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ORIGINAL PAPER

Parent–Teacher Disagreement on Ratings of Behavior Problems in Children with ASD: Associations with Parental School Involvement Over Time

Sarah Levinson[1] · Juliana Neuspiel[1] · Abbey Eisenhower[1] · Jan Blacher[2]

Abstract
ASD symptomology and behavioral problems pose challenges for children with ASD in school. Disagreement between parents and teachers in ratings of children's behavior problems may provide clinically relevant information. We examined parent–teacher disagreement on ratings of behavior problems among children with ASD during the fall and spring of the school year. When child, teacher, and class characteristics were considered simultaneously, only ASD symptom severity predicted informant disagreement on internalizing and externalizing behavior problems. We also examined associations between informant disagreement and parent school involvement. Cross-lagged panel analyses revealed that higher informant disagreement on children's behavior problems in the fall predicted lower parent school involvement in the spring, suggesting that greater informant agreement may foster parental school involvement over time.

Keywords ASD · Internalizing · Externalizing · Behavior problems · Informant disagreement · CBCL · Achenbach rating scale · Parent school involvement

Introduction

The transition to formal schooling is a critical period of development, requiring social, behavioral, and self-regulatory skills to adapt to the demands of school (Blankson et al. 2017; Welchons and McIntyre 2017). For children with autism spectrum disorder (ASD), this transition may pose unique challenges due to ASD-related symptoms, elevated behavior problems, and comorbid psychopathology (Romero et al. 2016). Parent and teacher ratings are used as a primary tool in the identification and treatment of children's behavior problems. Prior research suggests considerable disagreement between parents' and teachers' ratings of the severity of behavior problems among children with ASD (De Los Reyes et al. 2013; Llanes et al. 2018; Thompson and Winsler 2018). While few studies have explored predictors of this disagreement, understanding differences in parent and teacher ratings has implications for differentiating intervention across contexts as well as promoting shared understanding and goal-setting between parents and teachers. Parent–teacher disagreement may impact parents' school involvement and the quality of parent–teacher relationships. The present study assesses the stability of parent–teacher disagreement over time and examines predictors of informant agreement in ratings of internalizing and externalizing behaviors among children with ASD. We also examine how parent–teacher disagreement relates to parents' school involvement over time.

Comorbid Behavior Problems in Youth with ASD

Children with ASD evidence both elevated internalizing (e.g., anxiety, social withdrawal, physical complaints) and externalizing behavior problems (e.g., aggression, defiance,

✉ Sarah Levinson
sarah.levinson001@umb.edu

Juliana Neuspiel
julie.neuspiel@gmail.com

Abbey Eisenhower
abbey.eisenhower@umb.edu

Jan Blacher
jan.blacher@ucr.edu

[1] University of Massachusetts Boston, 100 William T. Morrissey Blvd, Boston, MA 02125-3393, USA

[2] University of California Riverside, 900 University Ave, Riverside, CA 92521, USA

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rule breaking) as well as greater comorbid psychopathology than their typically developing (TD) peers (Bauminger et al. 2010; Pandolfi et al. 2009). In this paper, we use the terms *behavior problems* or *problem behavior* to describe both internalizing and externalizing behavior problems. Prior research documents internalizing and externalizing problems as key predictors of long-term functioning and quality of life for individuals with ASD (Gray et al. 2014; Kamio et al. 2012). Early behavior problem identification and intervention may promote positive outcomes for those with ASD (for review see Kreslins et al. 2015), and parents' and teachers' ratings are often used to identify children's behavioral difficulties and plan treatment. Further exploring these patterns in the early school years may inform intervention efforts during this developmental transition.

Parent–Teacher Informant Disagreement on Behavior Problems in Children with ASD

Existing research shows higher parent–teacher disagreement, or lower agreement, on ratings of behavior problems for children with ASD as compared with TD children (Thompson and Winsler 2018; Ung et al. 2017). Kanne et al. (2009) found that, even within families, there was lower parent–teacher agreement on the behavior ratings for children with ASD than for that of their siblings without ASD in most problem areas. While parents and teachers reported higher psychiatric difficulties for children with ASD as compared with their TD siblings, parent–teacher agreement *r*-values were between 0.37 and 0.64 for TD siblings, compared to 0.08–0.35 for children with ASD. Such findings suggest that for children with ASD, there are differences in the patterns of behavior observed by parents versus teachers. Consistent with behavioral theory and interventions, behavior is best understood through the identification of the environmental factors that maintain them (Larkin et al. 2016). As such, all behavior is context-dependent, and we would expect children's behavior to differ across home and school contexts. As a result, informant discrepancies may reflect genuine differences in how children's symptoms present across contexts (Kanne et al. 2009). Alternatively, parents and teachers may rate the same problems differently due to different understandings of psychiatric symptoms in ASD.

With regard to type of behavior problems, parent–teacher agreement is lower for internalizing (e.g., anxiety) than for externalizing problems (e.g., aggression) among children with (Kanne et al. 2009) and without ASD (Rescorla et al. 2014). Compared to externalizing behaviors, internalizing problems may be less visible in a classroom setting. This invisibility may be especially pronounced for children with ASD, and their communication difficulties may exacerbate informant discrepancies. Not surprisingly, the magnitude of difference in agreement rates by behavior problem type appears to be even larger for children with ASD than TD children.

The extent of disagreement between parents and teachers in their ratings of child behavior may reflect the ways in which specific contexts elicit different types of behavior (Kanne et al. 2009). Home and school environments have unique demands, which may pose context-specific challenges that elicit particular behaviors. Informant disagreement may also reflect differences in perceptions and expectations of behavior; teachers and parents may differ in their understanding of the presentation of psychiatric symptoms in ASD. Research in non-ASD samples suggests that teachers have consistently lower ratings of behavior problems than parents, a pattern which has been attributed to teachers' greater knowledge of child functioning and higher decision thresholds at which teachers regard behavior to be problematic (De Los Reyes et al. 2013). Parents may experience children's behavior as more severe because they lack the large reference groups that teachers have in classrooms. Overall, it will be important to understand how characteristics of the child, rater, and environment (e.g., class size) predict informant discrepancies on ratings of children's behavior problems. In turn, this understanding may inform intervention during the early school years.

Child Characteristics and Informant Disagreement

While multiple factors play a role, it is likely that child characteristics (e.g., gender, ASD symptom severity) influence parent–teacher disagreement on ratings of challenging behaviors among children with ASD. Child gender has been associated with the magnitude of parent–teacher behavior agreement for TD children. In a sample of TD 4-year-olds, parents and teachers disagreed significantly more for girls than for boys on externalizing, but not internalizing problems (Berg-Nielsen et al. 2012). Parents consistently rated higher behavior problems than did teachers, but this difference was only significant for girls—not for boys. In fact, the greatest parent–teacher agreement was observed for boys' externalizing problems. These discrepancies may reflect gender-related expectations for behavior as well as differences in the salience of challenging behaviors across contexts. Although limited, research has examined gender differences in informant disagreement among children with ASD. Gender-related diagnostic disparities persist in ASD, as receipt of ASD diagnoses continues to be skewed towards boys/men (Kim et al. 2014). As such, the majority of existing research primarily includes boys/men with ASD, which has precluded our understanding of the experiences of girls/women on the spectrum. This is particularly problematic, as research documents that ASD symptoms may present differently in girls/women (Meng-Chuan et al. 2015). Likewise, research suggests that parents and teachers hold different

behavioral expectations for boys and girls, which contributes to a gender bias in reported behavior concerns (Hiller et al. 2016). A number of studies document that in comparison to parents and clinicians, teachers report fewer overall behavioral concerns for girls than boys with ASD (Hiller et al. 2014; Mandy et al. 2012). As a result, the limited knowledge around how ASD presents in girls/women and gender norms for child behavior may exacerbate gender-based perceptions of behavior problems, and lead to even higher informant disagreement for girls than for boys with ASD.

