Teacher attunement to preschool children's peer preferences:

Associations with child and classroom-level variables

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Conflict of Interest Statement

The authors whose names are listed immediately above certify that they have NO affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Abstract

Teacher attunement to peer preferences in preschool was assessed as the level of teacher-child agreement on each child's preferred playmates. The associations between attunement and children's age, sex, disability status (with or without disabilities), time spent with teacher, and classroom level variables - group size, emotional support, classroom organization, instructional support, and teacher experience - were investigated. Participants were 1415 children from 86 classrooms (743 boys and 672 girls; M_{age} = 62.15 months, SD = 8.80), including 108 children with disabilities. Overall, results showed that higher teacher attunement was associated with children's age (being older) and not having a disability. Implications for educational policies and classroom-level professional development are discussed.

Keywords: preschool, peer preferences, teacher attunement, classroom quality domains

Teacher attunement to preschool children's peer preferences:

Associations with child and classroom-level variables

This study assessed teachers' attunement to children's peer preferences in preschool, measured as the agreement between teachers and children regarding each child's peer preferences. We also analyzed the associations between attunement and several important child and classroom variables.

The Preschool Setting as a Context for Peer Interactions and Relationships

Successful peer interactions and relationships are fundamental for children's social development and adaptation (Stanton-Chapman, 2015). For most children in Western countries, the school setting is a natural ecology, a microsystem (Bronfenbrenner, 2005) affecting children's behaviors, interactions, and relationships. The preschool years are the launching years, marked by significant increases in peer interactions' frequency and diversity of partners (Benenson et al., 1997). Close peer relationships, frequently derived from self-report measures of mutual peer preferences, play an important role in social development. Mutual preferences during preschool associate with (a) higher levels of social competence (e.g., Daniel et al., 2015), (b) positive play behaviors and peer acceptance (e.g., Coelho et al., 2017), increased (c) social skills (e.g., Engle et al., 2011), (d) social engagement (Santos et al., 2015), (e) prosocial behavior (e.g., Santos et al., 2015), and (f) self-regulation (Santos et al., 2014b).

The Teacher's Role

In accordance with the Teaching Through Interactions framework (see Hamre, 2014), teachers address children's needs for relatedness and promote social skills development and positive peer relationships by providing consistent emotional support. Classroom organization and instructional support, two additional domains of classroom quality in this framework, are

also known to support early development and learning, when a certain level of quality is reached

(e.g., Burchinal et al., 2014). Conceptually, emotional support is rooted in attachment (e.g.,

Ainsworth et al., 1978; Bowlby, 1969) and self-determination (e.g., Ryan & Deci, 2000) theories

(see Hamre et al., 2007). Specifically, teachers may provide emotional support when they: a)

promote classroom positive climate, based on close and secure relationships, mutual respect,

positive communication and affect; b) are sensitive to children's needs, through awareness and

responsiveness, ensuring children's comfort; c) and acknowledge and support their perspectives.

Emotionally supportive teachers provide social relationships' positive models, expectations, and

attitudes, ensuring also multiple opportunities for children to establish positive interactions and

relationships with peers (Pakarinen et al., 2020). Research suggests that high levels of emotional

support positively associate with social outcomes during preschool (e.g., Curby et al., 2013; Qi et

al., 2020). It also suggests that promoting positive peer interactions and relationships for children

with disabilities may require more individualized and intensive approaches (see Case-Smith,

2013; McCollow & Hoffman, 2019).

Teacher Attunement to Children's Peer Relationships

Teachers' ability to recognize the classroom social dynamics, including social positions

and roles in the group, has been referred to as teacher attunement (Ahn & Rodkin, 2014; Hamm

et al., 2011) and measured as the extent to which teachers' reports overlap with students' reports

(Marucci et al., 2018). Teacher attunement reflects how well teachers are aware of children's

social experiences (Ahn & Rodkin, 2014) and might be an important feature of teachers'

relationships with children (Hamm et al., 2011). Attuned teachers are thought to be able to act

with an (in)visible hand, influencing children's peer experiences (Bierman, 2011; Hamm et al.,

2011), and addressing their needs for relatedness (Hamm et al., 2011; Ryan & Deci, 2000).

Therefore, we propose that teacher attunement to children's peer-related experiences is an important condition for teacher's provision of emotional support. This concept relates to attachment literature, in which attunement is referred to as being on the same wavelength, emerging from a dynamic relationship where partners' tunes influence each other (Field, 1985). Using the concept of teacher attunement in studies with young children highlights the role of shared views for the effective management of classroom social dynamics. Further, it draws attention to the teacher as one meeting relational needs, paramount for young children.

Extant research with older children suggests that teacher attunement to peer-related experiences is associated with children's popularity, leadership, and affiliation patterns (Hoffman, 2012). Responsive teachers, attuned to classroom friendships, have students with higher levels of self-reported school motivation (Gest et al., 2014). Moreover, it is also related with more positive school adjustment (Hamm et al., 2011; Neal et al., 2011). Teachers' attunement to children's affiliation's network (6th grade) has been associated with improvements in children's perceptions on the school bullying environment (Hamm et al., 2011). Further, improvements in elementary students' popularity have been associated with teachers' attunement to peer group membership, whereas increases in student centrality (in the web of the classroom relationships) have been associated with teachers' attunement to specific peer group affiliates (Hoffman et al., 2015).

