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A Novel Look at Peer Problems: Examining Predictors of Children's Sociometric Ratings of Classmates With ADHD Symptoms

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Abstract

Research predominantly focuses on problematic behaviors in children with symptoms of attention-deficit/hyperactivity disorder (ADHD) to explain why they are disliked by their classroom peers. By contrast, the current study explores characteristics of peers that are associated with them disliking classmates with ADHD symptoms. To do so, we undertook a novel methodological approach using hierarchical linear modeling to examine the strength of the association between child characteristics, their sociometric ratings given to classmates, and the recipients' ADHD symptom levels. Participants were 194 children (Grades K–4) in 12 classrooms. Using the sociometric method, children rated their liking versus disliking of each classmate. Children's ADHD symptoms were reported by the teacher. Children's self-reported stigma about ADHD, their own sociometric ratings received, and teacher ratings of children's academic competence were collected. Results suggested that children who reported more stigma about ADHD, and who were more socially and academically competent, had a stronger negative association between the sociometric ratings they gave and the recipients' ADHD symptoms (i.e., were more likely to dislike classmates with ADHD symptoms). These effects were strongest at the end of the academic year relative to the beginning of the year. Implications for interventions targeting the peer group are discussed.

Keywords

ADHD, peer relationships, sociometrics, stigma

Difficulties in peer relationships are a major functional impairment in children with symptoms or diagnoses of attention-deficit/hyperactivity disorder (ADHD). These children are robustly disliked by their peers, compared with their classmates (Gardner & Gerdes, 2015). Impairments in peer relationships persist throughout childhood into adolescence (Murray-Close et al., 2010), and being disliked by peers incrementally predicts negative adjustment outcomes, beyond those associated with the ADHD symptoms alone (Mrug et al., 2012). For these reasons, educators and clinicians are often concerned about the peer difficulties of children with ADHD symptoms and interested in how to best support these children.

The majority of existing research has focused on the poor behaviors and skills of children with ADHD symptoms to explain their peer problems (Mikami & Normand, 2015). Interventions tend to follow from this conceptualization, in that they attempt to rectify the deficits in those children. While this literature about poor behaviors and skills in children with ADHD symptoms is useful, we argue that it is incomplete for understanding the peer problems these children face (Mikami & Normand, 2015). Rather, peer relationships are reciprocal processes, meaning that it is also important to characterize the peers who dislike children with ADHD symptoms. Such knowledge could have future implications for improving interventions for peer difficulties in ADHD populations. The current article explores characteristics of classroom peers that may relate to their tendency to dislike children with ADHD symptoms.

Peers' Disliking of Classmates With ADHD Symptoms

Although on average, peers dislike children with ADHD symptoms (Gardner & Gerdes, 2015), all peers do not have equivalent judgments. Yet, extremely few studies have

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examined characteristics of peers as related to their disliking of those with ADHD symptoms, instead focusing on the characteristics of the children with ADHD symptoms who are disliked by peers (for an exception, see Hoza, Mrug, et al., 2005). Based on theory and existing literature, we explore two characteristics that could be related to peers' liking versus disliking of classmates with ADHD symptoms: stigma about ADHD (specifically, desire for social distance) and peers' own competencies (social and academic).

Stigma About ADHD. The negative societal attitudes, cognitions, and perceptions that exist about ADHD are referred to as stigma (Lebowitz, 2016). Stigma is a powerful force that negatively impacts the well-being of recipients, beyond the effects of ADHD itself (Nguyen & Hinshaw, 2020). Children's stigma about ADHD is often measured by their reported desire to distance from a hypothetical peer with ADHD symptoms. Studies consistently find that children express more unwillingness to engage in social, academic, or recreational activities with a hypothetical classmate with ADHD symptoms compared with a typical classmate (Law et al., 2007), as well as compared with a hypothetical classmate with internalizing problems (Bellanca & Pote, 2013) or one with academic difficulties (Gasser et al., 2018). Collectively, this body of literature suggests that stigma about ADHD is prominent, including in children. Still, Gasser et al. (2018) found that the level of desired social distance from a hypothetical classmate with ADHD symptoms varies depending on classroom norms, which suggests that such stigma is not inevitable.

Although it seems logical that stigma about ADHD would affect children's personal liking versus disliking of those with ADHD symptoms, few studies have examined any type of real-life consequences of stigma. One notable study by Na and Mikami (2018) tested whether children's pre-existing perceptions of ADHD influenced their judgments of real-life classmates whom they subsequently met for the first time in a summer camp. They found that children who initially reported more willingness to interact with a hypothetical classmate with ADHD symptoms (less desired social distance) indicated lower disliking of real-life classmates with ADHD in the summer camp. Also, children who were initially more willing to help a hypothetical classmate with ADHD were more inclined to like their classmates with ADHD, whereas those who believed ADHD symptoms were uncontrollable (as opposed to controllable), were more inclined to dislike their classmates with ADHD, when those classmates' ADHD symptoms were severe. To our knowledge, no work has attempted to replicate this finding.

