Longitudinal associations between externalizing problems and student–teacher relationship quality for young children with ASD

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A R T I C L E   I N F O

A B S T R A C T

The associations between student–teacher relationship (STR) quality and externalizing behavior problems in school were examined among 166 children with ASD (82% boys, ages 4–7 years) across three assessments over a 1.5-year period; IQs in the sample range from 50 to 139 ($M = 88.7$). Unlike other non-ASD populations, the association between STR quality and externalizing problems was not transactional; instead, cross-lagged panel analyses supported a child-driven pathway whereby early teacher-reported behavior problems led to poorer relationship quality over time. Higher externalizing problems predicted increased student–teacher conflict from fall to spring of the same school year and predicted increased student–teacher conflict and decreased student–teacher closeness in the subsequent school year. Child behavior problems appear to drive changes in children's relationships with teachers that follow them across multiple teachers and classroom contexts. The association between early student–teacher relationship quality and subsequent externalizing problems was not moderated by cognitive ability or intellectual disability status. Findings suggest that interventions targeting early disruptive behavior problems may indirectly improve children's school relationships over time.

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1. Introduction

The transition to formal schooling increases demands on children's social, behavioral, and self-regulatory skills (Pianta, 2010; Wildenger & McIntyre, 2012). This transition is common to all children, regardless of their disability status (Daley, Munk, & Carlson, 2011). The ability to adapt and function in the school environment is predictive of many positive outcomes, including children's behavioral adjustment (e.g., Silver, Measelle, Armstrong, & Essex, 2010), social acceptance (Arbeau, Coplan, & Weeks, 2010), social competence (e.g., Griggs, Gagnon, Huelsman, Kidder-Ashley, & Ballard, 2009), school attitudes (Birch & Ladd, 1997), work habits (Hamre & Pianta, 2001), and academic performance (Peisner-Feinberg et al., 2001), both concurrently and in later elementary school. However, for children with autism spectrum disorders (ASD) – characterized by deficits in social communication and interaction, and by restrictive and repetitive behaviors and interests (APA, 2013) – early

school transitions may be especially challenging. In particular, young children with ASD often show heightened levels of disruptive or externalizing behavior problems, which may be exacerbated by the new stress and demands associated with school (Kaat, Gadow, & Lecavalier, 2013). For typically developing (TD) young children who do not have ASD, but who share many behavioral risk factors, early student–teacher relationships have been shown to have a compensatory role in their concurrent and future school adjustment (Tsai & Cheney, 2012). In fact, externalizing problems and student–teacher relationship (STR) quality have been observed to have a transactional relation: that is, increased externalizing problems may predict poorer STRs in the future, and poor STRs may predict higher levels of externalizing problems in the future (Doumen et al., 2008; Eisenhower, Baker, & Blacher, 2007; Griggs et al., 2009; Hamre & Pianta, 2001; Silver, Measelle, Armstrong, & Essex, 2005; Silver et al., 2010). While well-documented in children facing behavioral and contextual risk factors, this transactional association between externalizing problems and STRs is virtually unexplored among young students with ASD. The aim of this article is to test whether it applies for children with ASD; subsequent findings may inform intervention for easing and improving the early school transitions for this vulnerable student population.

1.1. Early student–teacher relationships for at-risk children

As discussed above, young children who form strong bonds with their teachers are more likely than children who do not to show a number of positive outcomes. In the numerous studies that have used Pianta's (2001) *Student–Teacher Relationship Scale* to assess student–teacher relationship quality, student–teacher closeness is the hallmark of a positive relationship and includes such experiences as mutual enjoyment between the student and teacher, the student showing pride when praised by the teacher, or the teacher feeling in tune with what the child is feeling. Alternatively, negative STRs are characterized by student–teacher conflict, (i.e., the child ignoring or defying the teacher's instructions) and by student–teacher dependency (i.e., the child inappropriately seeking help and comfort from the teacher, instead of using trying to solve his or her problem independently) (Pianta, 1994). Conflictual and dependent STRs are consistently associated with negative school outcomes, including poor academic achievement and school adjustment (e.g., Birch & Ladd, 1997).

This literature has shown that among the factors that influence children's school adjustment, the quality of early STRs is particularly important (e.g., Baker, 2006; Hughes, 2011; Schmitt, Pentimonti, & Justice, 2012). Moreover, STR quality tends to be fairly stable over time, and predicted in large part by the behavioral challenges posed by the child (Blacher, Baker & Eisenhower, 2009; Doumen et al., 2008; Eisenhower et al., 2007; Jerome, Hamre, & Pianta, 2009; Serpell & Mashburn, 2012). To the extent that children show heightened aggressive or externalizing problems, but also positivity in their STRs, there may be therapeutic and reparative effect, whereby children show lower levels of externalizing problems over time (Meehan, Hughes, & Cavell, 2003). Similar findings have been found regarding the compensatory nature of STRs for children at risk due to their intrapersonal and family characteristics (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Griggs et al., 2009). While these findings are based on samples of TD children, it is likely that young children with ASD share some of the risk factors as the participants in these samples, particularly around behavioral risk and externalizing problems. In turn, it is feasible that early, positive STRs may play a similar compensatory and therapeutic role for children with ASD.

