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Interaction processes as a mediating factor between children's externalized behaviour difficulties and engagement in preschool

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Abstract

This study examined social interaction as a mediator between externalized behaviour difficulties and children's engagement in preschool. Data from 663 children (340 boys), aged 18 to 71 months, were collected at 81 Swedish preschool units in six municipalities to test a path model that included child, teacher, and child groups. The results indicated that behaviour difficulties and engagement may occur simultaneously. Hyperactivity had a direct negative influence on engagement, which was not the case with conduct problems. Teachers' responsiveness as well as positive interactions with peers had an indirect influence on the relationship between hyperactivity and engagement. Responsive staff and positive interactions within the child group seem to contribute to children's engagement despite hyperactivity. Children's engagement, as well as special support to stimulate engagement in preschool, is discussed.

Keywords: preschool; engagement; hyperactivity; conduct problems; social interactions

Introduction

The early years are crucial for the development of learning skills and later school achievement. A prerequisite for developing learning skills is the proportion of time a child is actively engaged in developmentally appropriate activities of everyday life, e.g. preschool (Bronfenbrenner & Ceci, 1994; Claessens, 2012). The preschool environment is a natural context for the promotion of developmentally appropriate activities, such as symbolic and social play with peers. In what way does functional interaction with teachers and peers in preschool support children who display behaviour difficulties in becoming more engaged in developmentally appropriate activities?

The Swedish curriculum for preschool, Lpfö 98 (Swedish National Agency of Education, 2011), advocates an inclusive approach in which all children, with or without a need for special support, are included in the same preschool group. An important principle is that activities aiming to promote engagement are based on each child's characteristics and needs. Despite this inclusive approach, there is a lack of knowledge about environmental factors that promote engagement in everyday preschool activities for children who display behaviour difficulties (Almqvist, 2006; Pramling Samuelsson & Johansson, 2006; Wolery, Brashers, & Neitzel, 2002).

Externalizing behaviour difficulties

Recently, there has been an increased focus on how behaviour difficulties, e.g. conduct problems and hyperactivity (Gustafsson, J-E. et al., 2010), affect children's engagement in preschool and school (Searle, Miller-Lewis, Sawyer, & Baghurst, 2013). Children who display behaviour difficulties are frequently active, but tend to spend less time engaged in developmentally appropriate activities. A meta-analysis by Allan, Allan, Lerner, Farrington, and Lonigan (2015) showed that children who display externalizing behaviour difficulties in preschool have difficulty regulating their attention, sustaining attention in problem-solving, and excluding non-relevant stimuli. This could indicate that they do not maintain engagement in activities long enough to be active participants in play (Searle et al., 2013). They may also display more negative behaviour towards teachers and peers (Doumen et al., 2008) in a manner that could lead to exclusion from engagement in social activities. Therefore, children who display externalizing behaviour

difficulties may need special support in preschool to promote their engagement in developmentally appropriate activities.

Externalizing behaviour difficulties are frequently operationalized to include hyperactivity and conduct difficulties (Wichstrom et al., 2012). In more severe cases, such difficulties are predictors for psychiatric diagnoses in later life (Hong, Tillman, & Luby, 2015), such as Attention Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD) (American Psychiatric, 2013), whereby ADHD is primarily related to hyperactivity and ODD to conduct difficulties. A diagnosis, per se, does not provide guidelines for the support needed to promote engagement and functioning in children with behaviour difficulties. It may be that the type of behaviour difficulties exhibited, i.e. hyperactivity or conduct difficulties, offers better information about children's challenges with respect to functioning in preschool than the diagnosis or a vague description of behaviour difficulties (Gillberg, 2010). Therefore, this study examined whether hyperactivity (e.g. easily distracted, concentration difficulties, wandering around) and conduct difficulties (e.g. aggressive behaviour, temper tantrums) may entail different pathways and influences on children's functioning in preschool, operationalized as engagement.

Externalizing behaviour difficulties and social interactions in preschool settings

Both conduct problems and hyperactivity are maintained through a mutual influence between the child's difficulties to function according to norms and expectations on the one hand and the environment's ability to respond to the child's needs on the other (Greene, 2012). Studies have shown that conduct problems tend to have a negative impact on teachers' perceptions of the child, leading to less teacher responsiveness (Denham, McKinley, Couchoud, & Holt, 1990; Nurmi, 2012). Peer interaction in preschool is also affected if a child displays aggressive behaviour, and can eventually lead to rejection by the peer group (Buhs, Ladd, & Herald, 2006; Lillvist, 2010; Olson, 1992).

Hyperactivity and deficiencies in self-regulatory behaviour seem to occur simultaneously and have a negative impact on the amount of time the child is actively engaged in learning activities in preschool (Metcalf, Harvey, & Laws, 2013; Searle et al., 2013). The relationship between hyperactivity and low levels self-regulation implies that hyperactive children may have difficulty sustaining attention for a longer period (Graziano et al., 2015; Martel, 2009). As a consequence, these children spend less time engaged in learning activities, something that affects their

development and later school functioning (Buhs et al., 2006; Bulotsky-Shearer & Fantuzzo, 2011; Gunnar, Sebanc, Tout, Donzella, & Van Dulmen, 2003). However, behaviour difficulties, such as hyperactivity, represent only part of the overall picture of child functioning in preschool (McWayne & Cheung, 2009). In order to obtain a more comprehensive understanding of the child's functioning, it is important to explore mediating factors that may have a positive impact on functioning, regardless of whether or not the child shows behaviour difficulties.