Peers' Competencies. Another potential factor involves the level of competencies in the peers who are judging classmates with ADHD symptoms. There are several reasons why children's own competencies could relate to their inclinations to like versus dislike classmates with ADHD symptoms. One possibility is that children with greater competence enjoy high status in the peer group and may be afraid that if they associate with low-status classmates (who are typically those with ADHD symptoms) then their own status will go down (García Bacete et al., 2017). A second potential reason, suggested by O'Driscoll et al. (2015), is that children may be concerned that classmates with ADHD symptoms will get them into trouble by association; those children with greater competence, who typically receive positive attention from teachers, may be most likely to have these concerns. Relatedly, children who are academically successful may be reluctant to associate with classmates with ADHD symptoms specifically because they perceive the ADHD symptoms as impeding their own academic performance (suggested by Gasser et al. (2018)).

In elementary school, children's social and academic competencies are intertwined and reciprocally influence one another (Ladd et al., 1999). Being academically competent tends to attract peers to like a child, and being well-liked by peers, in turn, is suggested to increase that child's academic motivation and engagement (Ladd et al., 1999). Indeed, the highest status children tend to have strengths in both social and academic domains at this age. In this study, we, therefore, consider both social and academic competencies of peers.

Regarding social competence, a relevant metric of this construct is peer preference, or the extent to which the child is liked, relative to disliked, in the peer group. In one of the few studies to examine the characteristics of children who like versus dislike classmates with ADHD, Hoza, Mrug, et al. (2005) found that the children who disliked those with ADHD had better peer preference themselves. To our knowledge, no study has attempted to replicate this finding. Regarding academic competence, an important indicator of this construct is academic enablers, which are the attitudes, behaviors, and cognitions that facilitate academic success (DiPerna, 2006). Examples of academic enablers are engagement in the material, motivation for learning, and the ability to work productively with peers on academic tasks. These enablers promote academic performance metrics such as grades and standardized test scores (DiPerna, 2006). No study to date has tested whether the academic competencies of peers may relate to their disliking versus liking of children with ADHD symptoms.

As mentioned, very few studies have examined characteristics of peers related to their judgments of children with ADHD. However, Blachman and Hinshaw (2002), in a summer camp, found that comparison girls (relative to girls with ADHD) had somewhat greater disliking of classmates who had ADHD. This suggests the importance of accounting for children's own ADHD symptoms in analyses that examine associations between their competencies and their

evaluation of classmates with ADHD. Given that the comparison girls in Blachman and Hinshaw had higher peer preference and academic achievement than did the girls with ADHD (Hinshaw, 2002); this also offers indirect support for the idea that children with higher competencies may be more inclined to dislike classmates with ADHD symptoms.

Furthermore, both Na and Mikami (2018) and Blachman and Hinshaw (2002) collected data in a short-term summer camp setting where children were previously unacquainted, meaning that the data likely captured initial impressions. By contrast, Hoza, Mrug, et al. (2005) collected data in regular classrooms between January and June of the school year, after children had ample opportunity to get to know one another. It is unknown how the amount of time that children have interacted with one another may affect the research questions in the current study. On one hand, stigma and competencies may play a larger role in children's initial evaluations of classmates with ADHD symptoms, because they have little else on which to base their judgments of these classmates. On the other hand, experience and interactions with classmates over time may allow children to be more aware of which classmates have ADHD symptoms, which could render their stigma and competencies more influential on their sociometric judgments of these classmates. The current study attempted to shed light on this question by examining children's patterns of sociometric ratings given at both the beginning, as well as the end of the school year.

The Sociometric Method

The sociometric method is often considered to be the gold standard for assessing peer liking and disliking, because reports come directly from peers (Bukowski & Hoza, 1989). In this method, children nominate classmates whom they like (positive nominations) and whom they dislike (negative nominations), or may rate each classmate on a scale where "like a lot" indicates one end and "dislike a lot" indicates the other end of the continuum. In the typical way of scoring the data, a child's peer preference score is computed by subtracting the proportion of their peers who nominated them as disliked from the proportion of peers who nominated them as liked. Or, the average rating that a child receives from peers can be computed, which is highly correlated with peer preference (Bukowski et al., 1994).

It is well-documented that children with ADHD symptoms or diagnoses receive lower peer preference scores and ratings relative to their classmates, on average (Gardner & Gerdes, 2015). The level of peer disliking may be strongest for children with high hyperactive/impulsive symptoms (reflecting the combined or hyperactive/impulsive presentations of ADHD), as compared with children with the inattentive presentation of ADHD who are more neglected. Nonetheless, all children with ADHD symptoms, even those with the inattentive presentation, tend to have peer problems relative to typically developing children (Gardner & Gerdes, 2015).

Their substantial peer impairment has led to a wealth of research in understanding what skills or behaviors in children with ADHD symptoms are associated with them being disliked by peers (Mikami & Normand, 2015). However, the sociometric method itself has restricted research about what characteristics are associated with children giving liking (versus disliking) nominations or ratings to classmates with ADHD symptoms. That is, sociometric data are typically organized to address the question of what predicts sociometric nominations or ratings *received from* classmates, as opposed to *given to* classmates.