1.2. Student–teacher relationships for children with ASD

The rate of ASD diagnosis in the United States is clearly on the rise with 1 out of 68 children is diagnosed with ASD (Center for Disease Control & Prevention, 2014), reflecting a 30% increase over the rates reported only two years ago. In turn, more children than ever with a formal diagnosis of ASD are entering the education system, in a variety of school and classroom settings. It is no longer a question of *whether* a teacher will encounter a student with ASD, but *when* (Blacher, Linn, & Zeedyk, 2014). Children with ASD face considerable challenges as they enter school for the first time; the risk of poor school adjustment for children with ASD is exacerbated by high rates of comorbid psychiatric disorders, poor adaptive behaviors, and possible intellectual disability (Leyfer et al., 2006; Mahan & Matson, 2011; Simonoff et al., 2008; van Steensel, Bögels, & de Bruin, 2013). Specifically, studies have shown that children with ASD are at heightened risk for symptoms of comorbid depression (Gadow, Guttmann-Steinmetz, Rieffe, & DeVincent, 2012), anxiety disorders (Guttmann-Steinmetz, Gadow, DeVincent, & Crowell, 2010; Simonoff et al., 2008), specific phobia and obsessive compulsive disorder (Leyfer et al., 2006), and attention deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (Kaat et al., 2013; Simonoff et al., 2008; Yerys et al., 2009). These psychiatric symptoms, paired with the cognitive, communicative, and adaptive functioning challenges associated with ASD, are likely to make it more challenging for children with this disorder to establish the positive STRs that have been observed to be so impactful for other at-risk populations.

Only a handful of studies have examined STRs for young children with ASD (Blacher, Howell, Lauderdale-Littin, Gennaro, & Laugeson, 2014; Brown & McIntosh, 2012; Longobardi, Prino, Pasta, Gastaldi, & Quaglia, 2012; Robertson, Chamberlain, & Kasari, 2003). In studies with a TD comparison sample, school-age children with ASD were observed to have higher levels of student–teacher conflict and lower levels of student–teacher closeness (Blacher et al., 2014a; Longobardi et al., 2012); a similar pattern was also observed when children with ASD were compared to children with intellectual disabilities, or ID (Blacher et al., 2014a). In terms of student–teacher dependency, Blacher and colleagues (2014) found that students with ASD and students with ID showed comparable levels, which were significantly greater than those of TD students. Because children with ASD are likely to need more adult assistance to master the behavioral, academic, and social skills necessary to

function well in the school environment, STRs may take on even more importance for children with ASD than for children requiring less adult assistance.

Among young students with ASD, STRs were predicted by child-level factors, including disruptive behavior, social cognition, and social responsiveness (Brown & McIntosh, 2012; Howell, 2010; Robertson et al., 2003). It is likely that these relationships are shaped by teacher-level factors too. For example, Keen, Sigafoos, and Woodyatt (2005) found that teachers responded inconsistently to communicative bids from students with ASD and expressive language delays. Even though responses to a communication inventory suggested that the teachers recognized that many of the pre-linguistic gestures, body movements, and facial expressions of students with ASD were, in fact, attempts to communicate, they acknowledged only 24% of non-verbal communicative bids made by their students. While there are many possible explanations for this low response rate, including not observing the behavior or intentionally removing attention from an undesirable or inappropriate communicative behavior, these findings suggest that teachers may interact less with students with ASD. This poses another barrier for forming strong STRs within this vulnerable student population.

While few in number, the existing studies on STRs for children with ASD are informative and lay the groundwork for understanding the nature of early STRs and the factors that influence them. To date, however, no study has tested whether the relation between STRs and externalizing problems, which has been identified as bidirectional in other at-risk populations, is present for young students with ASD and whether it is bidirectional or unidirectional (behavior-driven or relationship-driven).

1.3. Associations between behavior problems and student–teacher relationships

It is well-documented that children with ASD, relative to TD children, show heightened rates of externalizing problems, which may include aggression, hyperactivity, and rule-breaking behavior (e.g., Kaat et al., 2013; Kanne, Abbacchi, & Constantino, 2009; Simonoff et al., 2008; Yerys et al., 2009). Of interest, Kanne and colleagues (2009) observed that parents were more likely than teachers to report externalizing and other psychopathology for children with ASD. A concurrent, negative relation between externalizing problems and STRs has been observed for TD children: Doumen and colleagues (2008) found that STRs are more positive for students who enter school with fewer externalizing problems. Furthermore, early externalizing problems have been shown to predict decline in STR quality over time, and across multiple school years (Hamre & Pianta, 2001; Silver et al., 2010). The findings of existing studies, all with children without ASD, also suggest a transactional relation between externalizing problems and STRs, with increased externalizing problems predicting poorer STRs in the future, and poor STRs predicting higher levels of externalizing problems in the future (Doumen et al., 2008; Eisenhower et al., 2007; Griggs et al., 2009; Hamre & Pianta, 2001; Silver et al., 2005, 2010). In light of the high externalizing problems among young children with ASD, it is likely that a similar relation may exist within this population; however, no study to date has tested this. The association between STR quality and behavioral outcomes may also be moderated by children's cognitive level. Estimated rates of students with ASD who also have intellectual disability (ID) ranges from 31% (Center for Disease Control & Prevention, 2014) to 55% (Charman et al., 2011). STR quality may more strongly predict behavioral and academic outcomes for these children who have ID in addition to ASD than for those without ID, due to their need for more intensive teacher support in academic learning as well as in the reinforcement of new behavioral gains.