It is important to be aware of how different contextual factors can affect a child's functioning if he/she simultaneously exhibits hyperactivity and conduct difficulties. The social climate and teacher's didactic skills in the preschool classroom have been shown to be positive related to children's development and learning (Aydogan, 2012; Coolahan, Mendez, Fantuzzo, & McDermott, 2000; Friedman-Krauss, Raver, Morris, & Jones, 2014; Odom & Strain, 1984). A study by Almqvist and Granlund (2005) showed that both teacher responsiveness and positive peer interaction were supportive factors for children's participation in preschool, such as play, regardless of disabilities or behaviour difficulties.

A high proportion of free play activities in preschool, i.e. children's self-selected social and learning activities with little or no interference from the preschool staff, imposes great demands on children's ability to initiate, maintain and end activities in a socially acceptable way (Corsaro, 1988; Jonsdottir, 2007; Lillvist, 2010; Olausson, 2012). Children who have difficulties regulating their behaviour according to social expectations, e.g. those with hyperactivity difficulties and/or conduct problems, are at risk of becoming less involved in social activities (Greene, 2012; Lillvist, 2010; Santos, Vaughn, Peceguina, & Daniel, 2014). However, more research is needed concerning how social interactions in a preschool context may affect the negative influence of externalizing behaviour difficulties on engagement. To enhance this knowledge, not only behaviour difficulties but also the engagement construct must be clearly conceptualized.

Child engagement

Engagement has been referred to as the amount of time a child is actively involved in social interaction with other children or adults in activities or play materials, in a developmentally and contextually appropriate manner (McWilliam & Bailey, 1992). Several studies report a relationship between children's maturity and increased complexity in their engagement behaviour (Casey, McWilliam, & Sims, 2012; McWilliam & Bailey, 1992; Pierce-Jordan & Lifter, 2005). However,

all aspects of engagement are not necessarily related to developmental age and could therefore be interpreted as core engagement. For example, De Kruif and McWilliam (1999) found that attentional behaviour, which is indicative of core engagement, is common regardless of age. Attentional behaviour probably requires less complex activities, e.g. when other children are playing and the child follows their movements through eye-gaze. A similar result was found by Aguiar and McWilliam (2013), whereby attentional behaviour was frequently observed already in toddlers in both centred-based child care settings and mother-child dyadic play. Also, persistent behaviour such as when the child persistently tries to get the teacher's and others' attention, was common in both younger and older children (De Kruif & McWilliam, 1999).

With respect to more complex engagement behaviours there appears to be a positive relationship between complex engagement behaviours, such as problem-solving (whereby, for example, the child tries to complete something even though it takes a long time to finish) or complex rule-based play (Blasco, Bailey, & Burchinal, 1993; Malone, Stoneman, & Langone, 1994), and developmental age. These behaviours are more common in older preschool children (Aguiar & McWilliam, 2013; Casey et al., 2012; De Kruif & McWilliam, 1999).

Based on these earlier research results, the engagement construct seems to consist of two underlying dimensions, in this study entitled “core engagement” and “developmental engagement”. Core engagement refers to attentional and persistence behaviours that are not associated with the child's maturity level (De Kruif & McWilliam, 1999), while developmental engagement refers to behaviours of higher complexity that are associated with developmental age (Aguiar & McWilliam, 2013; Blasco et al., 1993; Casey et al., 2012; Malone et al., 1994). Both types of engagement need to be investigated in order to develop support that can contribute to children's engagement regardless of their functioning in terms of behaviour difficulties, cognitive impairment, or severe developmental delay. The relationship between behaviour difficulties and engagement may look different depending on whether core engagement or developmental engagement is investigated.

Conceptual framework

The bioecological model (Bronfenbrenner & Ceci, 1994) is the framework for the analysis. It is appropriate for understanding children's daily functioning and the influence of the immediate context. The preschool setting, as one example of a child's microsystem, has a direct influence on children's engagement (Bronfenbrenner & Evans, 2000). Children's engagement must be seen in the light of the dynamic interaction between the characteristics of the individual child – i.e.

behaviour, temperament, gender, biological age, mother tongue, cognitive level (Beijers, Riksen-Walraven, Putnam, de Jong, & de Weerth, 2013) – and social interactions with peers and teachers (Birch & Ladd, 1998; Choe, Olson, & Sameroff, 2013). For effective child development to take place, positive interactions need to occur fairly often over an extended period of time (Bronfenbrenner & Evans, 2000).

Proximal environmental factors in preschool settings and children's engagement

Although extensive research has described the impact of proximal factors such as teacher-child interactions and child-child interactions within the microsystem on the child's engagement at present and for later development (Ben-Arieh & Frones, 2011; Bronfenbrenner & Evans, 2000; Claessens, 2012), there is a lack of research on how proximal factors may act as a mediator between externalized behaviour difficulties (e.g. conduct problems and hyperactivity) and core and developmental engagement respectively.