Because sociometric data are usually not considered in terms of given nominations and ratings, unlike for received nominations and ratings, there is no standard way of processing these data. The few studies that have attempted to do so have taken varied approaches. Na and Mikami (2018) computed the average rating that each child gave to classmates with ADHD and the proportion of classmates with ADHD that they nominated positively and negatively. A limitation was that their same-gender summer camp classrooms had an average of three children with ADHD (and a total classroom size of 10 children), meaning that strong feelings about any one child with ADHD could dramatically sway the score. A summer camp, consisting of all same-gender classmates, may also lack external validity. Blachman and Hinshaw (2002) conducted their study in an all-female summer camp in which 61% of the girls had ADHD. They computed the number of positive and negative nominations, of three possible, that each girl gave to classmates with ADHD relative to comparison classmates. Again, the restricted range of scores (nominations were capped at three) and the unique composition of the summer camp are limitations of their approach. Finally, Hoza, Mrug, et al (2005) identified the peers who nominated a child as either their first best friend or second best friend and computed the average peer preference score for those peers. This score was compared for the peers who nominated children with ADHD relative to the peers who nominated comparison children. A strength of this approach is that data came from a regular classroom, but the restricted range of the scores (children had to be nominated as one of two best friends) again is a limitation.

The current study advances the methodology by taking an innovative approach to calculating peers' judgments of classmates with ADHD symptoms. In a school-based sample, our method captures the strength of the association between a child's sociometric ratings given to classmates with the recipients' ADHD symptom severity. To do so, we

used hierarchical linear modeling with sociometric ratings given to classmates nested within child raters. This method has the benefit of using all available data. To our knowledge, no study has used this approach.

Hypotheses

We hypothesized that a stronger negative association between sociometric ratings given and the recipients' ADHD symptoms (meaning a stronger inclination to dislike those with more ADHD symptoms) would be predicted by children's (a) higher stigma about ADHD, indicated by self-reports of desired social distance from a hypothetical peer with ADHD symptoms; and (b) higher competencies, indicated by sociometric ratings received themselves and teacher-rated academic enablers. We also explored the strength of these relationships at the beginning of the school year (reflecting initial impressions) and at the end of the school year (after children had a good deal of time to get to know one another).

Method

Participants

Participants were 194 children (52.4% male, 61.6% White) in 12 general education classrooms (Grades K–4). Children and their teachers were recruited from six schools distributed across an urban and suburban area in Western Canada (98 children; 6 classrooms) and a rural area in the Midwestern United States (95 children; 6 classrooms). See Table 1 for demographics of participants. The current study participants drew from a larger existing dataset that was an initial pilot test of a social-emotional learning program (Mikami et al., 2020), described further below.

Table 1. Characteristics of Child Participants.

Variable	*n* (%)
Age	6.6 (1.4)
Gender	
Female	90 (46.4)
Male	103 (53.1)
Nonbinary	1 (0.5)
Grade	
Kindergarten	21 (10.8)
First grade	102 (52.6)
Second grade	25 (12.9)
Third grade	23 (11.9)
Fourth grade	23 (11.9)
Race	
White/Caucasian	122 (62.9)
Asian/Asian American/Asian Canadian	26 (13.4)
Black/African American/Afro Canadian/Black Canadian	3 (1.5)
American Indian/Alaska Native	1 (0.5)
Multiracial	36 (18.6)
Missing/Did not report	6 (3.1)
Ethnicity	
Hispanic	5 (2.6)
Non-Hispanic	162 (83.5)
Missing/Did not report	27 (13.9)

Note. $N = 194$. Values for continuous variables represent means with standard deviations in parentheses.

Procedure

Procedures were approved by the school districts and research ethics boards at the associated universities. General education teachers of Grades K–4 were recruited through presentations at their school staff meetings or through principals relaying the information to them. Participating teachers provided written consent. At the beginning of the academic year, the teachers provided information about the study to the parents of children in their classroom. Child participants had parents who provided active consent for their participation, and they provided assent. On average, 76% of the children (range 56%–95%) in a classroom participated in the study. All classes had higher than a 50% participation rate, which is an established criterion for valid sociometric data (McKown et al., 2011).

All 12 teachers had agreed to pilot a classroom-wide social-emotional learning program during the academic year, the details of which are extensively described in Mikami et al. (2020). Although we thought that the social-emotional learning program might possibly result in all children receiving more positive sociometric ratings from peers overall, we did not expect that it would change the associations between characteristics of the nominator with their tendency to dislike versus like those with ADHD symptoms.

Approximately, 1 month into the school year (to allow teachers and children time to form initial impressions of one another), teachers rated children's ADHD symptoms and academic enablers. Children completed a sociometric procedure with a picture board of consented classmates to facilitate recall and answered a questionnaire to assess their stigma about ADHD. Each child was interviewed in private by a research assistant who read each question aloud, used a graphic to explain the rating scale, checked for comprehension, and recorded the child's answers. This was considered to be the fall timepoint. At the end of the academic year, the same procedure and measures were repeated, and this was considered to be the spring timepoint.

Measures

ADHD symptoms. The teacher version of the ADHD-5 rating scale (DuPaul et al., 2016) was used to assess child symptoms of ADHD as defined in the 5th edition of the *Diagnostic* and *Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013). In this commonly used scale, teachers rate children on the 18 core symptoms of ADHD, each judged on a 4-point metric (0 = *neve*r, 3 = *very often*). In the norming sample for the previous version of the scale (DuPaul et al., 1998), there was strong 4-week test–retest reliability, correlations with other ADHD rating scales and behavioral observations of symptoms, and success at discriminating between children with and without a diagnosis of ADHD. Although the ADHD-5 rating scale can be broken into subscales of inattentive and hyperactive/impulsive symptoms, we used a total ADHD symptom score reflecting the sum of all items to reduce the number of analyses. The correlation between inattentive and hyperactive/impulsive symptoms was $r = .719$ in fall and .741 in spring, $ps < .001$, and internal consistency of the total score (18 symptoms) was alpha = .96 in our sample at both timepoints. The total ADHD symptom score of the child making the sociometric ratings was used as a covariate in data analysis, and the scores of the recipients were the key predictor (to calculate the association between the recipients' ADHD symptoms and the sociometric ratings the child gave to recipients).