Overall, studies suggest that teachers' attunement might be positively associated with some aspects of children's peer-related experiences. Importantly, available studies have not examined the outcomes of teacher attunement to preschoolers' peer relationships nor the mechanisms explaining the associations between teacher's attunement and children's peer-related experiences. However, it is likely that teacher attunement is a necessary condition for teachers to

identify young children's needs. Indeed, such attunement may be an indicator of teachers' ability to "put themselves in children's shoes" (Meyer & Ostrovsky, 2018, p. 101) and a condition to provide individualized support.

Teachers' Attunement to Preschoolers Peer Relationships

Available evidence suggests that preschool teachers are not quite confident in identifying children's friendships and may be less accurate in identifying the friendships of young children with disabilities (Meyer & Ostrosky, 2018). Author (2017) reported a weak association between teachers and preschoolers reports of sociometric popularity of children with disabilities. This is noteworthy because, compared to typically developing children, preschoolers with disabilities have been found to: (a) be less socially accepted (Down syndrome; Schwab et al., 2015), (b) have lower increases in the frequency of peer interactions over time (mild developmental delays; Guralnick et al., 2006), (c) show patterns of more conflictual peer interactions (Guralnick et al., 2006), and (d) have fewer friends (behavioral disabilities; Buysse et al., 2012; Ferreira et al., 2017). Still, on average, preschool children with disabilities are involved in, at least, one mutual relationship (see Meyer & Ostrosky, 2014).

Other studies with preschoolers assessed the agreement between teachers and children on sociometric measures, mostly attempting to support methodological choices, such as trusting (or not) that teachers are reliable sources for assessing peer social structure. For example, Wu et al. (2001) compared teachers and preschoolers perceptions of popularity. Peer and teacher sociometrics loaded on two different factors, indicating that teachers' perceptions of children's popularity were only moderately similar. Authors (2020) also found low agreement between sociometric popularity of preschoolers without disabilities, measured through peer sociometric nominations and teachers' classifications.

Variables associated with Teacher Attunement to Children's Peer Relationships

To the best of our knowledge, no studies have specifically addressed the child and classroom-level features associated with teacher attunement to peer preferences in preschool. Based on the evidence presented above, children's disability status likely associates with teacher attunement (e.g., Author, 2019; Meyer & Ostrosky, 2018). Children's sex might also play a role, but data are inconsistent. Gest (2006), for example, did not find sex differences in teacher attunement to peer-related social experiences in elementary school. On the other hand, Ahn and Rodkin (2014) found that aggressive boys (but not girls) lost social status over time when teachers were more attuned to classroom social dynamics. Importantly, classroom-level characteristics have also been shown to relate with attunement. Specifically, teacher attunement has been found to be negatively associated with group size in elementary (Neal et al., 2011) and middle school (Marucci et al., 2018). Further, teacher attunement has been positively associated with time teachers spend weekly with their 6th grade students and their experience as teachers (Marucci et al., 2018). We are not aware of other studies reporting associations between teaching experience and teacher attunement to young children's peer preferences. Nevertheless, prior studies have considered teacher experience in relation with child outcomes and teacher-child interactions and the results are not conclusive (e.g., Brown et al., 2008; Downer et al., 2010; Guo et al., 2011; Kiuru et al., 2012; Marucci et al., 2020; McMullen et al., 2020). For example, while Brown et al. (2008) found a positive but weak association between teacher experience and child outcomes during the preschool and Marucci et al. (2020) found such a positive association in the early elementary years, most studies indicate no association (Guo et al., 2011; McMullen et al., 2020) or a negative association (Downer et al., 2010; Graham et al., 2020; Kiuru et al., 2012; Marucci et al., 2020), with less teaching experience associated with better child outcomes or

teacher-child interactions. For example, less teaching experience was associated with teachers'

improved ability to recognize children victims of bullying (Marucci et al., 2020) and with

classrooms with higher emotional support (Kiuru et al., 2012). Overall, negative associations

have been explained by the possibility that less experienced teachers, trained more recently, are

more sensitive to children's characteristics and aware of the impact of their teaching practices

(Kiuru et al., 2012).

Finally, Cappella and colleagues (2012) reported associations between a domain of

classroom quality - emotional support - and teacher attunement to children's peer relationships.

Associations between higher levels of classroom emotional support and teacher attunement to

classroom relationships may result at least from three mechanisms: (1) increased opportunities to

pay attention to social interactions, because less time is used in emotion and conflict

management; (2) more stable peer relationships, allowing the development and maintenance of

mutual ties, in turn, easier to perceive by teachers and; (3) increased sharing of perspectives and

opportunities to reach consensus in the perception of the classroom relational dynamics

(Cappella et al., 2012). Neal et al. (2011), on the other hand, reported mixed effects for levels of

classroom organization, with behavior management negatively associated with teacher

attunement and productivity positively associated with attunement. Therefore, classroom quality

domains such as emotional support and classroom organization need to be considered when

examining the correlates of teacher attunement to children's peer preferences. Importantly,

previous research suggests that both within- and cross-domain associations should be considered

when examining the correlates of classroom quality domains (Downer et al., 2010), namely

studies reporting associations between teachers' instructional support quality and children's

social skills, such as empathy (e.g., Siekkinen et al., 2013). Then, examining the associations

between teacher attunement and the quality of teachers' instructional support is also warranted.

