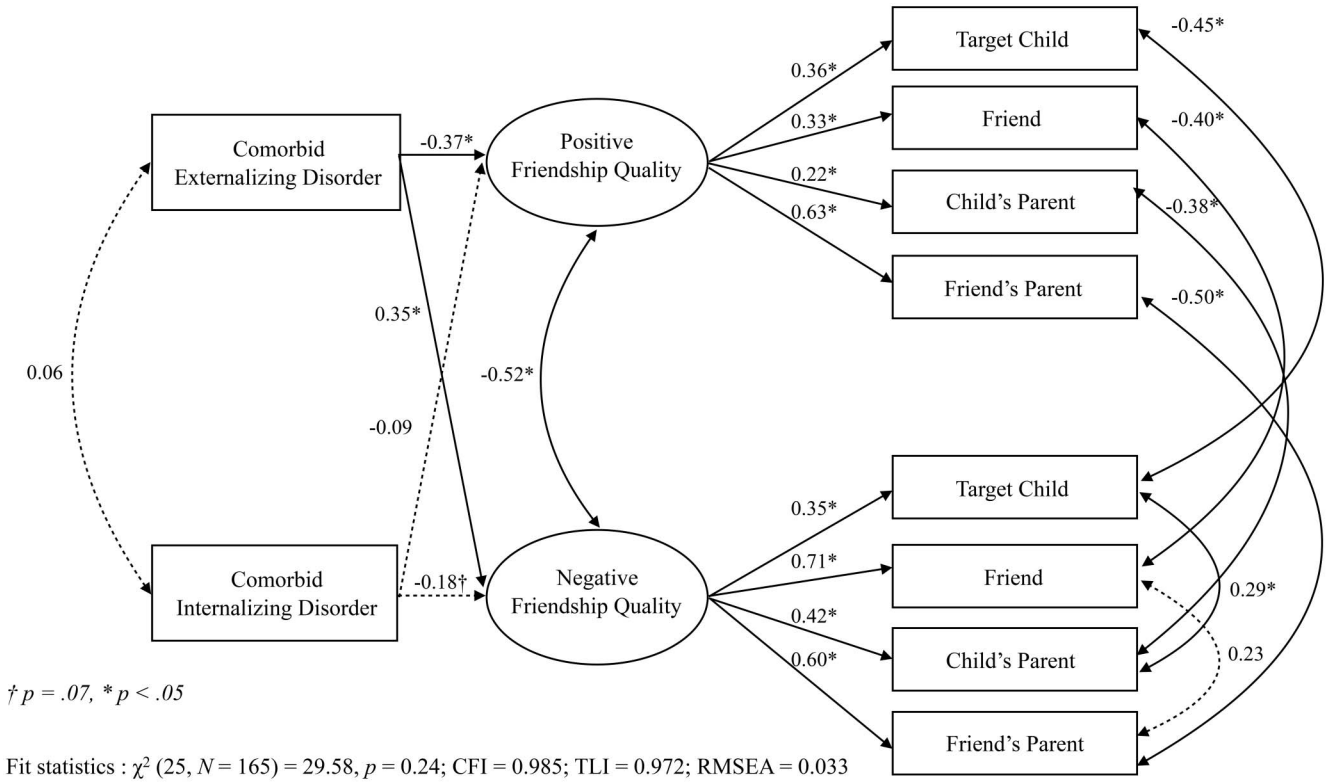

Figure 1. Path diagram for the Multiple Indicators Multiple Causes model examining the relationship between comorbid externalizing and internalizing disorders and friendship quality. On the left side are the covariates and their respective coefficients for the regression on the latent constructs. The double-headed arrows represent correlations between the two latent constructs, the residual correlations (method effects), and the residual correlations between target children/friends and their respective parents for negative friendship quality. Solid lines represent associations between variables and dashed lines represent nonsignificant relationships between variables. Comorbid externalizing disorders (i.e., oppositional defiant disorder and conduct disorder) and comorbid internalizing disorders (i.e., anxiety disorders and depressive disorders) were coded 0 = *no* and 1 = *yes*. χ^2 = chi square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

Discussion

Although previous research involving children with ADHD has assumed there are two global dimensions of positive and negative friendship quality (Blachman et al., 2002; Normand et al., 2011, 2013), the current study provided the first empirical confirmation of the two-factor structure of friendship quality using the FQQ for this population. Our results thus replicate the factor structure documented in previous studies with typically developing children (Berndt et al., 2009). This documentation could set the stage for theoretical and clinical advances in understanding the influence of positive relative to negative friendship quality on later adjustment in children with ADHD and development of evidence-based, friendship-focused interventions for this population.