Sociometric ratings given. A sociometric procedure was conducted (Bukowski et al., 1994), where children were asked to indicate their liking versus disliking of each consented classmate on a 5-point scale (1 = *really do not like*; 5 = *really like*). The ratings the child gave to classmates became the outcome variable in our primary analyses, where we captured the association between sociometric ratings given and the recipients' ADHD symptom levels.

Social competence. The sociometric ratings were also used to index the child's own social competence. To do this, we computed the average rating that each child received from classroom peers.

Academic competence. Children's academic enablers were measured via three subscales of the Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2001); these were the only ACES subscales administered in the larger dataset. Teachers used a 5-point scale (1 = *never*, 5 = *almost always*) to rate children on the academic enablers of engagement (8 items measuring active interest and participation in academic activities; e.g., *participates in class discussions*), motivation (11 items measuring drive and persistence on academic work; e.g., *persists when tasks are difficult*), and interpersonal skills (10 items measuring ability to work with others on academic tasks; e.g., *works effectively in a large group activity*). Alphas in our sample were .93 (fall) and .92 (spring) for the engagement subscale. Alphas for the motivation and interpersonal subscales were .97 and .95 at both timepoints, respectively. To reduce the number of analyses conducted, the subscale scores were summed to create a total academic competence score, supported by high correlations ($r = .53$ to .75) between the three subscales within each timepoint.

Stigma about ADHD. In the individual interviews, a research assistant read aloud a description of a hypothetical child displaying ADHD symptoms, which has been used in previous research to assess stigma about ADHD (Swords et al., 2011). The child in the vignette was depicted as having both inattentive (e.g., *Jake forgets what his teacher has told him to do and needs to be reminded*) and hyperactive/impulsive symptoms (e.g., *When the teacher asks the class a question, Jane often blurts out the answer before the teacher has a chance to finish*). The gender of the vignette child matched the participant's identified gender. After hearing the description, children rated their willingness to interact with the hypothetical child in three different social situations (e.g., work together in class, play, be friends), with each item rated on a 4-point scale (1 = *not at all;* 4 = *very much*). Internal consistency in our sample was alpha = .84 in fall, and alpha = .79 in spring. The rating was reversed coded so that a higher score on this measure indicated a higher desire for social distance. The final score reflected the mean of the three items on the scale.

Demographic covariates. Children's gender and age were reported by their parents, and the class size was recorded based on the roster provided by each school.

Data Analytic Plan

Study hypotheses were tested using cross-classified hierarchical linear modeling analyses with sociometric ratings given to classmates (Level 1) nested in child participants (Level 2), and including crossed random effects for rater and recipient. At Level 1, the outcome variable was sociometric ratings given to classmates, and the recipients' ADHD symptom levels were entered as a predictor. At Level 2, the key predictor (the child's own stigma about ADHD or own competence) was entered, as were covariates of the child's class size, age, gender (0 = *male*, 1 = *female*), and their own ADHD symptom levels. These covariates were chosen because they may relate to the sociometric ratings a child gives (Blachman & Hinshaw, 2002; Hoza, Mrug, et al., 2005), and we wished to examine the incremental role of the key predictors beyond these covariates.

Crucially, our study hypotheses were tested by the cross-level interaction between the key predictor (the child's own

Table 2. Descriptive Statistics of Study Variables.

	Fall					Spring				
Variable	*n*	*M*	*SD*	Min	Max	*n*	*M*	*SD*	Min	Max
Sociometric Rating Given	2828	4.02	1.18	1.00	5.00	2724	3.87	1.24	1.00	5.00
Recipient ADHD Symptoms	2837	12.67	12.49	0.00	48.00	2669	11.56	12.61	0.00	50.00
ADHD Symptoms	185	12.89	12.31	0.00	48.00	180	11.49	12.44	0.00	50.00
Stigma about ADHD	185	2.75	1.01	1.00	4.00	178	2.78	0.93	1.00	4.00
Social Competence	183	4.02	0.52	2.36	4.88	184	3.87	0.54	2.33	5.00
Academic Competence	185	103.75	22.24	54.00	143.00	179	111.39	23.10	39.00	145.00
Age	182	6.59	1.39	4.00	10.00					
Gender	184	0.47	0.50	0.00	1.00					
Class Size	12	21.58	3.58	16.00	28.00					

Note. *n* indicates the number of observations. *M* indicates the arithmetic mean. Min and Max reflect the minimum and maximum values on that variable obtained in our sample. The variables of class size, age, gender (0 = *male*, 1 = *female*), ADHD symptoms, stigma about ADHD, social competence, and academic competence all refer to the child participant. ADHD symptoms of the recipient are denoted when they pertain to the recipient. ADHD = attention-deficit/hyperactivity disorder.

stigma about ADHD or own competence) and the recipients' ADHD symptom levels. The significance of this interaction term determines whether the association between children's sociometric ratings given and the recipients' ADHD symptom levels differs depending on the level of the key predictor. For any significant interaction, probing was done by re-estimating the model for participants 1 *SD* above and 1 *SD* below the mean of the predictor (e.g., their own stigma about ADHD or their own competence).