Severity of ASD-related symptoms may also affect parent–teacher disagreement on behavior problems. Kanne et al. (2009) found higher parent–teacher agreement on their ratings of ASD symptoms than for general behavior problems, demonstrating the more trait-like, less contextually dependent nature of ASD versus other behavior problems. Although no studies to date have examined ASD symptom severity in relation to informant agreement on behavior problem ratings, children with more severe ASD symptoms may have more consistent behavior problems across contexts, which may lead to higher parent–teacher agreement in behavior problem ratings. Overall, it will be important to examine the influence of child factors in regards to parent–teacher disagreement on ratings of behavior problems among children with ASD.

Teacher and Class Characteristics and Informant Disagreement

While child characteristics (e.g., ASD symptoms, cognitive ability) contribute to challenging behaviors, it is the interaction of these underlying vulnerabilities *and* environmental factors that dictates the presence and maintenance of behavioral problems. Both context-specific factors of school (e.g., class size, teacher characteristics) and home (e.g., parenting behaviors) influence children's behavior, and thus, contribute to parent–teacher disagreement in reports of behavior problems. With regard to school factors, class size may provide information about the impact of context on the incidence of behaviors as well as teachers' perceptions and decision thresholds about problem behaviors. Certain behaviors may be overlooked in classes with higher numbers of students. Indeed, in a recent meta-analysis across 21 countries, countries with larger average class sizes evidenced lower informant agreement (Rescorla et al. 2014). Symptoms that are less disruptive may especially go unnoticed, leading to greater parent–teacher disagreement on internalizing problems in larger classes.

Class type (i.e., special versus general education) may influence teacher ratings. Research documents that teachers in special education classrooms often have greater exposure to children with ASD and knowledge of ASD than general education teachers (Bjornsson et al. 2018; Haimour and Obaidat 2013). However, it is unclear how class type influences informant disagreement. It is possible that unlike parents who often have limited training in behavior management, special education teachers' training and experience, combined with the structure and individualized attention expected in special education, may allow them to more effectively manage and reduce behavior problems, resulting in lower behavior problem ratings and greater disagreement with parents. Alternatively, the individualized attention of a special education class may foster increased awareness of a child's difficulties, especially internalizing symptoms, and in turn, higher ratings of behavior problems. This, combined with the greater parent–teacher communication that is often built into special education, may promote greater informant agreement. Further, in general education, the behavior problems of a child with ASD may stand out in comparison to TD peers and lead to higher teacher ratings that are more aligned with parents. The present study is the first to examine the role of classroom type in parent–teacher disagreement on children's behavior problems.

Finally, teaching experience may influence parent–teacher disagreement. If discrepancies between parents and teachers are reflective of teachers' greater knowledge about child behavior, then this difference might be even more pronounced for experienced teachers. Years of teaching experience has been associated with greater burnout (Day and Gu 2007) and increased coping strategies for managing job stress (Klassen and Chiu 2010). Burnout may increase teachers' sensitivity to behavior problems, thus leading to greater alignment with parents, who often experience children's behaviors as more challenging. Alternatively, if experienced teachers are more skilled at managing job stress and challenging behaviors, or adept at fostering positive relationships with students, they may witness fewer behavior problems, leading to greater disagreement with parents. Thus, we examine whether teaching experience predicts disparities in parents' and teachers' understanding of children's challenging behaviors.

Parental School Involvement and Informant Disagreement

Higher parental school involvement (PSI) is linked to better school adjustment for children with and without ASD (Holmes et al. 2018; Kim et al. 2018; Oberlander and Black 2011). The extent to which parents and teachers have a shared understanding of children's behavior problems, as reflected in their disagreement on behavior problem ratings, may relate to the quality of parent–teacher collaboration as well as parent's involvement in their child's school. In fact, we expect that parent–teacher disagreement and parental school involvement may reciprocally predict one another over time. Shared perceptions of a child's behavior

may promote smoother communication and greater congruity between parent and teacher goals for the child. In this sense, parent–teacher agreement may predict parents' higher involvement in their child's schooling, a crucial consideration given that high PSI is considered a 'best practice' for educating young children with ASD (Tincani et al. 2014), and parent school collaboration is an expectation under the Individuals with Disabilities Education Improvement Act (IDEIA 2004). In the other direction, higher PSI may foster more communication between parents and teachers and, in turn, greater parent–teacher similarity in perceptions over time. Meanwhile, lower PSI may lead to greater disparities between parents' and teachers' perceptions of child behavior. While parental school collaboration is a central context of intervention for children with ASD, the present study is the first to examine its reciprocal association with parent–teacher disagreement.

Aims of the Current Study

Due to the absence of research examining predictors of informant disagreement in regards to behavior problems among children with ASD, this paper addresses the following research questions: (1) Is parent–teacher informant disagreement on ratings of behavior problems higher when internalizing problems are elevated?; (2) Is parent–teacher informant disagreement on ratings of behavior problems higher when externalizing problems are elevated?; (3) What are the concurrent associations among child, teacher, and classroom characteristics and parent–teacher disagreement on ratings of child behavior problems?; and (4) How does parent–teacher disagreement relate to parental school involvement over time?

Method

Participants

Participants were from a Northeastern metropolitan area (37%) or southern California (63%) and were enrolled in a longitudinal study of school adaptation for young children with ASD; families were recruited through online and in-print advertisements as well as through local school districts, clinicians, autism resource centers, intervention agencies, autism-related conferences and websites, and parent support groups. In the current study, 163 children and their parents and teachers participated in data collection in the fall (Time 1) and/or spring of the school year (Time 2); see Table 1 for descriptive information. Children were in preschool (34%), kindergarten (32%), first grade (27%), and second grade (7%); children were ages 4 to 7 years ($M = 5$ years, 8 months) at the first assessment. Race was assessed with an open-ended, parent-report item later aggregated into categories; children were 6% Asian-American, 3% Black or African-American, 56% White, 9% Latinx/Hispanic, 20% bi- or multi-racial, 4% other, and 1% not reported. Children had a mean estimated Full-Scale IQ of 89 ($SD = 15$); 17% had IQs in the intellectual disability range ($IQ < 70$) on a three-subtest version of the *Wechsler Preschool Primary Scales of Intelligence* (WPPSI-III). According to *the Autism Diagnostic Observation Schedule* (ADOS), 89% of children fell in the autism (vs. autism spectrum) range. Most parent respondents (91% female, mean age 38.4 years) were married (82%), and 65% had at least a college degree; 49% had annual incomes above $80,000.

