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Reciprocal Relations Between Student–Teacher Relationship and Children’s Behavioral Problems: Moderation by Child-Care Group Size

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In this Norwegian study, bidirectional relations between children’s behavior problems and child–teacher conflict and closeness were examined, and the possibility of moderation of these associations by child-care group size was tested. Eight hundred and nineteen 4-year-old children were followed up in first grade. Results revealed reciprocal effects linking child–teacher conflict and behavior problems. Effects of child–teacher closeness on later behavior problems were moderated by group size: For children in small groups only (i.e., ≤ 15 children), greater closeness predicted reduced behavior problems in first grade. In consequence, stability of behavior problems was greater in larger than in smaller groups. Results are discussed in light of regulatory mechanisms and social learning theory, with possible implications for organization of child care.

Children with externalizing behavior problems tend to be hyperactive, impulsive, and aggressive, performing less well in school than other children (O’Connor, Dearing, & Collins, 2011). Externalizing behavior problems are evident during the preschool years, tend to persist into school age, and can extend into adulthood, with possible results such as low educational achievement, unemployment, and criminality (O’Connor et al., 2011).

In addition to established child and family predictors of behavioral problems, evidence indicates that child-care experience also matters (Belsky et al., 2007; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 2003). Prior research has examined whether and how proximate markers of child-care quality (e.g., caregiver sensitivity, cognitive stimulation) as well as more structural features (e.g., type, group size, time spent in child care) may influence children’s development (e.g., McCartney et al., 2010; NICHD Early Child Care Research Network, 2006). Of particular importance for this report is evidence that the quality of relationships that children experience with their caregivers is predictive of children’s behavior problems (Sabol & Pianta, 2012).

Consistent with ecological (Bronfenbrenner & Morris, 1998) and transactional (Sameroff & MacKenzie, 2003) theoretical frameworks that underscore the ongoing reciprocal relations between children and their surroundings, preschool relationships with teachers not only influence children’s development but are also expected to be affected by characteristics of children (Birch & Ladd, 1998; Sutherland & Oswald, 2005). Of note, however, is that evidence of such reciprocal effects in the case of children’s behavior and the student–teacher relationship (STR) is limited (Nurmi, 2012). One of the few relevant studies found that more child aggression at the beginning of the kindergarten year predicted increased teacher–child conflict, which in turn forecast an increase in child aggression by the end of the school year (Doumen et al., 2008). In the present research, we sought to extend prevailing knowledge by examining bidirectional processes involving two aspects of STR quality—conflict and closeness—and children’s externalizing behavior; additionally, we sought to evaluate whether the assumed reciprocal relations persist across the transition from preschool to school.

Furthermore, prior research provides evidence that effects of teacher–child relationships can be

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moderated by children's characteristics (e.g., gender: Baker, 2006; race: Murray, Waas, & Murray, 2008; externalizing behavior: Baker, 2006; Silver, Measelle, Armstrong, & Essex, 2005; effortful control: Liew, Chen, & Hughes, 2010). Classroom context has also been regarded as a potential moderator of child effects on their later development (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008). In this regard, the research reported herein is the first to test the proposition that preschool group size can moderate the putative influence of preschool teacher-child relationship or child behavior on children's future functioning. Therefore, the second goal of the present study was to investigate whether the preschool context, operationalized here in terms of group size, can alter (a) discerned effects of teacher-child relationship on the development of behavior problems, as well as (b) anticipated effects of children's behavior on subsequent behavior and quality of STR.

STR and Problem Behavior—Reciprocal Relations

Pianta (1999) theorized, consistent with attachment theory, that the STR can function as a secure base to aid and abet children's adjustment to school settings and, thereby, their positive development. For such a sense of felt security to develop—and with it the capacity to self-regulate emotion and behavior—the teacher should accurately perceive the child's needs and desires and behave in a supportive and caring manner (Pianta, 1999; Pianta, Hamre, & Stuhlman, 2003). In consequence, children should learn or continue to use adaptive strategies when engaging their social environment (Silver et al., 2005). Thus, high-quality STRs, characterized by high levels of closeness and low levels of conflict, are presumed to promote children's self-regulatory capacities (Pianta, 1999). Positive STRs might help children to develop—or maintain—positive internal working models of self and others, encourage them to seek support from others, while enabling them to manage their emotions in a socially acceptable manner (O'Connor et al., 2011). As a result of such supportive relationship experiences, children should be motivated to engage in appropriate behavior (Hamre & Pianta, 2001). Not surprisingly, then, positive STRs have been found to protect against the development of behavior problems (Buyse et al., 2008; Hughes & Cavell, 1999; O'Connor et al., 2011; Silver et al., 2005). In contrast, high levels of conflict and/or low levels of closeness with the teacher predict increased aggressive behavior over time (Birch & Ladd, 1997; Pianta

& Stuhlman, 2004; Silver et al., 2005). Low-quality STRs may lead teachers to be less sensitive, provide less support, and try to control children's behavior (Hamre & Pianta, 2001), which might result in cycles of coercive interaction (Sutherland & Oswald, 2005), thereby fostering the development of maladaptive strategies of emotion regulation or conflict resolution.