Each of the three key predictors at the fall timepoint (children's stigma about ADHD, social competence, academic competence) was tested in a separate model. We then repeated the process for the spring timepoint. Thus, six models were tested in total. Because of the nascent state of the literature, we elected to test each predictor in a separate model to evaluate its association with the outcome, as opposed to examining its incremental contribution to the outcome after accounting for all other predictors.

All continuous predictors were grand mean centered. Analyses were conducted using R 4.0.5 (R Core Team, 2021) and estimates were derived using robust multilevel estimation, which mitigates bias introduced by outlying data points at different levels (Koller, 2016). Model assumptions were assessed via visual inspection of the residuals. We also note that the children were nested in 12 classrooms. We did not add classrooms to Level 3 in the models because of the small number of Level 3 units and the lack of any predictors of interest at Level 3. Supporting this decision, likelihood ratio tests for unconditional fall and spring models indicated that adding classroom as a random effect did not improve model fit ($ps > .92$). In addition, exploratory analyses adding classroom as a fixed effect to Level 2 did not change any of the results from the cross-level interaction effects testing our primary hypotheses. However, results should be considered in light of the lack of nesting at the classroom level.

Results

Descriptive Statistics

Table 2 presents the *n*, mean, *SD*, minimum, and maximum values of the study variables. Participants had complete data on most variables. However, nine children (of the 194) did not complete the child interview at either timepoint (either because they were cognitively or linguistically unable to answer the questions or we questioned the accuracy of their answers, or because they did not agree to be interviewed). These children were excluded a priori from subsequent analyses. Of the remaining 185 participants, data were complete on fall measures for 183 to 185 children, and data were complete on spring measures for 178 to 184 children (depending on the measure). The missing data were largely attributable to children joining the class after the fall timepoint, or leaving the class before the spring timepoint. Furthermore, age data were missing for three children and one child was gender nonbinary. Missing Level 2 data were handled via listwise deletion.

Participants tended to report liking most of their peers at both the fall and spring timepoints, so the sociometric rating variable was negatively skewed. ADHD symptoms were positively skewed, which is expected given that this is a school-based sample. Although robust estimation is indicated to mitigate bias introduced by skewness (Field & Wilcox, 2017), visual inspection of the residuals showed greater de-weighting of the higher sociometric ratings (reflecting more liking), and the results should be considered in light of this estimation bias. The variables of stigma and academic competence were both approximately normally distributed.

Bivariate correlations between study measures are presented in Table 3. Consistent associations were found between children's greater ADHD symptoms and their

Table 3. Bivariate Correlation Matrix for Study Variables at Level 2.

Variable	1	2	3	4	5	6	7
1. ADHD Symptoms	—	.02	−.44***	−.78***	−.14	−.44***	−.10
2. Stigma about ADHD	−.05	—	−.05	.08	.10	−.05	−.06
3. Social Competence	−.55***	.04	—	.53***	.00	.21**	.04
4. Academic Competence	−.77***	.07	.58***	—	.06	.42***	.10
5. Age	−.14	.18*	−.06	.01	—	.05	.55***
6. Gender	−.37***	.02	.20**	.40***	.05	—	.07
7. Class Size	−.09	.03	.10	.08	.55***	.07	—

Note. n = 173 to 184, depending on the correlation. Correlation coefficients for measures at the fall timepoint appear below the diagonal. Correlations between the spring measures appear above the diagonal. The variables of class size, age, gender (0 = *male*, 1 = *female*), ADHD symptoms, stigma about ADHD, social competence, and academic competence all refer to the child participant. Regarding Level 1 variables, sociometric ratings given were correlated with recipient ADHD symptoms at the fall timepoint, $r = -.26$, $p < .001$, and spring timepoint, $r = -.20$, $p < .001$. ADHD = attention-deficit/hyperactivity disorder.
*$p < .05$. **$p < .01$. ***$p < .001$.

lower social and academic competencies, at both fall and spring timepoints. Stigma was uncorrelated with the other variables, except for being positively associated with child age, in spring. We assessed the potential for multicollinearity by computing variance inflation factors, which were all acceptable.

Fall Timepoint

There was a significant negative association between the sociometric ratings given by children and the recipients' ADHD symptom levels as a main effect ($B = -0.026$, 95% confidence interval [CI] = [−0.029, −0.022], $p < .001$), suggesting an overall tendency for children to dislike classmates with more ADHD symptoms. Table 4 displays model results with the addition of the key predictors of interest and their cross-level interaction terms (to determine whether the association between sociometric ratings given and the recipients' ADHD symptoms varied based on characteristics of the child making the ratings). All reported results account for covariates.

Stigma about ADHD. There was a significant interaction effect between children's reports of desired social distance from the hypothetical child with ADHD symptoms and the recipients' ADHD symptom levels, in predicting the sociometric ratings that children gave to classmates. Probing revealed that for children 1 *SD* above the mean in their desired social distance, the association between their sociometric ratings given and the recipients' ADHD symptom levels was more strongly negative ($B = -0.030$, 95% CI = [−0.035, −0.025], $p < .001$), relative to for children 1 *SD* below the mean in their desired social distance ($B = -0.023$, 95% CI = [−0.027, −0.018], $p < .001$).

Social competence. At the fall timepoint, the interaction between the children's own social competence and the recipients' ADHD symptom levels was not significant.