Most children (91%) attended public schools, 89% had an Individualized Education Program (IEP), and 55% spent more than 50% of the school day in a special education class; mean class size was 16.4 children ($M = 10.5$ for special education classes, $M = 20.6$ for general education classes). In addition to their classroom teacher, 17% of children were supported by aides or paraprofessionals. Participating

Table 1 Descriptive statistics of child characteristics, teacher/classroom characteristics, and CBCL (parent report) & TRF/CTRF (parent-report) scores at time 1 (Fall) and time 2 (Spring)

	N[a,b]	Mean or %	S.D.
Child sex (% male)	163	82%	–
ASD symptom severity (ADOS algorithm score)	163	13.7	4.1
Teachers' years of experience	154	14.2	9.1
Class size	127	16.4	8.4
Child behavior problems—Time 1 (T-scores)			
CBCL-Parent report total	160	64.8	10.5
Internalizing problems		63.3	10.0
Externalizing problems		60.5	10.8
TRF/CTRF-Teacher report total	145	60.1	9.6
Internalizing problems		58.4	10.2
Externalizing problems		58.2	9.3
Child behavior problems—Time 2 (T-scores)			
CBCL-Parent report total	158	63.5	10.2
Internalizing problems		61.6	10.1
Externalizing problems		59.5	10.6
TRF/CTRF-Teacher report total	141	58.2	9.4
Internalizing problems		55.9	9.6
Externalizing problems		56.4	9.69.6

[a]Although missing data was estimated using full information maximum likelihood (FIML), these descriptives are based on original data

[b]Values represent results of paired-samples t-tests comparing parent and teacher ratings within each category at the same time point

$^{*}p \leq 0.05$, $^{**}p \leq 0.01$, $^{***}p \leq 0.001$

teachers were 88% female with an average of 14 years teaching experience (range 1–44 years); 68% had a master's degree. In response to a six-option item, teachers reported their race as follows: 70% White, 14% Latinx/Hispanic, 6% Asian American, 6% other, 3% Black, 1% American Indian/Alaska Native, 1% not reported.

Procedures

Interested families attended initial eligibility sessions during the summer or fall; after parents provided informed consent, children were assessed for eligibility using the ADOS (Lord et al. 2000) and a three-subtest battery (Matrix Reasoning, Picture Completion, and Vocabulary subtests) from the WPPSI-III (Wechsler 2002). In cases where children had not already received a diagnosis of ASD from a non-school professional, the Autism Diagnostic Interview-Revised (ADI-R; Lord et al. 1994) was administered to the parent. Eligible participants were those who (a) scored in the autism or autism spectrum range on the ADOS, (b) earned an estimated IQ score of 50 or higher on the WPPSI-III, (c) either had a previous diagnosis of ASD from a non-school clinician or scored in the autism or spectrum range on the ADI-R, and (d) were ages 4–7 years and entering elementary school or their final year of preschool.

Two subsequent sessions at our research office, held in the fall (Time 1) 0–3 months after the eligibility session, and in the spring roughly six months later (Time 2), included child performance-based assessments, parent-completed questionnaires, and teacher-completed questionnaires. Immediately following the Time 1 and Time 2 parent–child sessions, teachers received and completed classroom information surveys, where they provided information regarding themself (e.g., gender, race, years of teaching experience), the classroom (e.g., number of students), and the student (e.g., behavior problems). Teachers were provided envelopes and mailed the surveys back to the research team. Parents received $50 and teachers received $25 at each time point. A university institutional review board approved all procedures.

Measures

ASD Diagnosis and Symptom Severity

Children's ASD status and symptom severity was determined using the ADOS (Lord et al. 2000), a semi-structured, interactive, observational assessment of communication, social interaction, play, and restricted and repetitive behaviors. In this paper, we use the ADOS communication and social interaction total algorithm score to assess ASD symptom severity. The ADOS demonstrates strong specificity and sensitivity in research and clinical settings (Hurwitz and Yirmiya 2014), and incorporates age-specific modules (Lord et al. 2000). The ADOS has been found to have strong psychometric properties, with strong validity and moderate to high internal consistency, interrator, and test–retest reliability in terms of single items, total scores, and across modules (Bolte and Poustka 2004; Schutte et al. 2015; Zander et al. 2016). To be eligible for our study, children had to fall in the autism or autism spectrum range. The ADOS was administered by clinical psychology doctoral students who had completed ADOS research-level training and were research-reliable or in the process of obtaining reliability; in cases where the assessor's official research reliability was still in process, the assessment was observed and scored by an ADOS reliability trainer whose scores were used in analyses.

Cognitive Functioning

Children's cognitive ability was assessed at the initial eligibility session with the Matrix Reasoning, Picture Completion, and Vocabulary subtests of the WPPSI-III, a widely used measure of cognitive ability for children ages 2 years, 6 months to 7 years, 3 months, that has high subtest and scale reliability and validity (For review see Gordon 2004; Wechsler 2002). We computed an estimated full-scale IQ score from these subtests (Sattler 2008); scores of 50 or above were required for eligibility. For the standardization sample, this three-subtest version of the WPPSI has adequate predictive validity ($r = 0.90$) and reliability ($r = 0.95$) as an indicator of cognitive ability (Sattler and Dumont 2004).

Demographics

Background information about the child and family (parent report), including demographics, and about the teacher and classroom (teacher report), including class size, teacher years of experience, and classroom type (general education vs. special education classroom), were obtained through parent and teacher surveys at Time 1.

Parental School Involvement

The *Parent and Teacher Involvement Scale,* teacher version (PTIS-T, 22 items) and parent version (PTIS-P, 20 items NICHD Early Child Care Research Network 2005;) assess teachers' and parent's perceptions of parental school involvement with school activities (activities subscale) as well as the quality of the parent–teacher relationship (relationship subscale). In this paper, we used the total parental school involvement score (sum of subscales). Both scales have good internal consistency in the standardization samples with alphas of 0.79–0.93 (Corrigan 2002; Miller-Johnson and Maumary-Gremaud 2000). In the present study, the alpha coefficient was 0.80.

Behavior Problems

The *Caregiver-Teacher Report Form ages 1.5–5* (CTRF) or *Teacher Report Form ages 6–18* (TRF; teacher report) were used to assess teacher-reported child behavior problems; the *Child Behavior Checklist ages 1.5–5* or *Child Behavior Checklist ages 6–18* (CBCL; parent-report) were used to assess parent-reported child behavior problems (e.g., internalizing, externalizing), depending on the child age at each assessment. These scales contain between 99 and 112 items (Achenbach and Rescorla 2000; Achenbach and Rescorla 2001. We used the internalizing problems and externalizing problems broadband scores ($M = 50$, $SD = 10$). These scores have shown excellent validity and are correlated with other behavior problems measures (Achenbach and Rescorla 2000). A number of studies support the CBCL's factor structure as well as the reliability of the measure's subscales in identifying internalizing and externalizing behavior problems for youth with ASD (Pandolfi et al. 2014).