Effects of STRs in preschool tend to endure over several years (Hamre & Pianta, 2001), thereby influencing future relationships with teachers in school (Howes, Phillipsen, & Peisner-Feinberg, 2000; Jerome, Hamre, & Pianta, 2009; O'Connor & McCartney, 2006). Nevertheless, it must be appreciated—as the concept of coercive cycles just mentioned clearly implies—that influence processes are bidirectional (Sameroff & Mackenzie, 2003; Sutherland & Oswald, 2005). Thus, greater behavior problems on the part of the child predict more problematic STRs (Nurmi, 2012), with the reverse being true of lower levels of behavior problems (O'Connor, 2010). Indeed, two studies chronicled reciprocal effects linking children's externalizing behavior and teacher-child conflict in preschool (Zhang & Sun, 2011) and in kindergarten (Doumen et al., 2008). What has not yet been established is whether discerned reciprocal effects also apply to teacher-child closeness and/or persist across the transition from preschool to school, the developmental focus of the current inquiry.

In addition to child characteristics, the reciprocally dynamic STR can be influenced by factors and forces beyond the school setting, most notably the family (O'Connor, 2010). This would be consistent with Bronfenbrenner's (1977) notion of the "mesosystem" or interrelation of immediate settings in which the child spends substantial time. This implies that the background family context should be taken into account when examining children's experiences and functioning in preschool and elementary school.

Furthermore, whereas previous research has focused almost exclusively on teacher-reported problem behavior (e.g., Doumen et al., 2008; Silver et al., 2005), in the present study we extend inquiry by examining whether effects of STR might translate on general aspects of children's behavior, not only in the school, but also in other social arenas, as seen through the eyes of the child's parents.

The Moderating Role of Preschool Group Size

Based on the notion that reciprocal, cross-time relations between teacher-child relationships and

behavior problems—the focus of interest here—are probabilistic and can vary as a function of the context in which these relationships operate (Sameroff, 1975; Sameroff & Mackenzie, 2003), we examine the moderating role of preschool classroom context. Much research underscores the importance of classroom relational climate or classroom aggression levels, as predictors of the STR (Mantzicopoulos, 2005) or as predictors of changes in student aggression (Thomas, Bierman, Powers, & the Conduct Problems Prevention Research, 2011). Such evidence raises the possibility that classroom contextual factors could affect the extent and/or nature of cross-time links between caregiver/teacher-child relationships and behavior problems. However, evidence of such contextual moderation is limited to only one study showing that the effect of children's externalizing problems on subsequent conflict with teachers proved most pronounced when children were in classrooms marked by high levels of problem behavior (Buyse et al., 2008). What these investigators did not consider, however, was whether a reciprocal process is operative as well, and thus whether this caregiver/teacher-child relationship effects on child behavior are also moderated by classroom context. One of the goals of the current study is to address this empirical lacuna and, thereby, extend inquiry in this area. This is done by focusing on group size as a contextual moderator of reciprocal, cross-time links between caregiver/teacher-child relationships and problem behavior.

We focus on group size, because it has been linked with children's functioning. More specifically, children who spend a greater proportion of their time in child care in a large group of peers engage in more externalizing behavior than other children (e.g., McCartney et al., 2010). This may be because children in small groups spend less time interacting with peers and more time interacting with adults than they do in larger groups (e.g., Dunn, 1993). Furthermore, in smaller groups, the teacher might engage in more direct interaction with the individual child (Bourke, 1986) compared to children in larger groups, who gain less individual attention from adults (Blatchford, 2003; Pianta et al., 2003). Structural characteristics of preschool groups in terms of their size might not only directly affect the quality of child-teacher interactions, such as the teacher's sensitivity (Pianta et al., 2003), but they might also possibly exacerbate effects of already established behaviors and relationships on later functioning. Based on these observations, we expect that experience in *smaller* groups will enhance the influence of child-teacher relationship

quality on subsequent child behavior. This social-learning-theory-based hypothesis (Bandura, 1971) stems from the view that in small groups, the teacher will be a greater source of influence on children than in large groups. We further expect that experience in *larger* groups will strengthen the links between children's problem behavior and later children's functioning due to learning of antisocial behavior from peers.

Group Size as a Moderator of the STR—Children's Behavior Link

With regard to the link between STR and later children's functioning, we assume that children in small groups will be more likely to learn to regulate their emotions and behavior when they experience closer and less conflicted relationships with teachers than when they spend more time in large groups. What this hypothesis implies, of course, is that small groups should enhance the influence of the STR in a for-better-and-for-worse manner: When children are in small groups and child-teacher relationships are more positive, children should manifest fewer problems over time, but when such relationships are more conflicted in small groups, children should develop more problems than would be the case were they in larger groups.

In other words, we predict that when group sizes are smaller, teacher-child closeness will exert a greater protective effect on future behavior problems than when they are larger. This expectation is based on the view that in smaller classes in which teachers can spend more time with and get to know children better, the effects of closeness will be more pronounced in preventing the growth of behavior problems. However, when teachers experiencing conflicted relationships with students are forced to attend to a child more frequently—as is presumably the case in smaller groups—they might participate in more coercive interactions, which might in turn result in the fostering of problem behavior. These processes, we suspect, would be less likely to operate in larger groups where individualized attention may be less frequent.