In sum, the current study will address the following research questions with data collected from young children with ASD, their parents, and their teachers:

1 What is the nature of externalizing behavior problems and student–teacher relationship quality within our sample?
2 Is there a transactional relation between student–teacher relationship quality and externalizing problems over time for children with ASD?
  2a. Does level of externalizing problems predict change in student–teacher relationship quality from the beginning to the end of the school year, and from one school year to the next?
  2b. Does student–teacher relationship quality predict change in externalizing problems from the beginning to the end of the school year, and from one school year to the next?
3 Is the hypothesized effect of student–teacher relationship quality on externalizing problems moderated by children's level of cognitive ability or by the presence of intellectual disability?

2. Methods

2.1. Participants

Participants included 166 children with ASD (82% male) and one parent per child (84% biological mothers), who provided family background information. At the time of study enrollment, children were 5 years, 8 months on average (range: 4–7 years). Children were in preschool (40%), kindergarten (28%), first grade (24%), and second grade (7%). Child race was based on an open-ended parent-report item later aggregated into categories; children were 4% Asian-American, 4% Black or African-American, 59% White, 9% Latino(s)/Hispanic, 21% bi- or multi-racial, and 3% other. Most parent respondents were

married (82%), and 74% had at least a four-year college degree. Approximately half of the families (48%) had annual incomes above $80,000. Families were from a Northeastern metropolitan area (46%) and southern California (54%) and 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.

Most children (72%) attended public schools. Teachers reported that 50% of participating children were in special education classrooms for 50% or more of the day. On average, children had a mean class size of 16 children. In addition to their primary classroom teacher, 17% of children also had individual classroom aides.

Teacher participants were 83% female with an average of 14.2 years of teaching experience (range: 0–44). The majority of teachers (63%) had earned a master's degree. Teachers reported their race in response to a multiple-choice item as 70% White, 13% Latino/a, 6% Asian-American, 3% Black, 1% Native Hawaiian/Pacific Islander, and 6% biracial, multiracial, or other.

2.2. Measures

Data were collected as part of a larger study examining the adaptation to early schooling among young children with ASD. The first two measures described were used to determine eligibility for the study.

2.2.1. ASD diagnosis
In order to determine whether child participants met criteria for ASD, the ADOS was administered to all children. The ADOS is a semi-structured, interactive observation schedule designed to assess communication, social interaction, play and imaginative use of materials, and restricted and repetitive behaviors in individuals who may have an ASD. The assessment involves a variety of social "presses" designed to elicit behaviors relevant to a diagnosis of ASD. Behaviors are scored and a standardized diagnostic algorithm is applied; eligible children fell in the autism or autism spectrum range. The ADOS was administered by 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.

2.2.2. Cognitive functioning
Children's cognitive functioning was assessed with an abbreviated version of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III; Wechsler, 2002); including the Matrix Reasoning, Picture Completion, and Vocabulary subtests. The WPPSI-III is a widely used assessment of cognitive ability for children ages 2 years, 6 months to 7 years, 3 months that has high subtest and scale reliability (Wechsler, 2002). Abbreviated versions such as this one of the WPPSI-III and the former WPPSI-R have demonstrated high reliability and convergent validity (e.g., Lobello, 1991; Sattler, 2008).

2.2.3. Demographics
Background information about the child and family (parent report) and the teacher and school (teacher report) were obtained through parent- and teacher-completed demographic surveys at the time of the first assessment (Time 1).

2.2.4. Student–teacher relationship quality
The Student–Teacher Relationship Scale (STRS; Pianta, 2001) was completed by the child's primary classroom teacher at all three assessments. This 28-item instrument with a five-point response scale assesses a teacher's perception of his or her relationship with a target student. Designed for use with children 3–8 years old, the STRS contains three subscales: Conflict (12 items) measures the teacher's feelings of negativity and conflict with the student (e.g., "This child and I always seem to be struggling with each other," and "This child remains angry or is resistant after being disciplined"); Closeness (11 items) measures the teacher's feelings of affection and open communication with the student (e.g., "I share an affectionate, warm relationship with this child," and "When I praise this child, he/she beams with pride"); and Dependency (5 items) measures the teacher's perception of the student as overly dependent (e.g., "This child asks for my help when he/she really does not need help"). The total index raw score can range from 28 to 140 and is computed using the following formula: total raw score = (72 − conflict) + closeness + (30 − dependency). We examine total, conflict, and closeness scores in the present study. Pianta (2001) reports adequate reliability and validity; in the present sample, across Times 1, 2, and 3, alphas for total ranged from .71 to .76, alphas for conflict were .82–.88, and alphas for closeness were .62–.84.