Analytic Approach

Parent–teacher informant disagreement on ratings of behavior problems was determined using steps outlined by De Los Reyes and Kazdin (2005) to create a standard difference score representing the magnitude of disagreement between parent (CBCL) and teacher (CTRF) scores. We converted T scores to Z scores and subtracted teacher score from parent score to determine disagreement scores for internalizing and externalizing problems. The following analyses used the absolute value of the standard difference score so that scores reflected the magnitude of disagreement regardless of direction. Consistent with these authors and with the calculation method, we refer to the resulting values as disagreement rather than agreement.

Descriptive statistics and correlations were conducted using SPSS Version 21.0; regressions and cross-lagged panel analyses were completed with Mplus 7. We used full information maximum likelihood to account for missing data, which provides parameters to utilize all available observed data points (McCoach and Black 2008). Maximum likelihood estimation techniques have performed better than multiple imputation, listwise deletion, or pairwise deletion and produce unbiased parameter estimates (Enders and Bandalos 2001; Schlomer et al. 2010). We assessed fit with the comparative fit index (CFI), root mean-square error of approximation (RMSEA), standardized root mean square residual (SRMR), and χ^2. Values > 0.95 for CFI, ≤ 0.06 for RMSEA (90% CI), and ≤ 0.08 for SRMR are considered acceptable fit, as are non-significant χ^2 values (Hu and Bentler 1999). The model was trimmed to remove non-significant paths when doing so resulted in comparable or better fit.

Results

Data on children's behavior problems data were missing from 2.5% (Time 1) and 3.1% (Time 2) of parents and for 11.0% (Time 1) and 13.5% (Time 2) of teachers. Little's Missing Completely at Random (MCAR) test was not significant, $\chi^2(266) = 2.285$, $p = 1.00$, suggesting that the data can be assumed to be missing completely at random. Missingness was negatively associated with parent education and household income for Time 2 parent data only, and was higher for boys than girls for Time 2 parent and teacher data, but was not related to child age, race, or grade in school at Times 1 or 2.

Associations Between Informant Disagreement and Severity of Behavior Problems

We expected that informant disagreement would be greater at higher levels of child behavior problems. We conducted bivariate correlations to examine these associations concurrently at Times 1 and 2. Consistent with the finding that parents made higher ratings of behavior problems than teachers on average, at Time 1 (see Table 2), informant disagreement was positively associated with parent ratings and negatively associated with teacher ratings across internalizing (parent: $r = 0.26$, $p < 0.01$; teacher: $r = -0.32$, $p < 0.01$) and externalizing problems (parent: $r = 0.27$, $p < 0.01$; teacher: $r = -0.18$, $p < 0.05$). In other words, informant disagreement was lower when parent ratings were higher or teacher ratings were lower. A similar pattern was observed at Time 2 (see Table 3), with higher parent ratings and lower teacher ratings associated with greater informant disagreement across internalizing (parent: $r = 0.38$, $p < 0.01$; teacher: $r = -0.38$, $p < 0.01$) and externalizing problems (parent: $r = 0.26$, $p < 0.01$; teacher: $r = -0.28$, $p < 0.05$).

Concurrent Factors Associated with Parent–Teacher Disagreement

Correlations with Parent–Teacher Disagreement

We examined child characteristics (ASD severity, sex), classroom factors (class size and classroom type), and teacher years of experience as correlates of parent–teacher disagreement, as shown in Tables 2 and 3.

With regard to child characteristics, disagreement between parents and teachers on internalizing (Time 1: $r = -0.18$, $p < 0.05$; Time 2: $r = -0.20$, $p < 0.05$) and externalizing problems (Time 1: $r = -0.20$, $p < 0.05$; Time 2: $r = -0.23$, $p < 0.01$) was lower for children with more severe ASD symptoms. Child sex did not predict informant

Table 2 Correlation coefficients (t-tests for dichotomous variables, and chi-square between the two dichotomous variables) between child characteristics, teacher/classroom characteristics, CBCL (parent-report) & TRF/CTRF (teacher-report) scores, and informant disagreement at time 1 (Fall)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Child sex[a]	–													
2. ASD symptom severity	−0.10	–												
3. Teacher's years of experience	2.16*	−0.09	–											
4. Class size	−0.07	−0.28**	0.33**	–										
5. Class type[a]	0.75	−3.19*	1.90	8.50**	–									
6. CBCL-Total problems	−0.01	−0.11	0.13	0.16	0.55	–								
7. CBCL-Internalizing subscale	0.78	−0.09	0.15	0.13	0.47	0.80**	–							
8. CBCL- Externalizing subscale	−0.09	−0.12	0.09	0.12	0.69	0.89**	0.60**	–						
9. TRF/CTRF-Total problems	−0.47	0.27**	−0.19*	−0.10	−0.27	0.10	0.05	0.14	–					
10.TRF/CTRF- Internalizing subscale	−0.35	0.24**	−0.13	−0.18	−0.41	0.03	0.10	0.03	0.85**	–				
11. TRF/CTRF-Externalizing subscale	−0.65	0.19*	−0.22**	−0.14	−0.43	0.11	0.02	0.19*	0.87**	0.64**	–			
12. Disagreement Total problems	0.14	−0.24**	0.13	0.16	1.92	0.32**	0.36**	0.32**	−0.17*	−0.16	−0.16	–		
13. Disagreement Internalizing subscale	−0.30	−0.18*	0.14	0.19*	1.10	0.26**	0.26**	0.19*	−0.26**	−0.32**	−0.19*	0.75**	–	
14. Disagreement Externalizing subscale	−0.30	−0.20*	0.07	0.09	0.91	0.20*	0.18*	0.27**	−0.14	−0.13	−0.18*	0.80**	.56**	–

T-tests were conducted with raw, unadjusted data; all other analyses utilize FIML to address missingness

*$p \leq .05$, **$p \leq .01$

[a]The statistics listed for these two dichotomous variables (Child gender; male = 0, female = 1; Class type; gen. ed. = 0, special ed. = 1) are t-test/chi-squared statistics rather than correlation coefficients

Table 3 Correlations Coefficients (t-tests for dichotomous variables, and chi-squared between the two dichotomous variables) Between Child Characteristics, Teacher/Classroom Characteristics, CBCL/CTRF Scores, and Informant Disagreement Values at Time 2 (Spring)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Child sex	–													
2. ASD symptom severity	−0.98	–												
3. Teacher's years of experience	2.16*	−0.09	–											
4. Class size	−0.07	−0.28**	0.33**	–										
5. Class type[a]	0.75	−3.19*	1.90	8.50**	–									
6. CBCL Total problems	−1.36	−0.09	0.07	0.16	0.48	–								
7. CBCL Internalizing subscale	−0.60	−0.11	0.07	0.16	−0.16	0.82**	–							
8. CBCL Externalizing subscale	−1.62	−0.06	0.06	0.09	0.21	0.88**	0.61**	–						
9. CTRF Total problems	−0.98	0.29**	−0.21*	−0.30**	−1.95	0.15	−0.02	0.24*	–					
10. CTRF Internalizing subscale	0.22	0.26**	−0.22*	−0.31**	−2.15*	0.09	0.11	0.09	0.77**	–				
11. CTRF Externalizing subscale	−1.66	0.24**	−0.27**	−0.29**	−1.29	0.13	−0.06	0.26**	0.88**	0.56**	–			
12. Disagreement Total problems	−1.07	−0.25**	0.13	0.26**	2.30*	0.40**	0.45**	0.32**	−0.35**	−0.29**	−0.30**	–		
13. Disagreement Internalizing subscale	−1.31	−0.20*	0.19*	0.24*	1.77	0.34**	0.38**	0.25**	−0.38**	−0.38**	−0.31**	0.50**	–	
14. Disagreement Externalizing subscale	−0.72	−0.23**	0.12	0.26**	2.81*	0.26**	0.22**	0.26**	−0.25**	−0.27**	−0.28**	0.54**	0.43**	–