Study Goals

Our study aims to test the associations between child-level variables (i.e., age, sex,

disability status, and time spent with teacher), and classroom-level variables (i.e., emotional

support, classroom organization, instructional support, teacher experience, and group size), and

teacher attunement to preschool peer relationships, specifically, peer preferences. Teacher

attunement was operationalized as the extent of agreement between children and teacher's

reports of children's peer preferences. Based on prior studies, we hypothesized that higher

attunement or agreement would be observed for (a) older children; (b) girls; (c) children without

disabilities; (d) children who had spent more time with their teacher; (e) classrooms with higher

emotional support, classroom organization, and instructional support; (f) teachers with more

experience (building on the findings reported by Marucci et al. [2018], specific to teacher

attunement); and (g) classrooms with a smaller group size. Increases in the number of

interactions and social partners, and in the complexity of peer relationships set the preschool as a

blooming context for socialization. Finding which factors associate with teacher attunement to

children's relationships is important; first, because not much is known regarding this age period,

in particular for children with disabilities; second, because that knowledge will inform practice

and professional development opportunities aiming to support peer relationships.

Method

Participants

This study was conducted in 86 Portuguese preschool classrooms in the Lisbon area: 12

classrooms in private non-profit, 7 classrooms in private for-profit, and 67 classrooms in public;

19 of the latter were in school clusters included in the Priority Intervention Territories Program, which targets socioeconomically disadvantaged geographical areas. Participants were 1415 children (743 boys and 672 girls; 108 children with disabilities, 1 to 4 per classroom) (M_{age} = 62.15 months, SD = 8.80) and 86 preschool teachers (1 male). Children with disabilities had diverse conditions, including global developmental delay (n = 20), autism spectrum disorder (n = 14), communication/language disorders (n = 7), rare conditions (n = 7), cerebral palsy (n = 4), Down Syndrome (n = 2), and other conditions (n = 13). Five children did not have any diagnosis at the time of the study and data on type of disability were not collected for 36 children, who were not selected as target children for other analyses outside the scope of this study.

All teachers (M_{age} = 46.89 years, SD = 8.80) had a college degree in early childhood education and, on average, 21.50 years of teaching experience (SD = 7.85; Range = 2 to 35 years). Classroom group size ranged between 14 and 27 children (M = 21.17, SD = 2.55).

Participants were drawn from a larger sample of 1866 children, 1537 of which had written consent to participate. One hundred of these did not complete the sociometric task and/or were missing from teacher nominations; 22 additional children were removed due to missing values for at least one of the demographic variables analyzed in this study.

In Portugal, preschool education is available for children between the age 3 and the age of compulsory education (Decree Law No.147/97). Enrolment in the 1st year of basic education is compulsory for children turning 6 years of age by September 15th. Preschool provision is supervised by the Ministry of Education, and includes public, private for-profit, and private non-profit centers. In 2017/2018, 53.1% of the children attending preschool in Portugal were enrolled in public settings, 30.7% were enrolled in private non-profit settings, and 16.2% were enrolled in for-profit settings (Direção-Geral de Estatísticas da Educação e Ciência, 2019). In this study,

most children were enrolled in public settings (77.9 %), followed by private non-profit settings

(13.9 %), and private for-profit settings (8.3 %). Although optional, preschool is of universal

access from the age of 4 (Law No. 65/2015). Coverage rates are relatively high, with

approximately 82.8%, 93.1%, and 94% of 3, 4 and 5-year-olds, respectively, currently attending

preschool (Direção-Geral de Estatísticas da Educação e Ciência, 2019). Regarding teachers'

training, lead teachers are required to have the minimum qualification level of a master's degree

in early childhood education (European Commission/EACEA/Eurydice, 2019).

Measures

Demographic Data

Teachers were given a questionnaire and asked to report on their age, sex, training,

teaching experience, and classroom size; for how long they had been with each child (in

months); as well as on children's age, sex, and disability status (i.e., children with and without

disabilities).

Children's Playmates Rating Scale

Children were presented with photographs of each participating classmate, in random

order, and asked to sort the photographs into one of three categories/boxes: children with whom

the child liked to play with a lot, sort of liked to play with, or did not like to play with (scored 3,

2, and 1, respectively). Happy, neutral, and sad emoji faces were used to identify each box.

Reciprocal scores of 3 were used to create squared, symmetrical, 0/1 matrices of peer

preferences. Children identified, on average, 8.81 classmates they liked to play with a lot (*SD* =

3.91). Reciprocal/mutual choices were found for 57.76% of the cases (*SD* = 23.93%; M mutual

peer preferences = 4.95; Total mutual peer preferences = 6999). This rating scale has been

frequently used with preschool-aged children in assessing peer preferences (e.g., Santos et al.,

2014a; Santos et al., 2015). Moreover, test-retest correlations for this measure with preschoolers has been satisfactory (.64), suggesting some stability in children's peer preferences (e.g., Wu et al., 2001).

Teacher Nominations of Preferred Playmates

Teachers were asked to identify each participating child's preferred playmates by filling in a double entry matrix, pairing all possible children. Specifically, for each child, teachers were asked to identify which peers did he/she like to play with a lot, among all possible classmates. Teachers nominated 3.47 preferred playmates per child ($SD = 2.43$), with 62.57% of these nominations being mutual ($SD = 35.32$), meaning that the teacher reported that child "a" liked to play with child "b" while also reporting that child "b" liked to play with child "a".

Comparing teacher and children's reports of peer preferences requires data to be on the same binary, symmetric scale. Because teachers provided asymmetric reports for a considerable percentage of children, which likely represents errors of omission (e.g., Neal et al., 2011), we identified peer preferences whenever teachers nominated either a relationship from classmate i to j, or a relationship from classmate j to i (M peer preferences = 4.58; Total peer preferences = 6474).