2.2.5. Externalizing problems
The Caregiver-Teacher Report Form ages 1.5–5 and the Teacher Report Form ages 6–18 (CTRF & TRF; Achenbach & Rescorla, 2000, 2001) were used to assess child behavior problems, depending on the age of the child at each assessment; these two age-specific versions contains 99 and 112 items, respectively. Items present child problems alphabetically (from "aches and pains without medical cause" to "worries"), and response options include not true, somewhat or sometimes true, or very true or often true, now or in the past 2 months. T scores for broadband (total, externalizing, and internalizing problems) are produced with means of 50 (SD = 10). These scores have shown excellent validity and have been correlated with other measures of behavior problems (Achenbach & Rescorla, 2000) and autism symptoms (Sikora, Hall, Hartley, Gerrard-Morris, & Cagle, 2008). The present study utilizes the externalizing behavior problems T score, for which reliabilities for this sample were α = .95 and .95 for the two age-specific versions.

2.3. Procedure

Interested families attended initial eligibility sessions in our research office during the summer or fall; after parents provided informed consent, child participants were first 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, Rutter, & Le Coulter, 1994) also 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 received a previous diagnosis of ASD from an out-of-school clinician or scored in the autism or autism spectrum range on the ADI-R, and (d) were ages 4–7 years and entering elementary school or their final year of pre-K in the fall.

Three subsequent sessions, held in the fall (Time 1), the spring roughly six months later (Time 2), and the spring of the following school year (Time 3), included child assessments at our research office, parent-completed questionnaires, and teacher-completed questionnaires. Parents were compensated $50 per visit (which included participating in a lengthy interview and some assessment, as well as the completion of a packet of questionnaires) and teachers were compensated $25 (or $50 for their final packet) to complete a much briefer packet of measures. Teachers received their packets immediately following the Time 1, Time 2, and Time 3 parent–child visits.

3. Results

To address our first question, descriptive statistics and correlations between variables were conducted with no adjustments for missing data. To address questions about the associations between student–teacher relationship (STR) quality and behavior problems over time, structural equation modeling analyses were conducted with MPlus using full information maximum likelihood (FIML) to estimate missing data; FIML has been demonstrated to be a robust estimator in structural equation modeling (SEM) that performs better than pairwise deletion, listwise deletion, or similar-response-pattern imputation (Enders & Bandalos, 2001; Schlomer, Bauman, & Card, 2010). Results utilize maximum likelihood estimates (MLE). Outliers (scores >3 SD from the sample mean) were included in all reported analyses. Included in analyses were all participating children for whom teacher-report data were available from at least one of the three assessments (88% of participants, N = 166). While data from Time 1 visits was complete (145 participants), data collection for the second and third assessments was still underway and thus Time 2 and Time 3 data were available for only 94 and 82 participants, respectively; given the simplicity of the model being tested, with few measured variables and no latent factors, we expect this sample size to be adequate for detecting medium to large effects.

3.1. Preliminary analyses: means and correlations

We first examined the levels of student–teacher relationship quality and externalizing behavior problems among these children with ASD, as shown in Table 1. Correlations between these variables are shown in Table 2.

3.1.1. Student–teacher relationship quality

As Table 1 indicates, on average children with ASD fell in the 57th–62nd percentile relative to their peers in terms of student–teacher conflict and fell in the 28th–30th percentile on average in terms of student–teacher closeness; levels of dependency on the teacher were in the 50th percentile, on average. STR quality variables were consistent across the 1.5-year

Table 1
Descriptive statistics of STR quality and externalizing problems over time.

	Time 1		Time 2		Time 3	
	Mean (SD, range)	Percentile	Mean (SD, range)	Percentile	Mean (SD, range)	Percentile
STRS						
Total STR quality	109.5 (12.9, 78–138)	35th	108.2 (14.8, 59–134)	30th	112.8 (13.7, 56–137)	40th
Student–teacher conflict	22.8 (8.0, 12–46)	62nd	22.9 (7.9, 12–48)	62nd	20.6 (8.1, 12–54)	57th
Student–teacher closeness	40.5 (7.5, 18–69)	28th	40.6 (7.9, 19–54)	28th	41.6 (7.5, 22–55)	30th
Dependency	10.2 (3.2, 5–20)	50th	10.1 (3.4, 5–20)	50th	10.0 (3.4, 5–20)	50th
TRF/CTRF						
Externalizing problems T score	58.2 (9.3, 36–79)	75th	56.4 (9.3, 36–78)	73rd	55.6 (8.7, 36–76)	73rd

Note. The normative means for the STRS total, conflict, closeness, and dependency scores are 117, 19, 46, and 10, respectively (Pianta, 2001).