We contend that predictions advanced through this point should receive empirical support even when the adult-child ratio remains constant as group size varies—as it typically does in the Norwegian context where the current research was carried out (i.e., six children per adult). We base our reasoning on the view that smaller groups are more likely to remain stable throughout the day, so that the child has the opportunity to interact with the

same teacher over hours, days, weeks, and months. In large groups, efforts to create smaller subgroups—so that special activities can be pursued—often result in children dealing with different teachers throughout the day. And in situations in which large groups remain undivided, the complexity of interactions and interactants (child–child; teacher–teacher; child–teachers) likely results in less opportunity for children to benefit from established close relationships with an individual teacher to the same extent as children from smaller groups. Thus, even though the teacher–child ratio in larger groups remains the same as in smaller groups, teachers have to divide their attention between a larger number of children. By the same token, the hypothesized negative effects of a conflicted relationship with one teacher on later children’s functioning will be less pronounced in larger groups compared to smaller groups. This line of argument is supported by evidence from qualitative research conducted in Norway, revealing that teachers in larger centers that typically have larger groups report that it is more difficult for them than for teachers in smaller centers who manage smaller groups to pay attention to individual children (Alvestad et al., 2014; Seland, 2011).

*Group Size as a Moderator of Children’s
Behavior—Later Functioning Link*

Furthermore, it is possible that group size can moderate the stability of problem behavior. We hypothesize that when children are exposed to more peers in large preschool groups that negative peer influence will be greater; thus, preschool-age problem behavior will predict greater problem behavior on the part of first grade-age children than would be the case were groups smaller. This prediction is based on the social-learning view that in larger groups, children often learn antisocial behavior from peers (Laird, Jordan, Dodge, Pettit, & Bates, 2001). There is also empirical evidence supporting this peer learning mechanism in a school setting. Barth, Dunlap, Dane, Lochman, and Wells (2004) found that children already showing behavior problems in fourth grade displayed a greater increase in problem behavior when placed in highly aggressive fifth-grade classroom environments than when placed in less aggressive classrooms. Therefore, it is possible that children already displaying behavior problems might be more vulnerable to the influence of large group size and will thus be more prone to manifest such problem behavior 2 years later.

There is further evidence consistent with the proposition just advanced that large groups may promote problem behavior. An American study by McCartney et al. (2010) showed it was principally when children were in large groups—which proved to be the norm—that greater exposure to child care predicted more externalizing problems. Experience in large peer groups has also been linked to higher stress levels and behavioral and emotional dysregulation (Fabes, Hanish, & Martin, 2003), which might in turn lead to increased problem behavior (Legendre, 2003; Vermeer & van IJzendoorn, 2006).

Based on the aforementioned findings, we argue that this negative peer-learning process will prove more operative in larger groups—though we do not measure this process directly, but only examine its hypothesized effects. We argue that larger groups have a greater probability of containing at least some children with behavior problems. Children in larger groups may thus have more opportunity to be disturbed by or interact with noncompliant children or children with problem behavior than in smaller groups. In other words, contact with larger number of peers increases the probability of observing and potentially reproducing problem behavior, and hence leading to increased stability of behavior problems.

According to Clarke-Stewart (1989), children do not learn to follow social rules or to resolve conflicts without resorting to aggression unless guided by their caregivers. However, larger groups might put extra strain on teachers, thus leaving less opportunity for providing emotional support and appropriate response to children’s problem behavior, which might in turn lead to even more problem behavior—even in the face of common teacher–child ratios across smaller and larger classrooms. Therefore, we argue that this additional explanation in terms of less positive teacher-directed regulation of behavior might add to the effects of more negative peer influence, and thereby increases the stability of behavioral problems among children in larger groups.

So far, we have hypothesized that in larger groups compared to smaller groups, the stability of problem behavior will be greater than would be the case were children in smaller groups. Nonetheless, based on the bidirectional perspective, it is possible that group size can also moderate the effect of children’s problem behavior on later student–teacher conflict. However, we did not formulate a specific hypothesis regarding this relation and our investigation of this interaction was only exploratory.

Norwegian Child-Care System

In order to familiarize readers with child care in Norway, which has a system quite different from that of the United States, the locale where most of the work cited in this report was conducted, we provide a brief description of its most important regulatory conditions. Norwegian welfare state provides employees with parental leave for 10.5 or 13 months with, respectively, 100% or 80% salary replacement and universal, heavily subsidized access to child care, to which every toddler is entitled upon turning 1 year of age. Consequently, 80% of children enroll in a day-care facility during their 2nd year of life (Statistics Norway, 2013a).