*$p \leq 0.05$, **$p \leq 0.01$

[a]The statistics listed for these two dichotomous variables (Child gender; male = 0, female = 1; Class type; gen. ed. = 0, special ed. = 1) are t-test/chi-squared statistics rather than correlation coefficients

disagreement on externalizing or internalizing problems (Time 1 externalizing: $t = 0.30$, $p <$ ns; Time 2 externalizing: $t = -0.72$, $p <$ ns; Time 1 internalizing: $t = 0.30$, $p <$ ns; Time 2 internalizing: $t = -1.31$, $p <$ ns).

With regard to classroom characteristics, as expected, parent–teacher disagreement was associated with class size for internalizing problems at Times 1 and 2 (Time 1: $r = 0.19$, $p < 0.05$; Time 2: $r = 0.24$, $p < 0.05$) and for externalizing problems at Time 2 only (Time 1: $r = 0.09$, $p <$ ns; Time 2: $r = 0.26$, $p < 0.01$); larger class size predicted greater parent–teacher disagreement on internalizing problems. By Time 2, disagreement was higher for children in general versus special education classes on both internalizing (Time 1: $t = 1.10$, $p <$ ns; Time 2: $t = 1.77$, $p < 0.05$) and externalizing problems (Time 1: $t = 0.91$, $p <$ ns; Time 2: $t = 2.81$, $p < 0.05$).

With regard to teaching experience, when teachers had more years of experience, disagreement was higher on internalizing problems by Time 2 (Time 1: $r = 0.14$, $p <$ ns; Time 2: $r = 0.19$, $p < 0.05$) but not on externalizing problems (Time 1: $r = 0.07$, $p <$ ns; Time 2: $r = 12$, $p <$ ns).

Combined Regressions of Factors Associated with Disagreement

Regressions were conducted to assess the extent to which child, teacher, or classroom factors account for unique variance predicting informant disagreement in a combined model. We included only those factors that were significantly associated with disagreement at Time 1 or Time 2 (e.g., ASD symptom severity, years of teaching experience, class size, class type). Because of the multicollinearity between class type (special vs. general education) and class size ($\beta = -0.74$), we examined only class size and did not include class type in the regressions. Assumptions of linearity of the relations between independent and dependent variables, homoscedacity of the errors, and normality of the error distribution were met for the remaining predictor variables.

In a regression predicting informant disagreement on internalizing problems at Time 1, ASD symptom severity and class size were entered as independent variables in the same step of a combined regression. In this combined model, child ASD symptom severity ($\beta = -0.18$, $p = 0.057$) and class size ($\beta = 0.14$, $p = 0.147$) did not predict parent–teacher disagreement on internalizing problems; the overall model was not significant, $R^2 = 0.063$, $p = 0.148$. At Time 2, with ASD symptom severity, class size, and teacher experience entered as independent variables in a combined regression, again, child ASD symptom severity ($\beta = -0.19$, $p = 0.055$), teacher experience ($\beta = 0.13$, $p = 0.174$), and class size ($\beta = 0.13$, $p = 0.190$) did not predict parent–teacher disagreement on internalizing problems; the overall model was not significant at $R^2 = 0.103$, $p = 0.069$. Overall, across both time points, although not statistically significant, informant disagreement on internalizing problems was lower when children had more severe ASD symptoms.

In a regression predicting informant disagreement on externalizing problems at Time 1, in which ASD symptom severity was entered as the only independent variable, ASD symptom severity was associated with informant disagreement ($\beta = -0.20$, $p = 0.013$); however, the overall model was not significant, $R^2 = 0.040$, $p = 0.213$. By Time 2, with both ASD symptom severity and class size entered as independent variables, both child ASD symptom severity ($\beta = -0.23$, $p = 0.020$) and class size ($\beta = 0.25$, $p = 0.046$) significantly predicted informant disagreement; the overall model was not significant, $R^2 = 0.113$, $p = 0.052$. Overall, across Times 1 and 2, parent- teacher disagreement on externalizing problems was lower when children had more severe ASD symptoms and, by Time 2, disagreement was lower when classes were smaller.

Parent–Teacher Disagreement in Relation to Parental School Involvement Over Time

We first conducted confirmatory factor analyses (see Fig. 1) At each time point, three parcels (PSI1, PSI2, and PSI3), were created by drawing every third item from both parent- and teacher-report scales (PTIS-P and PTIS-T) to each parcel; these were loaded onto a parental school involvement (PSI) latent factor. The first parcel (PSI1) was used as the marker indicator for PSI for both time points. Two out of four indices (with the exception of χ^2 and RMSEA) indicated that the two-factor model of Time 1 PSI and Time 2 PSI fit the data well, $\chi^2(8) = 44.9$, $p < 0.001$, SRMR = 0.03, RMSEA = 0.17 (90% CI 0.12–0.22), CFI = 0.96. All freely estimated parameters were statistically significant ($ps < 0.01$). Factor loadings revealed that the indicators were strongly related to the PSI latent factors at Time 1 (0.92–0.94) and Time 2 (0.93–0.97).

Next, two cross-lagged panel models—internalizing and externalizing problems—were constructed to examine the potential bidirectional associations between the PSI latent factor and parent–teacher disagreement across Times 1 and 2. Autoregressive and synchronous paths, as well as the cross-lagged paths, were included in the initial models. For the internalizing problems model (Fig. 2), fit was good on two out of four indices, $\chi^2(16) = 53.5$, $p < 0.001$, SRMR = 0.025, RMSEA = 0.12 (90% CI 0.086–0.157), CFI = 0.97. When variances from concurrent and cross-lagged associations between PSI and informant disagreement were accounted for, the autoregressive paths for both PSI ($\beta = 0.76$, $p < 0.001$) and informant disagreement ($\beta = 0.61$, $p < 0.001$) across Times 1 and 2 were significant, indicating strong longitudinal stability. Parental school