Table 2
Bivariate correlations between externalizing problems, student–teacher conflict, and student–teacher closeness.

	1	2	3	4	5	6	7	8
1. Externalizing problems T score, Time 1	–	–	–	–	–	–	–	–
2. Student–teacher conflict, Time 1	.70[***]	–	–	–	–	–	–	–
3. Student–teacher closeness, Time 1	−.15[†]	−.14	–	–	–	–	–	–
4. Externalizing problems T score, Time 2	.79[***]	.53[***]	−.08	–	–	–	–	–
5. Student–teacher conflict, Time 2	.63[***]	.71[***]	−.23[*]	.63[***]	–	–	–	–
6. Student–teacher closeness, Time 2	−.03	−.13	.64[***]	−.08	−.26[*]	–	–	–
7. Externalizing problems T score, Time 3	.45[***]	.22[†]	−.11	.48[***]	.33[**]	−.17	–	–
8. Student–teacher conflict, Time 3	.36[**]	.28[*]	−.10	.39[***]	.33[**]	−.09	.69[***]	–
9. Student–teacher closeness, Time 3	−.15	−.20	.35[**]	−.29[*]	−.27[*]	.53[***]	−.34[**]	−.37[***]

This table reflects raw teacher-reported data.
[***] $p \leq .001$, [**] $p \leq .01$, [*] $p \leq .05$, [†] $p \leq .10$.

period covered by the three assessments; total STR quality scores were correlated at $rs = 0.34$–0.59 between time points. At the same time, there was a significant, 4.6 point increase in total STR quality from Time 2 to Time 3, $t = -2.94$, $p = .002$. Within each time point, student–teacher conflict and student–teacher closeness scores correlated at $rs = -.14$, $-.26$, and $-.37$ at Times 1, 2, and 3, respectively. These correlations between Closeness and Conflict subscales of the STRS are notably lower than observed in the standardization sample ($r = -.45$; Pianta, 2001) and suggest that, with this sample, the two subscales may be best examined separately rather than as part of the total STR quality score.

3.1.2. Externalizing problems

Externalizing problems among these young children with ASD were elevated across all three assessments; at Times 1, 2 and 3, 44%, 42% and 29% of children had scores in the borderline or clinical ranges. Externalizing problem scores were related over time, with correlations of .79 (Times 1 and 2), .45 (Times 1 and 3), and .48 (Times 2 and 3) between time points across the 1.5 years of the study. At the same time, mean scores declined by 2.6 points from the fall of the first school year (Time 1) to the spring of the second school year (Time 3), $t = 1.80$, $p = .0076$. Externalizing problems were correlated with student–teacher conflict at rs of 0.70, 0.63, and 0.69 (all significant at $p < 0.001$) at Times 1, 2, and 3, respectively, and were correlated with student–teacher closeness at rs of -0.15 ($p = .076$), -0.08 ($p = 45$), and -0.34 ($p = .002$) at Times 1, 2, and 3.

3.2. Associations between STR quality and externalizing problems over time

Next we tested for a transactional association between externalizing problems and STR quality across a 1.5-year period. Using multiple-wave, cross-lagged panel analyses, which enable us to detect potential causal processes (Kline, 2010), we examined potential bi-directional associations between STR quality variables and externalizing problems over time: specifically, we considered whether initial levels of externalizing problems predicted change in STR quality over time, and whether initial levels of STR quality predicted change in externalizing problems over time. Models were tested for goodness of fit using the comparative fit index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Tucker & Lewis, 1973), the root mean-square error of approximation (RMSEA; Browne & Cudeck, 1993), and the χ^2 fit statistic. Values greater than .90 for the CFI and TLI and values less than or equal to .08 for the RMSEA are generally considered to indicate acceptable model fit, as are non-significant χ^2 values. Beta (B) values reported in text and figures represent standardized estimates.

We included two sets of cross-lagged paths: The path from externalizing problems at the first assessment (e.g., Time 1) to STR quality at the second assessment (e.g., Time 2), and the path from STR quality at the first assessment to externalizing problems at the second assessment; we included these same paths from Time 2 to Time 3. In each model, we estimated correlations between measures taken at the same age, as well as autoregressions for each variable across time. Non-significant paths were pruned to obtain a best-fitting model.

3.2.1. Student–teacher conflict

We first examined the association between externalizing problems and student–teacher conflict over time. The full model with all paths included showed excellent fit; CFI = 1.00, TLI = 1.01, RMSEA = 0.00 (C.I.: 0.00–0.11), $\chi^2_{(4)} = 3.46$, $p = 0.48$. When all paths were included, both of the cross-lagged paths from externalizing problems to student–teacher conflict were significant, but the cross-lagged paths from student–teacher conflict to externalizing problems were not significant for either time pairing ($B = -0.05$ for the STCO1 to EXT2 path; $B = -0.02$ for the STCO2 to EXT3 path).