Teacher Attunement to Children's Peer Preferences, Measured as Agreement

Teacher attunement was measured as the level of agreement between each child-teacher pair, using the Jaccard index (Jaccard, 1908): $n11 / (n11 + n10 + n01)$; with $n11$ equal to the number of peer preferences identified by both child and teacher; $n10$ equal to the number of peer preferences identified by the child, but not the teacher; and $n01$ equal to the number of peer preferences identified by the teacher, but not the child. This index ranges between 0 and 1, with a

value of .60, for example, indicating that 60% of peer preferences were identified by both child

and teacher in their sociometric reports.

Classroom Quality Domains

Classroom observations were conducted using the Classroom Assessment Scoring

System (CLASS Pre-K; Pianta et al., 2008). The CLASS Pre-K comprises 10 dimensions, scored

on a 7-point scale (1 and 2 = *low quality*; 3, 4, and 5 = *mid-range quality*; and 6 and 7 = *high*

quality), that map onto three domains: emotional support, classroom organization, and

instructional support. In this study, we tested the associations between the three domains and

teacher–child agreement separately (Cronbach α: emotional support = .90, classroom

organization = .85, instructional support = .86). Four independent, trained, and certified

observers on the CLASS protocol (through the test administered by Teachstone) spent at least 2

hours in each classroom (four cycles of 20-minute observation and 10-minute record), focusing

observations on the lead teacher. Prior to data collection, teachers and observers agreed on the

best time of the day for conducting the observations, usually, the beginning of the school day.

Standard CLASS scoring principles were used.

Inter-rater agreement was checked in 25% of classrooms (two observers performed one

out of every four observations together). ICCs (two-way random-effects model, average score)

for emotional support, classroom organization, and instructional support (.90, .86, and .84

respectively) indicated good reliability.

Procedures

This study was part of a broader study, BLINDED, approved by the Portuguese National

Data Protection Authority and the General-Directorate of Education. Data were collected in the

2012/2013 and 2013/2014 school years. Each year, we e-mailed half of the public-school clusters

as well as private (profit and nonprofit) centers in the district of Lisbon, identified as having

inclusive classrooms by early childhood intervention teams. After follow-up telephone calls with

the boards of these centers, we conducted telephone calls and/or meetings with preschool

teachers willing to participate, to provide further information on study goals and methods.

Classrooms were selected according to the following criteria: (1) having at least one child with

disabilities receiving early childhood intervention or early childhood special education services

(i.e., inclusive classrooms); (2) most children aged 4-years old or older; and (3) at least, a 60%

parental consent rate. Classrooms composed mostly of 3-year-olds were not sampled due to the

lower reliability of data from very young children in sociometric tasks (Hymel, 1983).

Data Modelling Approach

We analyzed the child and classroom variables associated with Jaccard index scores

(teacher-child agreement) using generalized mixed regression models with repeated measures

nested within teachers (i.e., teacher/class - level 2, Jaccard index scores - level 1). The full model

included four level-1 variables: (1) child's age (months), (2) child's sex (1 = boy, 0 = girl), (3)

child's disability status (1 = with disabilities, 0 = without disabilities), and (4) child's time with

teacher (i.e., for how long the child had been with the teacher, in months). Class mean values of

all level-1 variables were also included as level-2 variables because they allow to disaggregate

within-classroom from between-classroom effects (Snijders & Bosker, 2012). For sex and

disability status, mean values represent the classroom proportion of boys and children with

disabilities, respectively. Additionally, the following level-2 variables were also included: (1)

teacher experience, (2) classroom group size, (3) emotional support (CLASS), (4) classroom's

organization (CLASS), and (5) instructional support (CLASS). Finally, cross-level, two-way,

interactions between these variables and child's disability status were included as well.

To assist interpretations of model estimates, continuous level-1 variables were centered on the corresponding class mean, sex and disability status were centered on 0 (0.5 = boys, - 0.5 = girls; with disabilities = 0.5, without disabilities = - 0.5), and level-2 variables on the corresponding grand-mean. This way, model estimates represent estimated mean effects for the average child in the average classroom (irrespective of sex and disability status). Models, with binomial distribution and logit link, were fitted using the lme4::glmer function (version 1.1-21) in R (version 3.6.1) (Bates et al., 2015; R Core Team, 2018). To control for the multiple tests present in the regression models, we computed q values (the probability that a test is truly not significant given that it was called significant) using the two stage approach by Benjamini et al. (2006) with False Discovery Rate set at 0.05.

Results

Descriptive Statistics

Table 1 and Table 2 present the descriptive statistics for level-1 and level-2 variables. Emotional support and classroom organization levels were in the mid-range while instructional support scores were low. Correlation values involving Jaccard index scores were significant, albeit of small magnitude, for age ($N = 1415$, $r = .12$, $p < .001$), disability status ($N = 1415$, $r = -.12$, $p < .001$), and classroom group size ($N = 86$, $r = -.28$, $p = .010$).

The distribution of Jaccard index scores (Figure 1) showed that for 213 (out of 1415) teacher-child pairs, agreement levels were equal to 0 (15.05%). Thirty-six of these 0 scores referred to children without peer mutual preferences (four children did not identify any preference; one with disability), and 43 to children for whom teachers did not identify any preferred play partner (five of which had disabilities). Absence of agreement was significantly higher in children with disabilities, $\chi2$ (1, $N = 1415$) = 18.213, $p < .001$ (32/108 vs. 183/1307).

Due to the high proportion of teacher-child pairs with Jaccard index scores of 0, particularly for children with disabilities, we decided to fit two separate generalized mixed models: one comparing 0 and non-zero teacher-child pairs (dependent variable: binary), the other, modelling Jaccard index scores of non-zero teacher-child pairs (dependent variable: proportions). In other words, the first model identified which variables were associated with teacher and children agreeing on at least one mutual relationship; the second model identified which variables were associated with higher levels of agreement (for teacher-child pairs that agreed on at least one mutual relationship).