Many aspects of Norwegian child care are regulated by law, including the preschool curriculum, staff training and adult-child ratio. As a result, the quality of Norwegian child care is quite homogeneous and in accord with international standards (UNICEF, 2008). Indeed, Norway achieved 8 of a maximum 10 benchmarks; the United States achieved 3. The Norwegian system prescribes that the adult-child ratio cannot be greater than one caregiver for every six children age 3 or older, and this rule is widely followed (Vassenden, Thygesen, Bayer, Alvestad, & Abrahamsen, 2011). However, Norway lags behind several highly developed countries when it comes to staff education, because it does not meet the suggested criteria that 80% of all child-care staff must be trained (UNICEF, 2008). There must also be at least one teacher—with minimum of 3 years of preschool pedagogical education at college level—per 14–18 children age 3 or older, and a child-care center pedagogical leader must have the same qualifications (Ministry of Education, 2012). However, in 2006, 8% of child-care staff who were supposed to have such education did not meet these requirements (Kjelvik, 2012).

Day care is mainly provided in child-care centers and to a smaller extent in group care in private homes (3.4% in 2008; Norwegian Directorate for Education and Training, 2012). The maximum monthly fee that parents pay—about \$ 380—is legally stipulated (Statistics Norway, 2013b). There are virtually no differences between various types of child care, except that in private-home child care the staff is slightly less educated and must be occasionally supervised. Importantly, *size of the peer group is not regulated and can vary between different arrangements* (as long as the standard ratio is maintained). In the current study, we thus aim to investigate the importance of the size of the child-care group when it comes to understanding the cross-

time interrelation of STRs and children's behavior problems. Given the presence of ratio- but not group-size-related regulations in the Norwegian child-care system, there will be clear translational implications should the hypotheses advanced receive empirical support.

Method

Participants and Procedures

The Trondheim Early Secure Study comprises participants from two birth cohorts of children born in 2003 and 2004 and their parents living in the city of Trondheim, Norway. Only a brief outline is provided here, as details about the procedure and recruitment have been presented previously (Wichstrøm et al., 2012). The Strengths and Difficulties Questionnaire (SDQ) 4–16 version (Goodman, 1997), together with an invitation letter, were mailed to parents ($N = 3,456$). Completed SDQs were brought to a subsequent community health checkup; all 4-year-olds in Norway are encouraged to attend the well-child clinic and 3,358 did so. Parents with inadequate proficiency in Norwegian were excluded ($N = 176$). The health nurse missed asking 166 parents about their interest in participating in the study. At the well-child clinic eligible parents ($N = 3,016$) were informed about the study using procedures approved by the Regional Committee for Medical and Health Research Ethics. Written consent was obtained from parents of 2,475 children (71.6% of all contacted).

In order to recruit a study sample that oversampled for children at risk for developing problems, children's SDQ total difficulties scores were divided into four strata. Using a random number generator, defined proportions of children in each stratum, ranging from few to many problems (i.e., 0.37, 0.48, 0.70, 0.89) were drawn to participate in a further study ($N = 1,250$). Of the 1,250 parents invited to participate, 992 (77.9%) parents appeared at the university for further study at Time 1 (T1), where parents provided information about child-care history; child behavior, child, and family factors; and children's language comprehension ($N = 935$) was examined. Dropout rate did not vary by SDQ strata, $\chi^2 = 5.70$ (3), $p = .13$, or gender, $\chi^2 = 0.23$ (1), $p = .63$. Eight hundred and nineteen parents participated in a follow-up assessment 2 years later at Time 2 (T2), when the child had started in first grade. Almost as many girls (49.5%) as boys (50.5%) participated at T2. Nearly all parents who participated in the study were the child's

biological parent (98.2%), and a large majority of the participating parents were women (84.5%). Both mothers (96.4%) and fathers (94.8%) were mainly of Norwegian ethnicity. The majority of parents was married (54.8%) or had lived together for more than 6 months (34.3%). With regard to marital status, 8.5% were divorced or separated, 0.3% widowed, 1.2% had lived together for < 6 months, and 0.9% of the parents had never lived together.

The parents consented to having their child-care provider and/or teacher complete questionnaires regarding teacher-child relationship quality, which were sent to day-care centers at T1 and to primary schools at T2. Day-care centers and schools were requested to select the teacher who knew the child best to respond to the questionnaire. Response rates among teachers were 90.6% at T1 and 92.2% at T2. Preschool teachers had known the child for an average of 13 months whereas school teachers had known the child for an average of 6 months.

Measures

Externalizing Problem Behavior

The externalizing scale of the parent version of the Child Behavior Checklist (CBCL) was used to assess externalizing problems at T1 and T2 (Achenbach & Rescorla, 2000). At T1 the 1.5–5 year version was applied (25 items) whereas at T2 the 6–18 year version (35 items) was administered. For each item, the parent is asked to determine how well the item describes the child now or within the past 6 months: 0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very true or often true*. Higher scores indicate more problems. The CBCL has excellent concurrent and predictive validity and is the most widely used screening instrument for behavior problems in children (O'Connor, 2010). We preferred parent reports of CBCL to teacher reports in order to minimize the effects of shared rater variance if teachers were to rate behavior problems and child-teacher relationships. Cronbach's alphas were .89 and .88 at T1 and T2, respectively.

Student-Teacher Relationship

The conflict and closeness subscales of the Student-Teacher Relationship Scale (Pianta, 2001) were used to measure child-teacher relationships at preschool and at first grade on a 5-point Likert-type scale ranging from 1 = *definitely does not apply* to 5 = *definitely applies*. The conflict subscale (12 items) provides teacher-perceived negativity within the

relationship with the child, while the closeness subscale (11 items) assesses whether the teacher perceives the relationship to be warm, affectionate, and including open communication (Jerome et al., 2009). Cronbach's alphas were .77 and .82 for conflict, and .65 and .70 for closeness at T1 and T2, respectively.