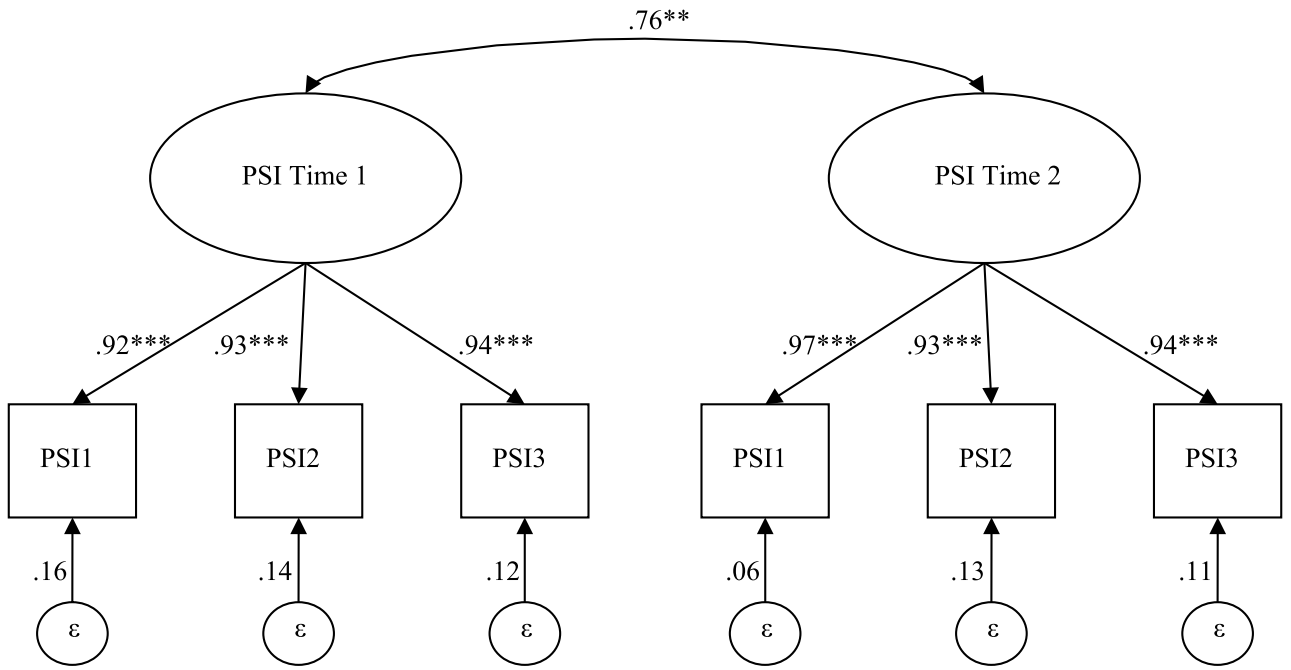

Fig. 1 Confirmatory factor analysis solution for parental school involvement latent factors at time 1 and time 2. ***$p < 0.001$. *Note* PSI = Parental School Involvement. PSI1, PSI2, and PSI3 = parcels reflecting teacher- and parent-reported PSI items

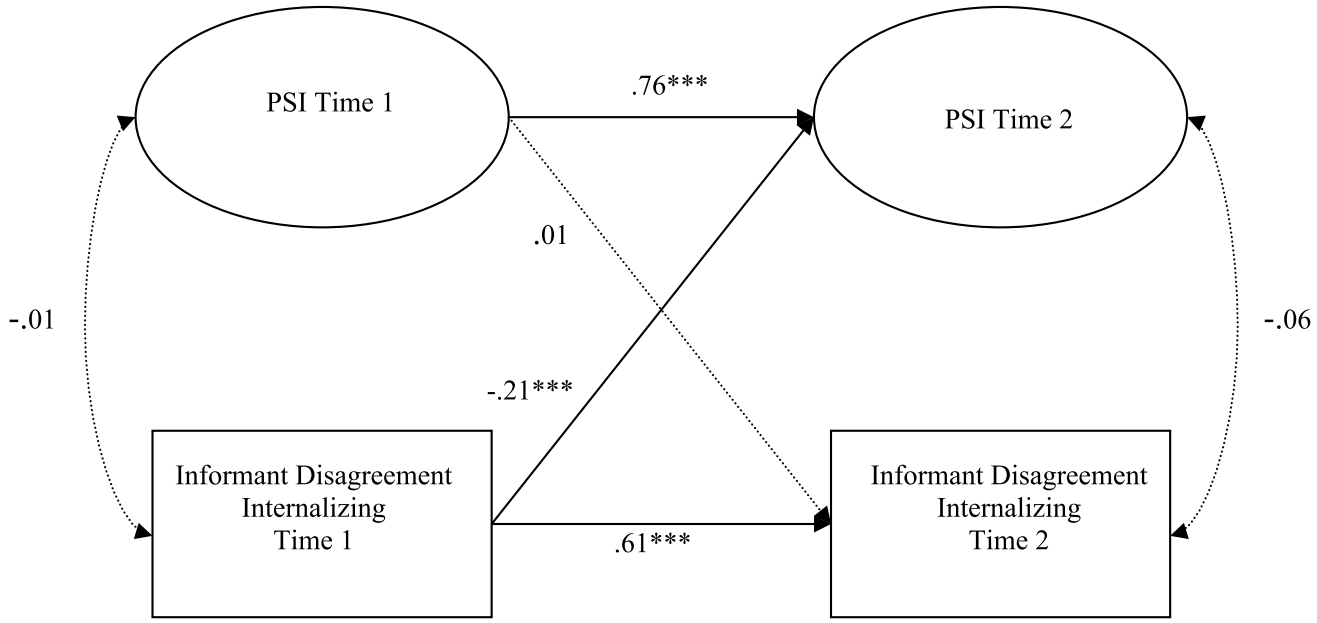

Fig. 2 Standardized cross-lagged structural model 1 between parental school involvement and informant disagreement on internalizing problems between time 1 and time 2. ***$p < 0.001$

involvement and informant disagreement were not concurrently associated at either time point. The cross-lagged path from PSI at Time 1 to informant disagreement at Time 2 was not significant, while the cross-lagged path from informant disagreement at Time 1 to PSI at Time 2 was significant ($\beta = -0.21$, $p < 0.001$); lower informant disagreement at Time 1 predicted increased PSI at Time 2.

For the externalizing problems model (see Fig. 3), model fit was good on two out of four indices, $\chi^2(16) = 57.2$, $p < 0.001$, SRMR = 0.026, RMSEA = 0.13 (90% CI