Zero vs. Non-Zero Teacher-Child Agreement

Model estimates in Table 3 show that age, disability status, time with teacher, and teacher's instructional support were significantly associated with teacher-child agreement on at least one mutual relationship. Chances of non-zero agreement were higher for children: (1) who were older, $\beta = 0.03$; (2) without disabilities, $\beta = -1.09$; (3) who had been with their teachers for a longer period of time, $\beta = 0.03$; and (4) in classrooms with lower levels of instructional support, $\beta = -0.83$. In other words, (1) younger children, (2) children with disabilities, (3) children who had spent less time with their teachers, and (4) children who attended classrooms with higher instructional support were more likely to disagree with their teachers on all peer preferences identified. Nevertheless, q-values (controlling for False Discovery Rate of 0.05) suggest that except for presence of disabilities, the significance of the remaining associations should be taken with caution.

Levels of Teacher-child Agreement

Model estimates in Table 4 show that teacher-child agreement levels were significantly associated with children's age and disability status. Higher levels of agreement were associated

with: (1) older children, $\beta = 0.01$, and (2) the absence of disabilities, $\beta = -0.23$. In other words, teachers were more likely to agree with (1) older children and (2) children without disabilities on a higher number of peer preferences. Nevertheless, q-values suggest that the association between disability status and teacher-child agreement should be taken with caution.

Discussion

This study investigated the extent to which preschool teachers are attuned to children's peer relationships, specifically, to peer preferences, while also investigating child and classroom level variables potentially associated with attunement. Extant literature suggests that the degree to which a teacher is aware of classroom social dynamics, or *attuned*, appears to be associated with the quality of interactions and relationships a child might experience within the classroom (e.g., Gest et al., 2014; Hamm et al., 2011; Hoffman, 2012; Neal et al., 2011). In this study, we examined the variables associated with preschool teacher's attunement regarding peer preferences. Based on previous studies, we hypothesized observing higher teacher attunement when children: (a) were older (Cillessen & Bellmore, 2002; Daniel et al., 2017), (b) were girls (Cillessen & Bellmore, 2002), (c) had no disabilities (Meyer & Ostrosky, 2018), (d) spent more time with their teachers (Marucci et al., 2018), (e) were in classrooms of higher quality (Cappella et al., 2012), (f) whose teachers were more experienced (Marucci et al., 2018), and (g) attended classrooms with a smaller group size (Neal et al., 2011; Neal et al., 2016). Overall, support was found for hypotheses (a) and (c). That is, teacher attunement was higher for older children and for children without disabilities.

In comparison to prior studies, in elementary school years (e.g., Neal et al., 2011; Neal et al., 2016), we found relatively low mean levels of teacher attunement (30% agreement on mutual peer preferences in our study; 40% agreement on social networks in Neal et al., 2016).

Nevertheless, the variance was considerable, indicating that some teachers were highly attuned whereas others were not.

Teachers' Attunement to Peer Preferences and Children's Age

Children's age was associated with higher teacher attunement. This finding aligns with prior research supporting age-related changes in the patterns of preschoolers' social experiences. Specifically, between the ages of 3 and 5, there is a remarkable increase in group play and conversations (Robinson et al., 2003) and a widening of the network of peer interactions (Santos et al., 2015). Moreover, the stability of children's relationships and social networks also increases with age (Barbu, 2003; Wang et al., 2019), even though some stability is already found during early years (Wu et al., 2001). It is possible that the associations between children's age and teacher attunement on peer preferences reflects the increased stability in children's relationships, resulting in clearer patterns of dyadic relationships, facilitating teachers' awareness of preferred playmates. In addition, the associations between children's age and teacher attunement might also reflect age-related increases in accuracy when reporting about features of social relationships, as suggested by Cillessen and Bellmore (2002) and Daniel et al. (2017).

Teachers' Attunement to Peer Preferences and Children's Disability Status

As hypothesized, teacher attunement was lower when children had a disability, a finding consistent with studies indicating that the interactions and friendships of children with disabilities might differ from those of children without disabilities (Odom, 2000; Odom et al., 2006). Therefore, it is possible that these children do not show preferences in a conventional or stable manner, increasing teachers' difficulties in accurately identifying their peer preferences (Meyer & Ostrosky, 2018). However, it is also possible that, as younger children (Cillessen & Bellmore, 2002; Daniel et al., 2017), children with disabilities are less accurate in their reports

regarding peer preferences. Even though we did not control for the type of disability, some studies have suggested that the effect of a disability, at the level of peer relationships, might be more or less pronounced, depending on certain features of the disability. Odom and colleagues (2006), for instance, reported that young preschool children with disabilities who were well accepted by their peers tended to have a disability that was less likely to impact emotional regulation and problem solving; on the contrary, rejected children were more likely to have disabilities affecting social skills (see also Bauminger & Kasari, 2000). Overall, with the appropriate caution, since the number of participating children with disabilities was much lower than the number of children without disabilities, and type of disability was not controlled for, our results support the notion that children's disabilities might pose challenges on how well teachers attune to their peer preferences. In addition, children with disabilities were over-represented in the subgroups of children who did not identify peer preferences and whose teachers did not identify peer preferences. Therefore, our findings support the need for more research including children with disabilities, namely controlling for type of disability. Importantly, results highlight the need for providing teachers with specific professional development opportunities, increasing their knowledge and awareness regarding the interactions and patterns of relationships of young children with disabilities.