Child-Care Group Size

Child care was defined as regularly scheduled care, outside of the child's home, provided by a nonrelative to three or more children. Parents reported how many other children were present in the child's child-care group at age 3–4 years. Groups that were smaller than 12 children represented only 7.3% of the sample. Based on the distribution of group size, we assigned children to small groups (up to 15 children) and large groups (more than 15 children). We arrived at cutoff point ≤ 15 because it represents the lowest tertile, but the results were robust for (small) group size up to 17 children. While the issue of group size illuminated in the work by McCartney et al. (2010) informed our study, we have not set out to use the American specific group size cutoffs, but rather aimed for group size cutoffs informative to the Norwegian context. We also tested whether there were any differences regarding strength of moderation of group size on STR and behavior between children from groups counting 16–20 children versus more than 20 children (second vs. third tertile); however, these groups did not differ significantly.

Child and Family Covariates

The associations between quality of the STR and levels of problem behavior (and stability of behavior over time) might be influenced by a variety of potentially confounding factors. Therefore, multiple covariates assessed at T1 were included in the study design, based on work cited in the following sentences showing them to be related to one or more of the STR and problem behavior constructs central to this inquiry. For children's characteristics, we selected gender (Birch & Ladd, 1997) and language ability using a Norwegian adaptation of the Peabody Picture Vocabulary Test-III (10 items; Dunn & Dunn, 1997; O'Connor et al., 2011), Cronbach's alpha = .98. We also examined temperament (Rudasill, Reio, Stipanovic, & Taylor, 2010), specifically, negative affectivity. This measure is based on the anger, discomfort, fear, sadness, and soothability (reversed) scales (62 items), as reported by parents using the Children's Behavior Questionnaire

for children 3–7 years of age (Rothbart, Ahadi, Hershey, & Fisher, 2001), Cronbach's alpha = .88. On the family level, covariates included level of maternal education (McCartney et al., 2010) in five categories (lower secondary, upper secondary, vocational school, college, university) and parental depression, assessed using the Beck Depression Inventory–II (21 items; Beck, Steer, & Brown, 1996; McCartney et al., 2010), Cronbach's alpha = .89.

Statistics

We applied structural equation modeling in Mplus (Muthén & Muthén, 2008), employing maximum likelihood estimation with robust standard errors. Since the sample was stratified at screening, analyses were weighted proportionally to the inverse of the probability of selection of each participating child. This provided unbiased general population estimates. Missing data were handled with full information maximum likelihood estimation.

Analytically, we first assessed reciprocal relations between measured variables (teacher-child conflict and closeness, child problem behavior, using sum scores) and stability in problem behavior over time in an autoregressive cross-lagged model. All T1 measures and all T2 measures were adjusted for all T1 covariates. This implied a fully saturated model that, by necessity, fits the data perfectly. Next, we tested whether associations were moderated by preschool group size—by means of a multigroup analysis, with significance levels of differences in paths tested by constraining one path at a time. Comparison of the differences between models was

based on the corrected chi-square difference test (Satorra & Bentler, 2001).

Results

Means, standard deviations, and bivariate associations (correlations) between analyzed variables are displayed in Table 1. Child-teacher conflict and closeness were negatively associated within and across time. Behavior problems were negatively associated with closeness and positively associated with conflict.

Examining Reciprocal Relations

In the regression analysis, we first examined the effects of preschool student-teacher conflict as well as closeness and children's behavior problems on the respective outcomes (conflict, closeness, and behavior problems) in first grade, controlling for possible confounding child and family factors. The resulting autoregressive cross-lagged model is displayed in Figure 1. Stability in conflict and closeness in teacher-child relationships was evident, albeit moderate, even though there was a change of all teachers between day care and school. Higher preschool conflict scores predicted higher levels of problem behavior in first grade, whereas higher score on closeness predicted lower levels of subsequent problem behavior. Examining how early problems related to later teacher-child relationships revealed that children manifesting more preschool-age problem behavior experienced more conflict with their first-grade teachers, whereas no association

Table 1
Descriptive Statistics and Correlations Between Variables

Variable name, theoretical min & max	Min	Max	M	SD	1	2	3	4	5	6
1. Closeness, T1, 11–55	19	54	39.15	4.49						
2. Closeness, T2, 11–55	21	50	38.33	4.90	0.22**					
3. Conflict, T1, 12–60	12	45	17.88	4.70	-0.14**	-0.11**				
4. Conflict, T2, 12–60	12	46	18.02	4.86	-0.07	-0.17**	0.29**			
5. Behavioral problems, T1, 0–50	0	35	7.12	6.17	-0.09**	-0.09*	0.22**	0.15**		
6. Behavioral problems, T2, 0–70	0	30	3.93	4.55	-0.17**	-0.19**	0.25**	0.32**	0.60**	
7. Group size	3	55	18.9	6.4	-0.03	0.01	0.00	0.01	0.02	0.02
8. Gender (1 = boys)	1	2	1.5	0.5	0.07*	0.12**	-0.06	-0.14**	-0.08*	-0.15**
9. Language ability, 0–119	23	119	91.39	21.90	0.00	-0.08*	0.00	0.04	0.05	0.05
10. Negative affectivity, 1–7	1.7	5.1	3.7	0.5	-0.01	-0.01	0.09*	0.01	0.50**	0.28**
11. Maternal education, 1–5	1	5	3.8	1.11	0.08*	0.06	-0.12**	-0.10*	-0.13**	-0.11**
12. Parental depression, 0–63	0	39	4.4	5.3	-0.08*	-0.07	0.02	-0.07*	0.27**	0.21**