Academic competence. Similar to the pattern for stigma about ADHD, there was an interaction effect between children's own academic competence and the recipients' ADHD symptom levels. When the interaction was probed, again, children with higher academic competence (1 *SD* above the mean) had a stronger negative association between the recipients' ADHD symptoms and the sociometric ratings they gave ($B = -0.029$, 95% CI = [−0.034, −0.024], $p < .001$). For children with lower academic competence (1 *SD* below the mean), this negative association was weaker ($B = -0.022$, 95% CI = [−0.026, −0.017], $p < .001$).

Spring Timepoint

As in the fall timepoint, a negative association was found between the sociometric ratings given by children and the recipients' ADHD symptom levels as the main effect ($B = -0.020$, 95% CI = [−0.024, −0.015], $p < .001$). Table 4 also shows the model results when the key predictors and cross-level interaction terms were added, accounting for covariates.

Stigma about ADHD. A significant interaction between children's desired social distance and the recipients' ADHD symptom levels was observed. Probing of the interaction revealed the same pattern as with the fall data. Children scoring 1 *SD* above the mean in their desired social distance gave more negative sociometric ratings to recipients with higher ADHD symptom levels ($B = -0.024$, 95% CI = [−0.030, −0.019], $p < .001$), relative to children who were 1 *SD* below the mean in desired social distance ($B = -0.015$, 95% CI = [−0.021, −0.009], $p < .001$).

Social competence. In contrast to the pattern in the fall, there was a significant interaction between children's own social competence and the recipients' ADHD symptom levels. Probing revealed that children with social competence 1 *SD* above the mean had more strongly negative associations

Table 4. Hierarchical Linear Models Testing Predictors of Sociometric Ratings Given to Classmates With ADHD Symptoms.

	Stigma about ADHD				Social competence				Academic competence			
	Fall		Spring		Fall		Spring		Fall		Spring	
Predictors	Estimates	*SE*	Estimates	*SE*	Estimates	*SE*	Estimates	*SE*	Estimates	*SE*	Estimates	*SE*
(Intercept)	4.096***	0.056	3.997***	0.062	4.092***	0.058	3.998***	0.065	4.105***	0.059	3.994***	0.065
Class Size	0.037**	0.014	0.012	0.016	0.037*	0.015	0.016	0.017	0.041**	0.015	0.013	0.017
Age	−0.119***	0.035	−0.040	0.038	−0.116**	0.036	−0.055	0.040	−0.133***	0.036	−0.055	0.039
Gender	0.007	0.082	0.016	0.089	0.014	0.085	0.019	0.094	−0.000	0.086	0.025	0.095
ADHD Symptoms	0.002	0.003	0.011**	0.004	0.009*	0.004	0.010*	0.004	0.008	0.005	0.012*	0.006
Recipient's ADHD Symptoms	−0.026***	0.002	−0.020 ***	0.002	−0.025***	0.002	−0.019***	0.002	−0.025***	0.002	−0.020***	0.002
Stigma about ADHD	−0.122**	0.038	−0.124**	0.043								
Recipient's ADHD × Stigma about ADHD	−0.004*	0.001	−0.005**	0.002								
Social Competence					0.261**	0.095	−0.002	0.091				
Recipient's ADHD × Social Competence					−0.005	0.003	−0.015***	0.003				
Academic Competence									0.004	0.003	0.001	0.003
Recipient's ADHD × Academic Competence									−0.000*	0.000	−0.000***	0.000
Random Effects												
σ^2	0.83		0.99		0.84		0.97		0.82		0.97	
τ_{00}	$0.04_{\text{Recipient}}$ 0.18_{Child}		$0.08_{\text{Recipient}}$ 0.18_{Child}		$0.04_{\text{Recipient}}$ 0.20_{Child}		$0.08_{\text{Recipient}}$ 0.21_{Child}		$0.04_{\text{Recipient}}$ 0.20_{Child}		$0.07_{\text{Recipient}}$ 0.21_{Child}	
N	$184_{\text{Recipient}}$ 181_{Child}		$180_{\text{Recipient}}$ 173_{Child}		$184_{\text{Recipient}}$ 179_{Child}		$180_{\text{Recipient}}$ 173_{Child}		$184_{\text{Recipient}}$ 181_{Child}		$180_{\text{Recipient}}$ 173_{Child}	
Observations	2782		2609		2764		2609		2782		2609	

Note. All models are estimated with robust standard errors. All continuous variables are grand mean centered. The variables of class size, age, gender (0 = *male*, 1 = *female*), ADHD symptoms, stigma about ADHD, social competence, and academic competence all refer to the child participant. ADHD symptoms of the recipient are denoted when they pertain to the recipient. ADHD = attention-deficit/hyperactivity disorder.
*$p < .05$. **$p < .01$. ***$p < .001$.

between the sociometric ratings they gave and the recipients' ADHD symptoms ($B = -0.027$, 95% CI = [−0.033, −0.022], $p < .001$). By contrast, for children with social competence 1 *SD* below the mean, the negative association was weaker ($B = -0.011$, 95% CI = [−0.017, −0.005], $p < .001$).

Academic competence. Consistent with the fall timepoint, there was an interaction effect between children's own academic competence and the recipients' ADHD symptom levels. Children with higher academic competence (1 *SD* above the mean) again displayed a stronger negative association between their sociometric ratings given and the recipients' ADHD symptoms ($B = -0.028$, 95% CI = [−0.034, −0.023], $p < .001$). For children with lower academic competence (1 *SD* below the mean), the link between sociometric ratings given and the recipients' ADHD symptoms remained negative but was weaker ($B = -0.011$, 95% CI = [−0.017, −0.006], $p < .001$).