Teachers' Attunement to Peer Preferences and Time Spent with Teacher

After accounting for multiple tests present in the regression models, time spent with the teacher was not associated with teacher-child agreement, contrary to our hypothesis. Focusing on older students, Marucci and colleagues (2018) suggested that the time children and teachers spend together is likely associated with more opportunities for teachers to observe and recognize the behavioral patterns of children's social interchanges, thus improving teacher attunement.

Based on our findings, we suggest that variables that capture teachers' attention to and interpretation of patterns of peer interactions and relationships over time could be examined in future research on teacher attunement to peer preferences.

Teachers' Attunement to Peer Preferences and Children's Sex

We did not find an association between children' sex and teacher attunement, that is, teachers better attuned to girls' peer preferences. The few studies examining the associations between sex and perceptions of peer relationships, in other age groups, mostly favored girls (Bellmore, 2000; Cillessen & Bellmore, 2002). The notion that girls are "naturally" better than boys when it comes to the social milieu, particularly in developing dyadic bonds (Benenson et al., 1997), is a long-living one and the debate over differences and similarities between girls' and boys' peer relationships continues. It may be, as some studies propose, that sex differences during the preschool years are not stable and that the developmental gap, favoring girls, although often reported (Maccoby, 1998) is better explained considering that these differences are fluid, as part of a dynamic system.

Teachers' Attunement to Peer Preferences and Classroom Quality Domains

Contrary to our hypothesis, teacher attunement to children's peer preferences was not associated with classroom-level emotional support and classroom organization, nor with instructional support, after consideration of false discovery rates. Williams and colleagues (2018) suggest that the context characteristics are of great importance in improving/hindering the peer experience a child might have. The classrooms' quality, included in our study (mid-range quality for emotional support and classroom organization, and low quality for instructional support), may not have been sufficient to support teacher attunement to children's peer preferences. Prior studies indicate that a certain quality threshold is necessary (Burchinal et al., 2014), and that only

good quality will make a significant difference in children's outcomes. Importantly, given the correlational nature of our study and considering our initial assumption that teacher attunement may be a necessary condition for teachers to identify young children's needs and provide individualized support (including emotional support), we must also consider the possibility that participating teachers were not sufficiently attuned to children's peer-related experiences for significant associations with classroom quality domains to emerge.

Teachers' Attunement to Peer Preferences and Teacher Experience

We did not find an association between teacher attunement and teacher experience, contrary to Marucci et al. (2018). From the best of our knowledge, there are no other studies reporting on the association between teaching experience and attunement to young children's peer preferences. The studies analyzing the associations between teaching experience and classroom quality or child outcomes (e.g., Brown et al., 2008; Downer et al., 2010; Guo et al., 2011; Kiuru et al., 2012; Marucci et al., 2020; McMullen et al., 2020) have reported mixed results. Interestingly, Guo et al. (2011) and Spilt and Koomen (2009) also did not find significant associations between teaching experience and (a) teacher's self-efficacy, and (b) teachers' reports of relationship quality, respectively. We note that the teachers who participated in this study were rather experienced, similar to Marucci et al. (2018), and more experienced than teachers in most US samples (e.g., Guo et al., 2011), and that there is extant evidence of non-linear associations between teacher experience and teacher effectiveness (e.g., Podolsky et al., 2019).

Teachers' Attunement to Peer Preferences and Group Size

Contrary to our hypothesis, even though zero-order correlations showed a negative and significant association between group size and teacher attunement (the larger the group, the

lower the attunement), group size was not associated with teacher attunement, when other variables were considered. Except for the studies from Cappella et al. (2012) and Neal et al. (Neal et al., 2011; Neal et al., 2016), we are not aware of other studies examining associations between group size and teacher attunement regarding peer preferences. By contrast, many studies on overall classroom quality and child outcomes in preschool have included group size as a variable thought to be associated with quality (Early et al., 2007). A large proportion of studies do indicate that smaller group sizes are often associated with better quality and conditions for young children to learn and develop, particularly at younger ages (Burchinal et al., 2002; Francis & Barnett, 2019; OECD, 2018). Other studies, however, do not report classroom quality differences based on group size (e.g., Williams et al. 2015).

In sum, our findings indicate that overall levels of teacher attunement regarding peer preferences were relatively low. Importantly, even though teachers' reports of children's playmate preferences tended to diverge from children's own reports, there was great variability, showing that while some teachers were not attuned to peer preferences, other teachers were indeed on the same wavelength as children. Among the variables examined, only child characteristics - age and disability status - significantly associated with teacher attunement.

Limitations

Our study has important strengths, namely, the consideration of the concept of attunement during the preschool years, the participation of children with disabilities, the examination of child and classroom-level variables, and the use of a sophisticated data modeling approach, which accounted for false discovery rates to reduce Type I error. However, it also has important limitations. One limitation is that we depart from the teachers' perspective. Even though we grounded our study in evidence suggesting that teachers' attunement, specifically, teachers'

awareness of classroom peer preferences is associated with positive social outcomes for children, it is also reasonable to expect that the association is bidirectional, that is, that children more socially developed, namely with positive relationships with their peers, have increased skills to demonstrate and report on their peer preferences. Future studies should therefore consider this bidirectional association and examine reciprocal effects.

Regarding measurement limitations, similar to other studies (Marucci et al., 2018), we operationalized teacher attunement as knowledge about peer preferences, narrowing the scope of understanding of this construct. Further, even though the questions posed to children and teachers tackled preferred playmates, procedures and questions did not match exactly. Future studies might benefit from using similar questions and procedures, as much as possible. Relatedly, because the teacher nomination of preferred playmates measure was developed specifically for this study, future research on the validity and reliability of data is warranted. Moreover, we did not consider the type of disability when analyzing the data, but only the fact that children were identified as having a disability (or not). Further, we also did not collect data on children's and teachers' race/ethnicity.