Pruning to remove non-significant paths resulted in the model shown in Fig. 1, which also had excellent fit on all four indices, CFI = 1.00, TLI = 1.02, RMSEA = 0.00 (C.I.: 0.00–0.08), $\chi^2_{(6)} = 3.98$, $p = 0.70$. In this final model the behavior-driven pathway was significant from Time 1 to Time 2 ($B = 0.23$, SE = 0.11, $\beta = 0.20$, $p = 0.032$) and from Time 2 to Time 3 ($B = 0.25$, SE = 0.12, $\beta = 0.21$, $p = 0.042$), with externalizing problems predicting change in STR quality over time. Neither of the two
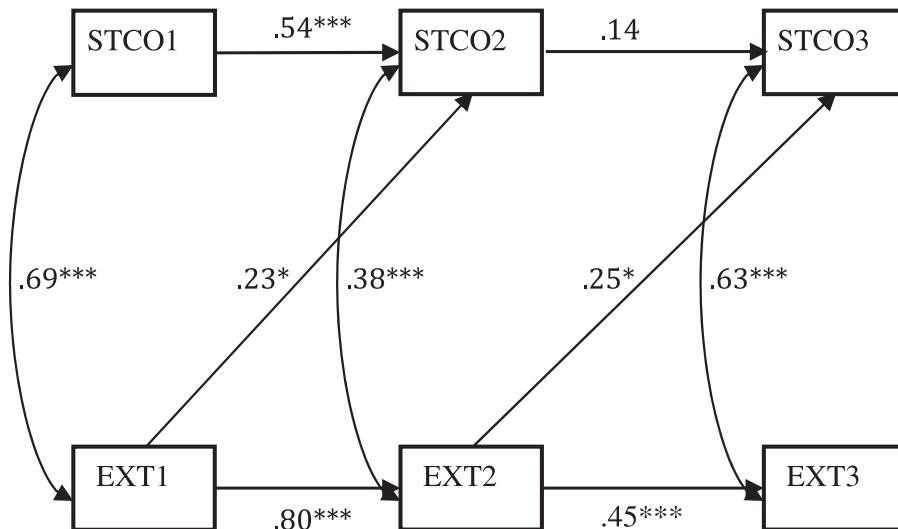
Fig. 1. Standardized estimates of cross-lagged panel model predicting student–teacher conflict and child externalizing problems.

relationship-driven pathways was significant; earlier student–teacher conflict did not predict change in externalizing problems.

3.2.2. Student–teacher closeness

For externalizing problems and student–teacher closeness, fit was good on all four fit indices when the full model was tested including all four cross-lagged paths, CFI = 1.00, TLI = 1.01, RMSEA = 0.00 (0.00–0.11), $\chi^2_{(4)}$ = 3.71, p = 0.45. When all paths were included, the cross-lagged path from Time 2 externalizing problems to Time 3 student–teacher closeness was significant, but the other three cross-lagged paths did not approach significance (B = 0.09 for the EXT1 to STCL2 path; B = 0.11 for the STCL1 to EXT2 path; B = −0.11 for the STCL2 to EXT3 path).

Pruning to remove non-significant paths resulted in the model shown in Fig. 2, which had excellent fit on all four indices, CFI = 1.00, TLI = 0.99, RMSEA = 0.02 (0.00–0.10), $\chi^2_{(7)}$ = 7.54, p = 0.38. The path from Time 1 behavior problems to Time 2 student–teacher closeness was not significant, but the path from Time 2 behavior problems to Time 3 student–teacher closeness was significant, (B = −0.20, SE = 0.10, β = −0.16, p = 0.041). Neither of the paths from earlier student–teacher closeness to later behavior problems was significant.

3.3. Intellectual disability status as a potential moderator

Next we tested the hypothesis that behavior problems would be more subject to the influence of student–teacher relationship quality for children with typical intellectual development (TID) relative to children with intellectual disability (ID). We ran the same baseline cross-lagged models as described above, with ID status as a grouping variable. All cross-lagged paths were included, and all paths were first constrained to be equal across ID status. Next the two cross-lagged paths from STR quality to behavior problems were unconstrained. The fits of these two nested models were compared using a chi-square difference test to determine whether model fit was significantly improved when these paths were unconstrained; significantly improved model fit would indicate that the two groups differ significantly from one another on the newly unconstrained paths.

For student–teacher conflict, the two models (constrained and unconstrained) were not significantly different according to a chi-square difference test, 85.25 (19)–84.11 (17) = 0.89 (2), p = 0.641. Likewise, for student–teacher closeness, the two models (constrained and unconstrained) were again not significantly different, 56.34(19)–53.96(17) = 2.378(2), p = 0.31. In other words, these paths do not differ significantly in strength between the ID and TID groups. Thus, child ID status does not moderate the influence of STR variables on child behavior problems over time.