Discussion

This study took a novel approach to understand peer problems by exploring characteristics of children that are associated with them liking versus disliking classmates with ADHD symptoms. In hierarchical linear modeling analyses, children who reported more stigma about ADHD, and who were more socially and academically competent, had a stronger negative association between the sociometric ratings they gave and the recipients' ADHD symptoms (i.e., were more likely to dislike classmates with ADHD symptoms). These results were demonstrated most robustly in the spring of the academic school year, but similar patterns were observed at the beginning of the year. Our findings shed new light on the complex issue of peer problems in children with ADHD symptoms and the role of their peers and demonstrate the creative use of a data analytic technique that can address these questions.

Characteristics Associated With a Tendency to Dislike Classmates With ADHD Symptoms

Although overall children gave lower sociometric ratings (reflecting more disliking) to classmates with higher ADHD symptom levels, our results suggest that variability exists in the extent to which this occurs in children. These results were obtained beyond children's own ADHD symptom levels (previously found to predict slightly more tolerance toward classmates with ADHD; Blachman & Hinshaw, 2002), and other demographic covariates. All in all, our findings underscore that, as opposed to it being a universally equal tendency, there may be certain children who are most inclined to dislike classmates with ADHD symptoms.

First, children with greater stigma about ADHD (measured through desired social distance from a hypothetical child with ADHD symptoms on a vignette measure) tended to have a stronger negative association (reflecting more disliking) between sociometric ratings given and the recipients' ADHD symptom levels. Although stigma about ADHD has been robustly documented to occur, including among children (Lebowitz, 2016; Nguyen & Hinshaw, 2020), it has rarely been examined as a potential explanation for the substantial peer problems faced by children with ADHD symptoms. Our finding, importantly, replicates the results of Na and Mikami (2018), but occurring in a general education classroom and using sociometric data from the whole classroom via hierarchical linear modeling analyses. Along with Na and Mikami, the current study documents a potential real-life consequence of stigma about ADHD, suggesting that it may affect children's sociometric judgments of their classmates with whom they interact at school every day.

In addition, more competent children tended to have a stronger negative association between the sociometric ratings they gave to classmates and the recipients' ADHD symptom levels. This pattern was found for both social and academic competencies at the spring timepoint and academic competence at the fall timepoint. Both types of competencies are valued in the elementary school classroom and are important metrics of success at this age. Our result for social competence replicates what was found in Hoza, Mrug, et al. (2005), but using a hierarchical linear modeling analytic approach that incorporated the data from the entire sample. Further, our study extended the result of Hoza, Mrug, et al. (2005) to academic competence.

The examination of both types of competencies strengthens the overall conclusion that the more competent children may be those who most dislike classmates with ADHD symptoms. An important future direction will be to better understand why this tendency may occur. For instance, do children with high social and academic competencies (relative to less competent children) not want classmates with ADHD symptoms to interfere with their good social reputation or their academic work by association? Alternatively, perhaps children with high competencies perceive themselves as more different from those with ADHD symptoms, who likely have low competencies in the classroom; this could lead children with higher competencies to view those with ADHD symptoms as an outgroup. Studies that ask children questions about why they dislike classmates with ADHD symptoms (e.g., García Bacete et al., 2017) could correlate those responses with children's own competencies to better understand the current study finding.

Interestingly, the results were most robust in the spring of the academic year. Similar patterns tended to present in the fall, but the finding for social competence did not reach statistical significance. Tentatively, we speculate that at the beginning of the year, children do not know one another well and may feel more hesitant about concluding that they dislike others after such a short period of time. They also may lack sufficient opportunity to recognize which classmates have consistent ADHD symptoms, and in turn, to grow annoyed with those ADHD symptoms. By the end of the school year, however, children's feelings about classmates likely have solidified, and, therefore, the factors related to their sociometric judgments can be determined. We recognize that the stigma measure, which asks about a hypothetical child with ADHD symptoms on a vignette, could possibly be more correlated with their disliking of actual classmates with ADHD symptoms at the end of the school year, because children would be answering the hypothetical measure while thinking about these classmates. However, this possibility would not explain the stronger pattern found at the end of the year for children's own social and academic competencies as correlated with their disliking of classmates who have ADHD symptoms. Notably, we obtained these results despite all the teachers in the sample participating in a social-emotional learning program for the entire school year.

Clinical Implications

The substantial peer problems faced by children with ADHD symptoms are concerning. There is evidence that being disliked by peers in childhood predicts exacerbated impairment in adolescence in wide-ranging domains (e.g., cigarette smoking, delinquency, anxiety, overall impairment), beyond the initial levels of impairment and ADHD symptoms themselves (Mrug et al., 2012). Without intervention, cascading, negative cycles of being disliked by peers and adjustment problems can unfold over time in children with ADHD (Murray-Close et al., 2010).