Finally, additional research is needed on the associations between teachers' characteristics and teacher attunement, other than teaching experience, for example, motivation, knowledge, and beliefs about peer relationships. Also, future research could also examine the associations between teacher attunement, as measured here, and preschooler's developmental outcomes. Examining the characteristics of highly attuned teachers might be a productive line of future research. Also, given that during the preschool, social development is of paramount importance, future research could examine the extent to which preschool teachers' attunement levels compare to those of teachers for other age groups.

Conclusion

By focusing on the preschool years and bringing into that stage the concept of attunement, while including children with disabilities, our study adds some meaningful contributions. First, it contributes to the (yet sparse) knowledge on the factors associated with teacher attunement to young children's peer preferences and, possibly, on teachers' awareness of children's social lives within the classroom. Such knowledge may inform the development of on-site professional development, thus increasing the likelihood of children having a teacher who reads their social needs, and attunes to the web of peer preferences, especially when social clues, provided by a younger child or a child with disabilities, are less clear and stable.

The peer preferences of younger children and children with disabilities appear to be less accurately perceived by teachers. Therefore, our results might have implications for educational practices, by suggesting the need for teacher professional development focusing on the importance of understanding fundamental aspects of peer relationships, with a special focus on earlier ages of preschool, and the developmental specificities of children with disabilities. Ultimately, increases in teacher attunement may lead to an improved awareness of the peer social dynamics, allowing teachers to accurately interpret peer relationships, and address the challenges emerging from individual children's characteristics, by ensuring a more positive experience for all children throughout the preschool years.

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Table 1

Means (M), Standard Deviations (SD), and Pearson Correlations for Level 1 Variables

	M	*SD*	1	2	3	4
1. Jaccard index	.31	.21				
2. Sex (boys)	.52	-	.02			
3. Age (months)	62.14	8.80	.12**	.03		
4. Disability status (with)	.08	-	-.12**	.09**	.18**	
5. Time with teacher (months)	12.13	10.49	-.04	.00	.21**	.06*

Note. N = 1415 children for all variables; Jaccard index is a similarity/agreement score ranging between 0 (total lack of agreement) and 1 (complete agreement): a mean value of .31, indicates that, on average, 31% of mutual preferences were indicated by both child and teacher in their sociometric reports; for sex (1 = boys, 0 = girls) and disability status (1 = with disabilities, 0 = without disabilities) mean values represent the proportion of boys and the proportion of children with disabilities in the total sample, respectively.

* $p < .05$. ** $p < .01$.

Table 2

*Means (M), Standard Deviations (SD), and Pearson Correlations for Level 2 Variables*

	M	*SD*	1	2	3	4	5	6	7	8	9
Aggregated level 1 variables											
1. Jaccard index	.31	.10									
2. Sex (boys)	.53	.13	.15								
3. Age (months)	62.36	5.14	.13	.10							
4. Disability status (with)	.08	.05	-.16	-.03	.28**						
5. Time with teacher (months)	12.18	8.15	-.19	-.08	.01	.11					
Classroom/teacher variables											
6. Teacher experience (years)	21.50	7.85	.16	-.02	.26*	-.02	-.13				
7. Classroom group size	21.17	2.55	-.28**	-.04	-.01	-.11	.05	.10			
8. Emotional support	4.99	0.80	.11	-.02	-.22*	-.06	-.11	.02	-.07		
9. Classroom organization	4.92	0.79	.20	.05	-.09	-.02	-.25*	.03	-.10	.77**	
10. Instructional support	1.68	0.48	.04	.13	-.14	.01	-.16	.05	-.06	.56**	.54**

Note. $N = 86$ classrooms for all variables; aggregated variables correspond to classroom means of level 1 variables; for sex (coded as 1 = boys, 0 = girls) and disability status (coded as 1 = with disabilities, 0 = without disabilities) values represent the mean proportion of boys and the mean proportion of children with disabilities within classrooms; age and time with teacher were measured in months; emotional support, classroom organization, and instruction support were measured on a 7-point scale (1- *low*, 7- *high*).
* $p < .05$. ** $p < .01$.