3.4. Cognitive ability as a potential moderator

We also examined the potential moderating effect of IQ as a continuous variable on the influence of STR variables on externalizing problems over time. To do so, we added both IQ and the IQ-by-STR-variable interaction term (calculated as the product of the two z scores) to the model for both Time 1 and Time 2, adding regression paths from IQ and the Time 1 interaction term to Time 2 externalizing problems and regression paths from IQ and the Time 2 interaction term to Time 3 externalizing problems.
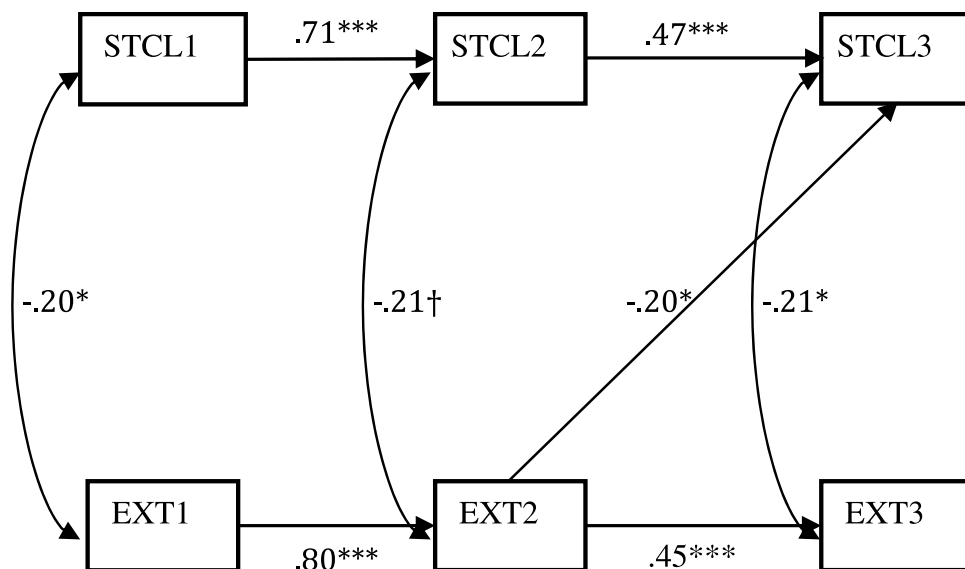
Fig. 2. Standardized estimates of cross-lagged panel model predicting student–teacher closeness and child externalizing problems.

For student–teacher conflict, the paths from IQ to externalizing problems were marginally significant at Time 2 ($p = 0.070$) and Time 3 ($p = 0.079$), but the paths from the IQ-by-conflict interaction terms to Time 2 and Time 3 externalizing problems were both non-significant. Model fit was not adequate on any of the four indices. Moderation effects of IQ for student–teacher closeness were similarly non-significant. The paths from IQ to Times 2 and 3 externalizing problems were significant ($ps = 0.025$ and 0.008), while the paths from the IQ-by-closeness interaction terms to Times 2 and 3 externalizing problems were not significant. Model fit was again not adequate.

4. Discussion

In the current sample of children with ASD, student–teacher relationship problems were elevated compared to those previously reported among TD children and their teachers, with less closeness and more conflict. This observation is consistent with previous research on young students with ASD (Blacher et al., 2014a; Longobardi et al., 2012). Further, findings suggest that the association between externalizing behavior problems and student–teacher relationship (STR) quality may be bidirectional over time, consistent with research in other high-risk populations (Doumen et al., 2008; Eisenhower et al., 2007; Griggs et al., 2009; Hamre & Pianta, 2001; Silver et al., 2005, 2010). In this section, we will discuss the implications of a bidirectional relation between externalizing behavior problems and STR quality, as well as ways to intervene in this cycle, in order to improve the school adjustment of young children with ASD.

While STR quality was lower in the current sample relative to what would be expected for TD children, it was observed to be highly consistent over the three time points of the study. The consistency of Time 3 STR quality ratings with those of Time 1 and Time 2 is particularly notable, given that Time 3 represents a new school year and, for the vast majority of children, a new classroom teacher. This suggests that early STR quality is predictive of later STR quality for children on the spectrum, although further longitudinal research is needed to determine just how much early STR quality influences later STR quality within this population. Seeing that, in the absence of intervention, low rates of STR quality are likely to persist from one year to the next for young children with ASD, programs or interventions to improve STR quality – and in turn, children's school adjustment and outcomes – appear to be necessary.

In the current sample, the domains of STR quality, namely student–teacher closeness and student–teacher conflict, were less strongly correlated than observed in other samples (e.g., Sclavo, Prino, Fraire, & Longobardi, 2012), including the standardization sample (Pianta, 2001). This finding suggests that student–teacher conflict and closeness may function more distinctly, and be more independently determined, for children with ASD. Given the differences between these two constructs in the current sample, it is perhaps unsurprising that they relate to behavioral outcomes differently. Student–teacher conflict was more closely associated with externalizing behavior problems than was student–teacher closeness. It may be the case that student–teacher closeness relates to other aspects of behavior and school adjustment not explored in the current study (e.g., internalizing problems, social functioning, academic achievement).