Note. T1 = Time 1; T2 = Time 2.
p* < .05. *p* < .01.

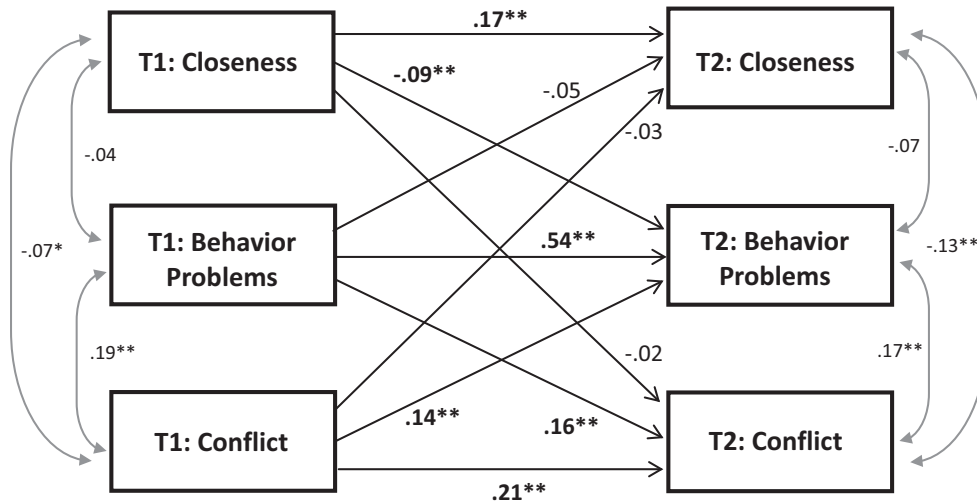


Figure 1. Main model with cross-lagged effects (standardized coefficients). Adjusted for covariates. * $p < .05$. ** $p < .01$.

between preschool-age problem behavior and later closeness with teachers emerged. Note that there was no direct effect of preschool group size on any of the outcomes, and potential effects of group size were also tested in the autoregressive cross-lagged model. R^2 coefficients were .37 ($p < .001$) for behavior problems, .10 ($p < .01$) for conflict, and .05 ($p = .01$) for closeness.

Moderation Effects of Group Size

Next we assessed whether the aforementioned bidirectional paths varied as a function of group size. Only some results proved consistent with predictions (Figure 2): In smaller groups (up to 15 children), child-teacher closeness at preschool predicted fewer behavior problems in first grade ($\beta = -.21, p < .001$), but as expected, no such effect of closeness on later behavior problems was evident in the case of children from larger groups ($\beta = -.05, p = .06$); critically, the coefficients for the two groups proved significantly different by corrected chi-square difference test, $\Delta\chi^2 = 4.23 (1), p = .04$. The effect of (greater) preschool child-teacher conflict on (more) problem behavior when children were in first grade was stronger in smaller groups ($\beta = .28, p = .01$) compared to larger groups ($\beta = .08, p = .05$), as expected, but the difference in coefficients across groups was not significant, $\Delta\chi^2 = 1.87 (1), p = .17$. Finally, the effect of preschool problems on child-teacher conflict in first grade was positive and larger in larger groups ($\beta = .18, p < .001$) than in smaller groups ($\beta = .11, p = .06$), but again the relevant coefficients did not

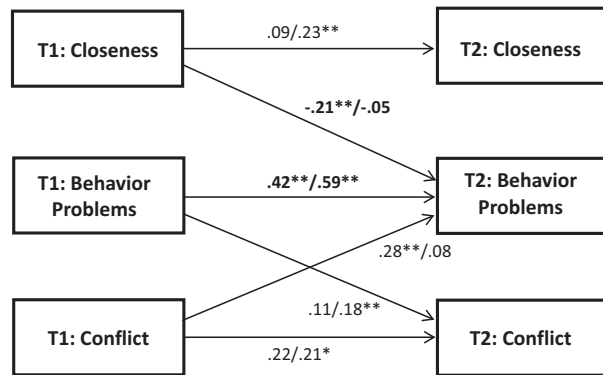


Figure 2. Moderation effects of group size (standardized coefficients by two categories of group size are presented: first by group size < 16, and second by group size 16 or greater). Significant interactions with group size are in bold. * $p < .05$. ** $p < .01$.

prove to be significantly different by the corrected chi-square difference test, $\Delta\chi^2 = 0.20 (1), p = .65$.