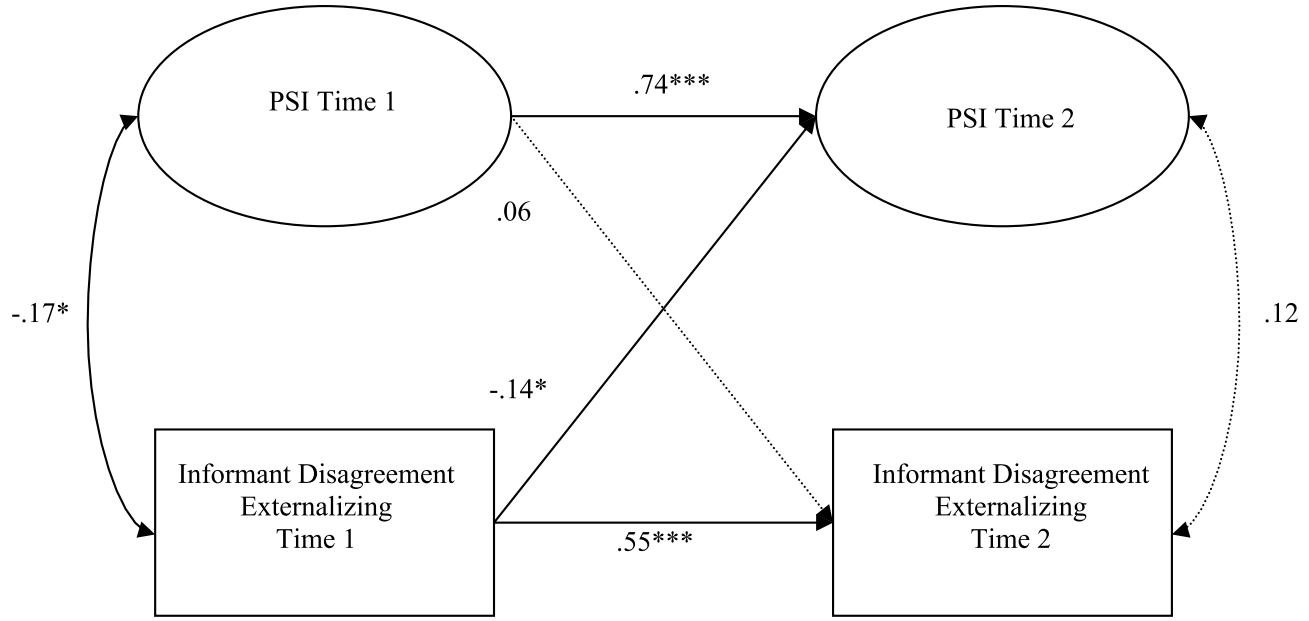

Fig. 3 Standardized cross-lagged structural model 2 between parental school involvement and informant disagreement on externalizing behavior problems between time 1 and time 2. *$p < 0.05$, ***$p < 0.001$

0.092–0.162), CFI = 0.96. Autoregressive paths for both parental school involvement ($\beta = 0.74$, $p < 0.001$) and informant disagreement ($\beta = 0.55$, $p < 0.001$) suggested strong longitudinal stability. In contrast to the internalizing problems model, PSI and informant disagreement on externalizing problems were concurrently associated at Time 1 ($\beta = -0.17$, $p = 0.047$) though not at Time 2. The cross-lagged path from PSI at Time 1 to informant disagreement at Time 2 was not significant, but the cross-lagged path from early informant disagreement to later PSI was significant ($\beta = -0.14$, $p = 0.025$). As with internalizing problems, lower informant disagreement on externalizing problems at Time 1 predicted increased PSI at Time 2.

Discussion

We explored predictors of parent–teacher informant disagreement on behavior problems (i.e., internalizing *and* externalizing behaviors) in young children with ASD. Parent and teacher disagreement on internalizing and externalizing behavior ratings was higher when children demonstrated greater behavior problems. This finding is consistent with previous research on TD children as well as other pediatric clinical samples, which consistently documents greater informant disagreement when children evidence elevated internalizing and externalizing problems (Deng et al. 2004; Efstratopoulou et al. 2012; Rescorla et al. 2014; Youngstrom et al. 2003). Likewise, both the present study and past research documents that parents typically report greater internalizing and externalizing problems than teachers (Deng et al. 2004; McDonald et al. 2016). This may be partly explained by parental attributions of child behavior (Joiner and Wagner 1996). A number of studies document that in comparison to caregivers of neurotypical children, caregivers of youth with ASD are more likely to perceive their child's behavior problems as stable, uncontrollable, and characteristic of the child (Berliner et al. 2019; Hartley et al. 2013), while positive behaviors are perceived as less stable, controllable, or characteristic of the child (Bussanich et al. 2017). When caregivers perceive behavior problems as internal, stable traits of their child, caregivers are more susceptible to overwhelming emotions and inconsistent, reactionary responses (e.g., overly punitive or lax) in regards to their child's behavior problems (Chiel 2019; Svenson 2005). This contributes to a vicious cycle of increasingly reactive behavior by both the parent and child, as such parental responses exacerbate and maintain child behavior problems (Berliner et al. 2019). A similar process likely occurs for teachers; Ling et al. (2010) found that when teachers experience negative emotional responses to the behavioral problems of their students with ASD, they are more likely to recommend punitive disciplinary strategies. It is possible that caregivers may be more susceptible to unhelpful attributions and subsequent emotional and behavioral responses than teachers given the overwhelming demands that caregivers of children with ASD experience. Likewise, teachers often receive some training regarding working with youth with ASD, which has been found to reduce reported negative attributions regarding children's ASD-related symptoms as

well as reduce negative affect and punitive reactions among teachers (Ling et al. 2010). Given the limited research on teacher attributions and ASD, additional research is needed in order to elucidate how caregiver and teacher beliefs relate to informant discrepancies.

Alternatively, rather than caregivers being a trigger for their child's behavior problems it may be that caregivers are simply more attuned to their child's behavioral challenges than their teachers. As a result, when such behavior problems are present, this greater sensitivity translates to higher, more accurate behavior ratings than teachers. This pattern likely also reflects the influence of environmental factors that determine the maintenance of behavior problems, resulting in true behavioral differences across contexts. For example, children often have greater structure at school than home. Particularly for children with ASD, this difference in structure across settings may result in fewer and less severe behavioral difficulties at school than at home/community settings (Ameis et al. 2018). It is also possible that caregivers may be more likely to inadvertently reinforce behavior problems. Research documents the negative impact of stress on problem solving skills (Chinaveh 2013; Montgomery and Melchor-Beaupre 2004). Given the significant stress that caregivers of children with ASD experience, caregivers will likely struggle to engage in effective problem solving in response to their child's behavior problems (Falk et al. 2014; Rezendes and Scarpa 2011). Interventions that equip caregivers with behavior strategies have been found to reduce children's behavior problems as well as parent stress (for review see Tarver et al. 2019). Teachers often receive some training in behavior management principles, which may support their use of effective behavior strategies. This may then reduce the likelihood that behavior problems occur and lead to greater parent–teacher disagreement. Given the influence of environmental factors on children's behavior, future research should examine the types of precipitants and reinforcers of children's behavior problems, and how these relate to informant disagreement. It is also possible that children with greater behavior problems are more likely to delay expressing their frustrations until they are in a more secure and less stressful environment, such as home, which may lead parents to observe more severe challenging behaviors than teachers. Although less well documented empirically, self-advocates on the autism spectrum describe the experience of delaying expression of their frustrations while in a stressful situation, and only "melting down" once they are in a less stressful environment, such as home (Invisible 2018). Clearly, additional research is needed in order to clarify the association between parent and teacher disagreement and children's behavior problems.