Furthermore, we found support for a multiinformant approach to measuring friendship quality, including reports from target children, friends, parents, and friends' parents. We consider this approach especially critical given that children with ADHD often overestimate their own social functioning in comparison with actual functioning (Owens et al., 2007). Indeed, in our sample, overall target children with ADHD reported more positive and less negative friendship quality than did the other informants. Interestingly, we also found that target children (and their friends) agreed more with their respective parents than with each other in their reports of negative (but not positive) friendship quality. Children of this age likely talk to their own parents about incidents that occur with their friends, and/or parents are physically present to supervise playdates. It is possible that negative interactions with friends (e.g., conflict) are also more salient and easier for parents to observe than the subtle expressions of positive friendship quality (e.g., intimate exchange). However, this model should be replicated in a future independent sample. Notably, in the child clinical literature, the utility of multiple informants to report on child behaviors and symptoms is generally well accepted (De Los Reyes et al., 2015). The results of the current study suggest that friendship quality might be best similarly assessed via multiple informants.

As predicted, the friendships of children with ADHD and a comorbid externalizing disorder were characterized by less posi-

tive and more negative friendship quality than those of children with ADHD and no externalizing comorbidity, after controlling for the presence of a comorbid internalizing disorder. Our findings appear to contradict those of Normand et al. (2011), who used dimensional measures of ADHD and comorbid symptomatology, but our results may be more generalizable to clinically diagnosed comorbid samples of children with ADHD. Indeed, this suggests that the well-documented deficits in social skills and peer rejection found to be associated with comorbid externalizing disorders extend to the friendship context.

On the other hand, the presence of a comorbid internalizing disorder did not predict friendship quality after controlling for having a comorbid externalizing disorder. This result echoes previous findings, suggesting that comorbid anxiety symptoms may not impact friendship in ADHD samples (Hoza et al., 2005; Normand et al., 2011). Some authors have argued that comorbid anxiety inhibits the impulsive, reactive behaviors that are characteristic of children with ADHD, which could in turn mitigate any negative effect of anxious behaviors on peer functioning (Jarrett & Ollendick, 2008), or anxiety could change the effects of ADHD symptoms on peer functioning. It is also possible that relative to children with ADHD and externalizing disorders, those with internalizing disorders are more likely to find one close friend who understands their needs, which could reduce the negative impact on their friendship quality in that dyadic relationship.

Strengths, Limitations, and Future Directions

Strengths of this study include the confirmation of child ADHD and comorbidities through state-of-the-art procedures, including a standardized diagnostic interview and parent and teacher rating scales. Second, the MIMIC approach allowed us to rigorously evaluate for the first time whether comorbid externalizing and internalizing disorders incrementally predicted levels of positive and negative friendship quality in a clinically diagnosed sample of children with ADHD. Third, several scholars who have argued that researchers who study children's friendships have too often viewed friendships as dichotomous (i.e., the best of friends vs. not having friends at all; Berndt et al., 2009). Thus, as recommended, we decided to include a broad range of friendships to increase the potential representativeness of this clinical sample. Fourth, the very low rate of missing data within our sample represents another strength.

Study findings need to be viewed with some limitations in mind. First, although we used an inclusive procedure to confirm reciprocated friendship and minimize selection bias effects (Berndt et al., 2009), our measure of friendship quality was restricted to only one friendship per target child, and the family of the target child with ADHD selected the friend to invite. Second, we did not investigate the factor structure of the raw items, or of the subscales comprising the positive FQQ composite, because that would necessitate fitting a very large model (in terms of the number of variables) to our sample. Third, although our sample size is comparable with many other clinical samples, it is small for CFA or MIMIC modeling and it precluded us including other covariates. Indeed, comorbidity is only one of many factors that can influence friendship quality. Fourth, our cross-sectional design precluded conclusions about the temporal sequence between comorbid disorders and friendship quality. In summary, future studies using longitudinal designs and larger samples could shed light on the factor structure of the FQQ items and explore other covariates (e.g., age, gender, sibling relationships, parents' romantic relationship, parental ADHD) that may relate to friendship quality. Finally, to gain a comprehensive understanding of friendships in ADHD, future research should also consider friendship quantity, stability, and behavioral characteristics of friends.

Clinical Implications

These findings underscore the utility of parents as informants about children's friendship quality and provide preliminary support for combining parental reports with those of children and their friends in ADHD populations. Because parents seem aware of their children's problems with friendship quality, including parents in friendship-focused interventions may also be promising. Children with ADHD and externalizing comorbidities may have more negative and less positive friendship quality than do those with ADHD and no externalizing comorbidities, calling for further assessment and intervention efforts for this subgroup. Promising work has recently shown that this at-risk subgroup may benefit from structured and intensive behavioral parent interventions to improve friendship quality (Mikami et al., 2019).

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