R^2 coefficients were .36 ($p < .001$) for behavior problems, .12 ($p = .11$) for conflict, and .02 ($p = .31$) for closeness in the smaller group. The respective measures in the larger group were .39 ($p < .001$) for behavior problems, .11 ($p = .01$) for conflict, and .08 ($p < .01$) for closeness.

Stability of Problem Behavior

As anticipated, problem behavior proved less stable over time among children from smaller groups than larger groups ($\beta = .42, p < .001$ and $\beta = .59, p < .001$, respectively), and this difference in stability coefficients proved to be statistically

reliable by the corrected chi-square difference test, $\Delta\chi^2 = 5.47$ (1), $p = .02$. A simple slope analysis revealed that the effect of the moderated stability in problem behavior started to be significantly different by group size when children scored 9 or more on the externalizing behavior scale. This means that it was only children with increased behavioral problems who displayed significantly higher stability in behavior problems when attending large groups compared to small size groups ($F = 4.10$, $p = .04$). Because closeness and child behavior were correlated (Table 1), we could have been tapping into the same phenomena. Therefore, we included both moderations in the same model, and these were still significantly different from a model specifying no moderation, $\Delta\chi^2 = 10.72$ (2), $p < .001$.

Discussion

Consistent with prior work, the current child-care-related study in Norway revealed that a more conflicted relationship between preschool teacher and child predicted more behavior problems when children were of first-grade age, even after controlling for the stability of problem behavior, but that greater closeness to teachers forecast fewer behavior problems in school-aged children. In other words, when STRs were poorer prior to school entry, behavior problems increased more over time, with the reverse being the case when these relationships were more positive. Although the effect of closeness on later problem behavior was small, our study makes an important contribution to the existing and rather limited evidence concerning student-teacher closeness and externalizing behavior (see Zhang & Sun, 2011). In fact, our study is among the first to report significant effects of closeness as a predictor of externalizing behavior development.

Furthermore and consistent with the reciprocal-process hypothesis, more early problems predicted increased conflict with school teachers 2 years later. However, early behavior problems were not associated with future teacher-child closeness. This finding is consistent with prior research (Zhang & Sun, 2011) and can be attributed to the presumption that teacher-child conflict is to a larger degree driven by the teacher's perception of children's externalizing behavior, whereas closeness is more likely to be a function of the teacher's skills, sensitivity, and responsiveness (Silver et al., 2005).

The present study expands existing knowledge by suggesting that the reciprocal relations between children's behavior and relationship with their

teacher persist through the transition from preschool to first grade. Our inquiry also showed that children's development related to two different social arenas—school and home environment—is interconnected. In particular, our findings underscore the importance of the preschool STR, which affects children's behavioral development beyond the context of an educational institution.

Additionally and consistent with our hypothesis regarding the moderating effect of preschool classroom context, specifically, group size, results indicated that experience in smaller groups strengthened the association linking greater preschool closeness with decreased problems 2 years later as compared to participation in larger groups; indeed, under the latter conditions, quality of teacher-child relationships in preschool failed to predict first-grade functioning. Although predictive coefficients relating the effect of conflict on later problem behavior were also stronger in smaller groups, consistent with expectations, this moderating effect of group size did not yield significantly different predictive coefficients across the two groups.

Recall that it was also predicted that participation in larger groups would generate greater stability in behavior problems across the transition to school. The data proved consistent with this hypothesis to a significant extent. However, with regard to the moderating effect of group size on the power of preschool problems to predict first-grade child-teacher relationships, the difference in coefficients across the two groups did not achieve statistical significance.

Although the results of the present study did not reveal any direct effect of group size on later children's functioning, contrary to some other prior research (see Dunn, 1993), our findings seem to highlight some benefits of small groups during the preschool period relative to larger groups. After all, supportive child-teacher relationships (i.e., greater closeness) in small groups forecast reduced growth of problems following the start of school and problem behavior in small groups displayed less stability. The latter result implies that children in small groups who manifest more problems than agemates were less likely to do so 2 years later relative to those with such problems in larger groups.

Why Might Small Groups Prove to Be a Beneficial Moderator?

We suggest that children might benefit from small groups due to the greater sense of security

and warmth that a supportive teacher–child relationship affords in such contexts than in larger groups (Pianta, 1999; Pianta et al., 2003). Young children depend on adults to be told and shown appropriate behavior and also to have their behavior monitored and corrected when necessary (Jerome et al., 2009). It is possible that the beneficial impact of a close relationship with a teacher in smaller groups is enhanced by a larger degree of proximity, stability, predictability, and comparatively smaller degree of complexity in personal interactions. As a result, it might be easier for children in smaller than larger group settings to initiate interaction with their teacher and to make use of a teacher’s support when needed. Similarly, teachers in small groups might be better positioned to provide individualized response to children’s behavior. Such a conclusion might remain valid also under conditions of fixed teacher–child ratio, which arguably cannot substitute several aforementioned beneficial features of smaller groups compared to larger groups.