Importantly, peers' disliking of children with ADHD symptoms has proved to be quite difficult to treat (Evans et al., 2018; Mikami et al., 2021). The majority of the intervention approaches for peer problems have focused on addressing deficient behaviors or skills in children with ADHD, under the presumption that if children with ADHD change their deficiencies then peers' liking will follow (Mikami & Normand, 2015). However, even state-of-the-art medication management and behavioral therapy, despite evidence that they improved behavior in children with ADHD, failed to change classroom peers' sociometric judgments of these children (Hoza, Gerdes, et al., 2005). Thus, although we think treating the deficient behaviors of skills in children with ADHD symptoms is a valid approach to addressing peer problems, we also argue that it is incomplete.

The findings from the current study underscore that peers may have unequal inclinations to dislike classmates with ADHD symptoms, and this variability could be related to characteristics in the peers themselves. Thus, it is possible that interventions could also address the perceptions of peers, to improve their liking of classmates with ADHD symptoms. However, given that our findings occurred in a sample of children whose teachers had implemented a year-long social-emotional learning program, this suggests that more specialized intervention may be needed to change particular peers' inclinations to dislike those with ADHD symptoms. For example, more targeted intervention may be needed to change children's stigma about mental illness, including ADHD (Link et al., 2020).

Another potential implication is that interventions could make special efforts to reach the peers who are socially and academically competent, as these children may be at the highest risk for having negative views about classmates with ADHD symptoms. Because of their status in the classroom, changing the judgments of these highly competent children may also carry a greater influence on the judgments of other peers. If we can better understand the mechanisms through which more competent children tend to have more disliking of classmates with ADHD symptoms (e.g., fear of lowering their own status, fear of getting in trouble by association, perceived difference), these mechanisms could be targets of intervention. For instance, if academic pressures from the teacher are strengthening peers' concerns that children with ADHD symptoms will interfere with their own academic learning, it would be important for teachers to find alternative ways to encourage academic learning without applying such pressures. Perhaps these intervention directions, coupled with efforts to reduce the problematic behaviors or skills in children with ADHD symptoms, could result in more efficacious interventions for peer problems in ADHD populations.

Study Strengths and Weaknesses

A strength of this study is the novel perspective on peer problems, involving examination of characteristics in children associated with their tendency to like versus dislike classmates with ADHD symptoms. Another contribution is the innovative data analytic technique involving hierarchical linear modeling to address study hypotheses, which allowed us to use the sociometric data generated from children about all of their classmates; to our knowledge, this technique has never been used before in studies testing similar research questions. In addition, this study used a multi-measure and multi-informant approach, with data

collected from teachers about children's ADHD symptoms and academic competence, peer sociometric interviews to index children's social competence as well as the dependent variable of sociometric ratings given to classmates, and child self-report of stigma about ADHD. This approach helps to reduce concerns about shared method variance driving results.

Our study results must also be considered in light of its limitations. Although the number of sociometric ratings given ($n = 2828$ in fall and 2724 in spring) nested in children ($n = 194$) led to a large dataset, the children resided in a small number of classrooms ($n = 12$), which prevented the classroom level from being incorporated in data analyses. In addition, although we tested study hypotheses cross-sectionally, in the fall and spring of a school year, future work would benefit from a longitudinal design assessing how peers' characteristics may predict changes in their sociometric judgments across time.

We also used sociometric ratings given to classmates, as opposed to nominations, as our outcome variable. This approach allowed us to assess the strength of the association between ratings given and the recipients' ADHD symptom levels and, therefore, best fit our data analytic strategy, but did not allow us to consider potentially important sociometric status categories such as rejected versus neglected. Children's sociometric ratings were also on a 5-point ordinal scale, which we treated as an ordinal approximation of a continuous variable, supported by evidence that this can be done for ordinal variables with at least five categories (Johnson & Creech, 1983). Another limitation related to the sociometric data is that only consented children participated in the procedure. Although all of our classroom consent rates exceeded the cutoff of 50% for valid sociometric data suggested by McKown et al. (2011), it is unknown how well our sociometric measures reflect the entire classroom. Given that we had incomplete consent rates, our use of sociometric rating scale data was preferable to nominations.

Our study considered children's dimensional ADHD symptom levels, which is relevant for a school-based sample and allowed us to use all of the sociometric data provided, but is not equivalent to establishing clinical diagnoses of ADHD. It is unknown how results might generalize to children's sociometric judgments of classmates with diagnoses of ADHD. Furthermore, we did not consider the potential differences between ADHD presentations, given that we did not conduct diagnostic assessments. Notably, though, our results were similar to those found by Na and Mikami (2018) for stigma, and Hoza, Mrug, et al. (2005) for social competence, both of whom involved participants with clinical diagnoses of ADHD. Relatedly, we do not know how common comorbidities with ADHD (e.g., oppositional behaviors, anxiety symptoms, depressive symptoms) influenced children's sociometric ratings given to these classmates. Finally, although the participants drew from two sites across Canada and the United States, increasing our sample diversity, it is unknown how the study results may generalize to other locales or to participants with different backgrounds.

Conclusion

This study found that certain characteristics in children may relate to them having a stronger negative association between their sociometric ratings given to classmates and the recipients' ADHD symptom levels, particularly at the end of the school year. Specifically, the children who are most likely to dislike classmates with ADHD symptoms may be those who have a higher stigma about ADHD, and greater social and academic competencies themselves. This study also provided an example of applying a novel data analytic technique (hierarchical linear modeling) to test these questions, which could be adopted by other research teams in the future. Results overall underscore the contribution of peers to the peer problems of children with ADHD symptoms, and we hope that they inspire intervention efforts to address the role of peers.

Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

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