Given the dissimilarity between student–teacher conflict and closeness, these constructs were tested separately for their relations with externalizing problems over time. In a departure from past research with non-ASD sample, a transactional association between externalizing behavior problems and STR quality was not observed in the combined, longitudinal model. Instead, cross-lagged panel analyses showed that the association between externalizing problems and STR quality

over time was driven by child externalizing problems, suggesting a possible causal impact of externalizing behavior on student–teacher conflict and closeness. Children with higher behavior problems experienced significant declines over time in STR quality; in fact, higher externalizing problems predicted increased student–teacher conflict even into the subsequent school year with a new teacher. It is possible that an earlier-occurring factor or unexamined variable also may be acting as a causal agent in the relations between externalizing behavior problems and STR quality (Little, Preacher, Selig, & Card, 2007). However, the inclusion of a third time point in the current study, which extends to the spring of the subsequent school year, and the continuity of the observed relationships into a third time point, both speak to *within-child* changes that persist over time, even across classrooms and with different teachers.

A consideration of both our correlational and our cross-lagged SEM analyses together reveals the benefits of utilizing SEM to enable more accurate and specific analytic interpretations. Taken alone, the bivariate correlations between externalizing problems and student–teacher conflict over time suggest that, when no other variables are partialled out, the two constructs are strongly correlated with each other over time in both directions. Indeed, the strengths of the correlations between either variable at Time 1 and the other variable at Time 2 were strong (rs of .53 and .63) and were not significantly different from one another. Thus, baseline levels of either variables–externalizing problems or student–teacher conflict–strongly predicted later levels of the other. However, by considering all of these variables together, the cross-lagged model revealed the relative importance of initial externalizing problems in predicting change in student–teacher conflict (with Bs of .23 and .25 for the paths from EXT1 to STR2 and EXT2 to STR3), rather than the reverse. In fact, in this combined model, the paths from STR1 to EXT2 and from STR2 to EXT3 were quite non-significant (Bs = -0.05 and -0.02, respectively). The important distinction here is that a cross-lagged model allows us to examine, not only how two variables relate over time, but how each variable uniquely predicts *change* in the other variable (Kline, 2010). In this case, even though both externalizing problems and student–teacher conflict were associated with each other across time, only externalizing problems predicted change in student–teacher conflict over time; student–teacher conflict did not predict change in externalizing problems in the context of this combined model.

4.1. Strengths and limitations

The current study contains multiple methodological strengths, including a longitudinal study design, a large sample recruited from the community, and the use of the ADOS to verify ASD diagnosis among child participants. The majority of our child participants were enrolled in public schools, thus reflecting the early school experiences of the majority of young children with ASD in the United States. The current study also benefited from a high rate of teacher participation, including three time points over a year and a half. The inclusion of two teacher perspectives in this study is an additional strength, because it captures the continuity of symptoms and behavior patterns across teachers and settings. Also, while children's level of cognitive functioning was not found to moderate significantly the relations between externalizing behavior problems and STR quality, the inclusion of children with a range of cognitive functioning is an additional strength of the current study.

Although the current study contains a number of strengths, it is important to note some of its limitations. Namely, the sample consisted of predominately White children of European-American heritage; this limits the extent to which factors related to race and ethnicity, such as cultural factors and discrimination experiences, may be analyzed as predictors or moderators of children's early school adjustment. While the sample contained children with a range of cognitive functioning, children with moderate to severe intellectual disabilities were not enrolled and thus, the results may not generalize to lower-functioning children with ASD. Similarly, current findings may not generalize to children with ASD in more restrictive school environments and non-public school settings.

4.2. Future directions

The current study focuses specifically on the relationships between children with ASD and their primary teachers, and does not examine the quality of relationships with other school personnel, including classroom aides, or how these may impact relationships with the primary teacher. Existing research suggests that the presence of individual aides, particularly in inclusive classrooms, may interfere with the ability of children with ASD to form close relationships with both their teachers and their peers (e.g., Marks, Schrader, & Levine, 1999; Symes & Humphrey, 2011). However, the impact of aides remains unclear, as other researchers have observed no differences in student–teacher relationship quality between children with ASD who did and did not have aide support (e.g., Robertson et al., 2003). Subsequent research ought to consider the influence of children's relationships with other school personnel on the quality of relationships with the primary teacher.

The consistently low STR quality, including elevated conflict and low closeness, for students with ASD and their teachers is notable, and deserves continued attention. Especially notable is the persistence of these relationship patterns from one classroom and teacher to the next. The findings of the current study underscore the need for support and intervention for young students with ASD, especially during the early school years. Based on the current findings, it is feasible that future interventions that target STR quality may have an indirect impact on children's externalizing problems. Similarly, interventions that target children's externalizing problems may have the added benefit of improving their relationships with their teachers. Although not explored in the current study, positive student–teacher relationships have been associated

with positive academic outcomes in TD samples, including improved literacy and pre-literacy skills (Curby, Rimm-Kaufman, & Ponitz, 2009). Interventions targeting teachers, in order to enhance their preparedness to build relationships with children with ASD, may also be effective means of curbing long-term externalizing symptomatology and the corollary academic and social problems that such persistent symptomatology may produce (Bornstein, Hahn, & Haynes, 2010).

Acknowledgements

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