We thus contend that the beneficial effect of close relationships with teachers is enhanced in smaller groups due to the greater likelihood of positive one-to-one child–teacher interaction (Bourke, 1986), which might foster a greater sense of security. Such a perceived sense of emotional support might contribute to better self-regulation and internalization of classroom norms for appropriate behavior. Composition of groups, in terms of fewer children with problem behavior present in small groups compared to larger groups, might also influence children’s behavior by providing more positive behavioral norms or expectations (Wright, Giammarino, & Parad, 1986). Additionally, small group membership (with fewer, but perhaps more frequent and intensive, relationships in the group) might strengthen the positive effect of a close STR by promoting children’s feelings of predictability, support, emotional security, and confidence.

In larger groups, not only might positive and individual interactions with teacher be less frequent, but more negative and insensitive interchanges might take place more often. Increased complexity of interactions in larger groups might also make it more difficult for teachers to respond in a timely and sensitive manner to an individual child’s behavior. In addition, peer influence, in terms of increased likelihood of observing and/or engaging in maladaptive behavior with both teachers and peers through observational learning, reinforcement learning, and peer-contagion processes

(Dishion & Dodge, 2005) might account for why problem behavior proved more stable over time in the case of children who experienced larger rather than smaller preschool groups. Moreover, in such circumstances, problem behavior may come to be regarded as more normative and perhaps acceptable (Farmer, McAuliffe Lines, & Hamm, 2011). Unfortunately, this speculative analysis must remain just that, as proximal process measurements of quality of teacher–child and child–child interactions were beyond the measurement possibilities of this epidemiological study. This lacuna highlights at least one future direction for research while underscoring a fundamental limitation of the current inquiry.

The superiority of small group size can be explained by two main theoretical principles, as suggested by Finn, Pannozzo, and Achilles (2003) in their review of small classes at school (i.e., not in day care). According to the “visibility-of-the-individual principle,” children in small groups cannot easily avoid being noticed and it is more difficult than in larger groups for teachers to ignore them. This makes it easier for teachers to monitor and respond in a timely manner to problematic behavior while being better positioned to notice—and reinforce—positive behavior. Additionally, the “sense-of-belonging principle” stipulates that small groups should foster greater cohesiveness and thus positive relationships among group members, including the provision and receipt of emotional support (Finn et al., 2003).

Importantly, our failure to detect any exacerbating effect of small group size on the relation between preschool child–teacher conflict and later behavior problems suggests that even though small groups apparently amplify effects of positive STRs, they do not strengthen effects of negative relationships, as we suspected might also be the case. This, of course, would seem to be good news. Possibly, management of comparatively fewer children in the group makes it easier for the teacher to respond in more appropriate ways to children’s emotions and behavior, even when there is conflict.

In addition, it should be mentioned that teacher–child relationships contribute to the tenor of the relationship, but not to the frequency of interaction. Interpretations of the findings once again call attention to the need to measure carefully in future studies the dynamic social interaction processes that take place between teachers and children and among children in smaller and larger groups.

Limitations and Translational and Theoretical Implications

Recall that Norwegian law regulates many aspects of child care, including the adult-child ratio, but not group size. What the current research makes clear, then, is the potential benefit of regulating not just adult-child ratio because the apparent effects of group size cannot be attributed to differences in adult-teacher ratio. Unfortunately, we were not able to assess stability of day-care personnel, so cannot be certain that the role of group size discerned in this inquiry was not itself a function of staff absence or turnover. This is an important limitation of the research that needs to be highlighted because one recent Norwegian study found that in larger centers, which typically have more children per classroom, there is greater staff turnover and also staff absence due to illness (Vassenden et al., 2011). Such instability of personnel might undermine children's feeling of security, as well as reduce their comfort in interacting with or responding to teachers.

Another limitation is that children in child care all had at least another preschool teacher, but we collected information from only one teacher (who knew the child best). Thus, we cannot preclude the possibility that children might have different relationships with the other teacher. We might assume that additional relationships of the same quality in the child-care group might strengthen the observed relationship effect, while contrasting relationships might lessen it. In fact, we could speculate that the absence of the protective effect of closeness on problem behavior in large groups could be a function of other relationships, possibly of lower quality, in such groups. Finally, we have to acknowledge that various preschool as well as school factors, which we did not account for, such as years of teaching experience (O'Connor & McCartney, 2006), teacher's education (Howes, Whitebrook, & Phillips, 1992), teacher self-efficacy (O'Connor, 2010), classroom size, as well as child care and classroom environment (O'Connor, 2010; Pianta, 1999; Pianta et al., 2003; Sabol & Pianta, 2012), could have affected the reported relations. Future work should explore such possibilities.

Conclusion

The major contribution of this study involves extending consideration of group-size effects on the quality of child-teacher relationships and on children's development, two well-studied foci of devel-

opmental and educational interest, especially in the context of common teacher-child ratios across groups of different sizes. More specifically, in highlighting differences between smaller and larger groups in terms of the (apparent) influence of child-teacher relationships during preschool on the development and stability of behavior problems (in this observational/correlational study), this work highlights the need to think of group size in moderational, not just main-effect, terms, as has been the tradition in research on child care and classrooms. Moreover, due to the absence of regulations stipulating permitted group size, this work calls attention to the potential utility of regulating preschool group size in Norway—or eventually decreasing already regulated maximal group sizes in other countries.

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