Figure 1

Distribution of 1415 Teacher-Child Agreement Scores (Jaccard Index) for Children with (n = 108) and without (n = 1307) Disabilities.
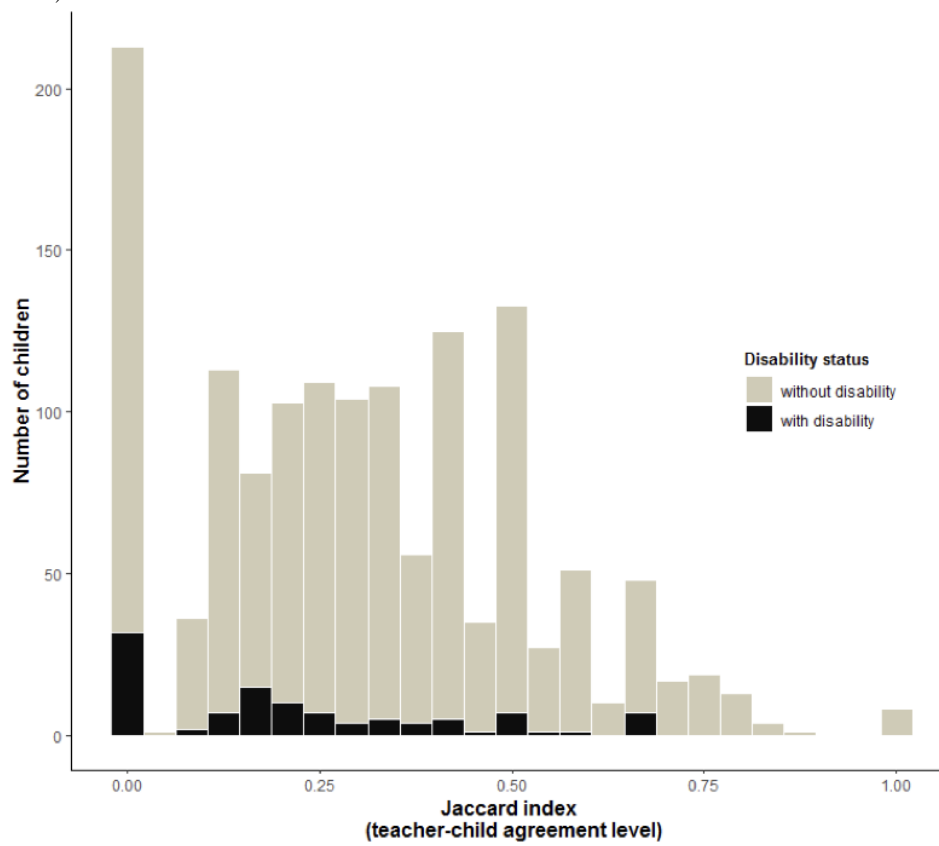
Note. Figure created using ggplot2 package (version 3.2.1) in R (Wickham, 2016).

Table 3

Associations Between Child and Classroom Variables and Jaccard Index Scores Above 0

	Estimate	SE	p	q
Fixed Effects				
Intercept	1.51	0.15	< .001	< .001
Level 1 variables				
Age (months)	0.03	0.01	.036	.129
Sex (boys)	0.10	0.16	.545	.640
Disability status (with)	-1.09	0.27	< .001	< .001
Time with teacher (months)	0.03	0.01	.020	.112
Level 2 variables (classroom variables)				
Classroom mean age	0.01	0.02	.792	.785
Classroom % of boys	0.82	0.92	.376	.610
Classroom % of children with disabilities	-3.08	2.21	.163	.291
Classroom mean time with teacher	-0.01	0.01	.574	.640
Teacher experience	0.01	0.02	.560	.640
Classroom group size	0.04	0.07	.515	.640
Emotional support	0.13	0.30	.660	.693
Classroom organization	0.22	0.30	.465	.640
Instructional support	-0.83	0.37	.025	.112
Cross level interactions				
Disability status × Teacher experience	0.00	0.03	.969	.910
Disability status × Classroom group size	0.23	0.12	.061	.156
Disability status × Emotional support	-0.79	0.52	.128	.254
Disability status × Classroom organization	0.82	0.52	.116	.254
Disability status × Instructional support	-1.20	0.63	.057	.156

Random effects	
Intercept *SD*	0.63
Deviance	1117

Note. Parameter estimates are the log odds ratio associated with a one-unit change of the variable; positive estimates indicate that higher values of the variable associated with higher likelihood of teacher-child pairs identifying at least one common mutual preference; negative estimates indicate that higher values of the variable associated with lower likelihood of teacher-child pairs identifying at least one common mutual preference; teacher-child pairs, for children without disabilities, were 2.97 times more likely (1 / *exp* (-1.09)) to identify a common mutual preference than teacher-child pairs including children with disabilities; *q*-value is the probability that a test is truly not significant given that it was called significant (maximum false discovery rate set at 0.05; Benjamini et al., 2006; Pike, 2011).

Table 4. *Associations Between Child and Classroom Variables and Teacher-Child Agreement Scores.*

	Estimate	*SE*	*p*	*q*
Fixed Effects				
Intercept	-0.75	0.06	< .001	< .001
Level 1 variables				
Age (months)	0.01	0.00	.001	.009
Sex (boys)	-0.02	0.05	.649	.837
Disability status (with)	-0.23	0.10	.024	.143
Time with teacher (months)	0.00	0.00	.891	.837
Level 2 variables (classroom variables)				
Classroom mean age	0.02	0.01	.099	.252
Classroom % of boys	0.17	0.34	.612	.837
Classroom % of children with disabilities	-1.05	0.82	.203	.453
Classroom mean time with teacher	0.00	0.01	.479	.837
Teacher experience	0.00	0.01	.776	.837
Classroom group size	-0.05	0.03	.062	.193
Emotional support	0.03	0.12	.787	.837
Classroom organization	0.03	0.11	.800	.837
Instructional support	0.09	0.16	.579	.837
Cross level interactions				
Disability status × Teacher experience	-0.01	0.01	.319	.633
Disability status × Classroom group size	0.01	0.05	.883	.837
Disability status × Emotional support	0.35	0.19	.065	.193
Disability status × Classroom organization	-0.33	0.18	.056	.837
Disability status × Instructional support	0.10	0.27	.703	.193
Random effects				

Intercept *SD*	0.29
Deviance	3805

Note. Positive parameter estimates indicate that higher values of the variable associated with higher teacher-child agreement scores; negative estimates indicate that higher values of the variable associated with lower teacher-child agreement scores; teacher-child pairs of children with disabilities had Jaccard indices 0.23 points lower than teacher-child pairs of children without disabilities; *q*-value is the probability that a test is truly not significant given that it was called significant (maximum false discovery rate set at 0.05; Benjamini et al., 2006; Pike, 2011).