Interestingly, when child, teacher, and class characteristics were considered simultaneously, only ASD symptom severity predicted informant disagreement on internalizing behaviors; such that when children had more severe ASD symptoms, parent–teacher disagreement on internalizing behaviors was lower. It may be that when children have more severe ASD symptoms, their symptom presentation may be less context-dependent, allowing parents and teachers to observe and report similar challenges. It is also possible that when children evidence more severe ASD symptoms, teachers spend more time with them, affording teachers greater opportunities to observe and perceive the harder-to-detect internalizing problems that parents are observing. This pattern also suggests that while internalizing behaviors (e.g., anxiety) are often distressing and interfering, these behaviors are more likely to be missed by teachers for students with less severe ASD symptoms. It is possible that student's communicative challenges paired with their less observable symptoms relative to their more affected peers with ASD, lead these students to "fly under the radar" and their internalizing difficulties to go unnoticed. This finding may be related to diagnostic overshadowing, a well-established phenomenon whereby teachers and other professionals working with people with ASD incorrectly attribute their internalizing symptoms (e.g., anxiety) to their ASD rather than to their psychological functioning (Kerns et al. 2015; White et al. 2009). Research on other developmental disorders, such as attention deficit/hyperactivity disorder, suggests that in comparison to parents, teachers may be more susceptible to diagnostic overshadowing for youth with less severe symptom presentations (Adams et al. 2019; Garcia-Rosales et al. 2020). Evidence from this same sample that young children with ASD also report high levels of loneliness and social dissatisfaction at school (Zeedyk et al. 2016) supports this possibility that children's distress may indeed be going undetected in the classroom. Additional research that explores teachers' perceptions of the internalizing problems of their students with ASD would help shed light on what symptoms, if any, are being missed. One possible explanation for the parent–teacher rating discrepancies may be related to the quality of student–teacher relationships (STRs) among children with ASD. Past research documents that children with ASD often experience relationships with their teachers characterized by low closeness and high conflict (Caplan et al. 2016; Prino et al. 2016; for review see Eisenhower et al. 2015). It is possible that closer STRs may foster teachers' attunement to children's internalizing difficulties. Additional research should examine the role of STR quality in predicting parent–teacher discrepancies.

Similarly, when child, teacher, and class characteristics were considered simultaneously, ASD symptom severity and class size both predicted informant disagreement on externalizing problems. As with internalizing behaviors, it may be that when ASD symptoms are more severe, children's externalizing behaviors are more stable across settings. With regard to the latter finding, class size was found to predict

informant disagreement by the spring of the school year, with lower disagreement in smaller classes. This finding should be interpreted with caution, given that it occurred in the context of a non-significant overall regression (p for the model = 0.052) and emerged only at Time 2 (spring). Given the singularity of this finding, it would be worthwhile to replicate this in a future study. Nonetheless, this association persisted above and beyond classroom type (e.g., general education vs. special education), in spite of the usual difference in class size between special education and general education classes. Regardless of classroom type, teachers in smaller classes may have greater bandwidth to attend to each student's behavior, while larger classes tax teachers' ability to monitor their student's behavior. Alternatively, communication between parents and teachers may be greater in smaller classes, allowing greater alignment of their views over time.

Past research documents the positive association between parental school involvement (PSI) and children's school adjustment (Holmes et al. 2018; Kim et al. 2018; Oberlander and Black 2011). Here, we examined whether a bidirectional association was present between PSI and parent–teacher disagreement and over the school year. We found that lower disagreement on internalizing and externalizing problems in the fall predicted higher PSI in the spring of the school year. Alternatively, PSI in the fall did not predict informant disagreement in the spring. In other words, when parents and teachers had greater alignment in their perceptions of child behavior problems at the beginning of the school year, parents showed greater involvement in school over time, even after accounting for their baseline levels of school involvement. Alternatively, this may be explained by our finding that parents that had greater agreement with teachers, had children with fewer behavior problems. Challenging behaviors are highly predictive of parent stress, feelings of incompetence, and low parenting efficacy, each of which may interfere with PSI (Iadarola et al. 2017; Rezendes and Scarpa 2011). It is possible that rather than an absence of a shared understanding with teachers dictating PSI, it may be that parents of children with more severe behavioral problems lack the bandwidth for such involvement. Future research should examine the role of parenting stress and efficacy, and how this impacts PSI as well as parents and teachers' perceptions of children's behavior problems across multiple school years.

Strengths, Limitations, and Future Directions

The present study is the first to explore how parent–teacher disagreement related to PSI over time in the context of ASD. Enhancing the extent to which parents and teachers share a common understanding of a child may be a means of leading to greater PSI and, in turn, support better long-term outcomes for the child (Holmes et al. 2018; Kim et al. 2018). In addition, a sustained level of PSI may promote effective management of the child's behavior problems.

Despite the strengths of the present study, there were also a number of limitations. First, although past research supports the CBCL as a valid and reliable measure of behavior problems in youth with ASD (e.g., Keefer et al. 2019; Pandolfi et al. 2014), recent factor analyses indicate that children with ASD show symptom patterns that are not captured by the existing narrow band subscales of the CBCL (Medeiros et al. 2017), particularly for children with ASD who have comorbid ID (Dovgan et al. 2019). Given that 17% of the present sample had co-occurring ID, our findings should be interpreted with caution. Future parent–teacher agreement research should involve item-level analyses of the CBCL, CBCL factors derived from ASD samples, or measures whose structures are well-validated among youth with ASD.

In addition, beyond the factors we examined, there are likely additional variables driving parent–teacher disagreement, such as caregiver and teacher psychological factors including well-being, stress, self-efficacy, and personality attributes (e.g., Karst and Van Hecke 2012). Caregivers with elevated depression may perceive their child's behaviors as more severe (Garstein et al. 2009), with negative affect triggering a negative perceptual bias (see Gotlib and Joormann 2010), in a way that may be heightened for parents of children with ASD relative to teachers given their closer identification with the child and, among parents of children with ASD greater likelihood of struggling with depression (Almansour et al. 2013). Future research ought to explore the influence of caregiver and teacher mental health on informant disagreement. Moreover, with our design, we are unable to determine the extent to which parent–teacher disagreement was a consequence of rater perceptions, environmental factors, or an interaction of the two. Future research should include objective observer ratings of children's behavior problems across both school and home/community to make this distinction.

The present study includes a small number of girls with ASD, making it impossible to draw meaningful conclusions regarding the role of possible gender bias in parent–teacher disagreement of child behavior problems. Given the well-documented contribution of gender role expectations to caregiver and teacher perceptions of child behavior (Hiller et al. 2014; Mandy et al. 2012), future research should examine how these biases may uniquely apply to perceptions of girls with ASD. In addition, given the diversity in cognitive and adaptive functioning across the spectrum, future research should consider the role of child IQ in informant disagreement. Moreover, given the evidence of teacher's racial bias regarding their perceptions of TD children (Cooc et al.

2017; Cullinan and Kauffman 2005), future research should explore how racial bias impacts teacher ratings of students with ASD. Further, while our sample reflects some diversity in terms of race, the incomes of participating families are skewed high. Thus, our findings may not apply to children across socioeconomic contexts. Future research should explore the experiences of parents with limited economic resources and the teachers of these students, as parents from low-income households may face unique barriers to maintaining school involvement. Overall, this study suggests that enhancing parents' and teacher's alignment in their view of child behavior may cultivate greater PSI, a recommended best practice for students with ASD.

Author Contributions SL directed the project. JN was involved in designing and planning the project. AE supervised the work. AE and JB conceptualized and oversaw the larger study, including data collection and management. SL took the lead in analyzing the data and drafting the manuscript with support from AE, JN, and JB. All authors contributed to editing and revising the manuscript and approved the fnal document.

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