Taken together, the various literature underscores the importance of examining proximal factors in preschool as predictors of child engagement displaying externalizing behaviour difficulties. Earlier studies often report engagement as participation in (that is, attending) everyday situations. However, the fact that children are present in the same situation or activities as other children does not necessarily mean that all children are automatically involved and engaged in the activity to the same extent (Granlund, 2013). The use of data from a sample representing a preschool environment that includes both children who display externalized behaviour difficulties and those who do not makes it possible to investigate how interaction with teachers and peers promotes engagement in children with different degrees of externalized behaviour difficulties.

Aim and hypotheses of the study

The overall aim of the present study was to examine teacher responsiveness and peer interaction as mediators between two types of externalizing behaviour difficulties and two types of engagement in preschool. Three hypotheses were tested: (1) Hyperactivity will have a direct negative effect on core and developmental engagement; (2) Conduct behaviour difficulties will have a direct negative effect on core and developmental engagement; and (3) Teachers' responsiveness and positive peer interaction will have an indirect positive effect on the relationship between the two types of externalizing behaviour difficulties and the two types of engagement.

Methods

Data

The data for this study were taken from a longitudinal project funded by the National Board of Health and Welfare (2012) and FORTE (2014) in Sweden. The current study has a variable-oriented approach (Bergman & Trost, 2006). Using a path analysis, the relationship between children's behaviour difficulties and their engagement is analysed. In the analysis, the extent to which teacher-child and child-child interaction can act as mediating factors between behaviour difficulties and engagement is investigated.

Participants

The total sample consisted of 663 children (340 boys and 323 girls) between the ages 18 and 71 months, and included both children formally identified as needing special support and those not identified as such. There were complete data for 640 children, whereas 23 children with incomplete data were removed. An independent *t*-test showed no significant differences between children with and without complete data according to gender, being formally identified as needing special support, core engagement, behaviour difficulties, or interaction processes. Meanwhile, there was a significant difference according to developmental engagement ($t = 2.283$, $df = 653$, $p < .05$, two-tailed). The magnitude of the differences in the mean of developmental engagement (mean difference = 0.43, 95 % CI: 0.06 to 0.79) was medium ($d = 0.71$).

Child characteristics, demographic variables and preschool staff education are described in Table 1. The preschool units ($N=81$) were located in six municipalities in Sweden, in both rural and urban settings. The units were organized in different age groupings depending on the organization of the different preschools. For example, children were placed in groups including ages one to three, three to five, or one to five years. Classroom group size ranged from eight to 50 ($M=23.2$, $SD=10.74$), and the number of preschool teachers from one to seven ($M=3.97$, $SD=1.31$). Adult-child ratio ranged from 1:2 to 1:9. Classrooms for younger toddlers (usually between 15 and 48 months) had fewer children per adult ($M=4.5$, $SD=0.99$) than those for older preschool children ($M=6.5$, $SD=1.46$).

According to cut-off scores based on the Strength and Difficulties Questionnaire (SDQ) (Goodman, 1997), 61 children demonstrated one or more behaviour difficulty related to emotional problems (0.2 %), conduct problems (18.2 %), hyperactivity (10.1 %) or peer problems (14.5 %).

Table 1. Child and teacher demographic information.

	Frequency (%)	Mean	SD	Range	
				Min	Max
<i>Child demographic</i>					
Female	49				
Male	51				
Age (month)		44	15.5	18	71
Formally identified as child in need of special support	5				
<i>Housing</i>					
Both parents	87				
Mother or father	6				
<i>Teacher education</i>					
Preschool teacher	82				
Child care worker	13				
Other	2				

Ethical considerations and procedure

The project was approved by the ethics committee in Linköping in Sweden (Dnr 2012/199-31). The manager of child and youth services and principal of each preschool unit in the six municipalities targeted were contacted and informed about the project. The principal informed the preschool staff at each preschool unit, who in turn informed parents within their units. Information about the project and a request for consent to participate was distributed to all children (N=1,593) and their parents, as well as preschool staff (N=281). There were no significant differences between children with and without informed consent according to *gender* and the proportion of children identified as being *in need of special support*.

Measures

The preschool staff completed questionnaires about individual children's engagement and behaviour difficulties. They also responded to questions concerning preschool staff perceptions about the relationship with parents, questions about the physical environment such as access to toys and psychosocial environment, and interactions between preschool staff and the child as well as between children in the preschool group. The whole survey package contained a total of 159 items. For this study, only items related to the concepts in the hypotheses were used for analysis, i.e. the

relationship between different types of engagement and externalizing behaviour difficulties, and perceptions of teacher-child and child-child interaction. The subscales used in this study are described in more detail below.

Outcome variable: developmental engagement and core engagement. Child engagement in preschool was measured using the Child Engagement Questionnaire (CEQ; McWilliam, 1991). The preschool staff rated children's engagement through free-recall impressions of the levels of their engagement with peers, adults, and materials. The rating was therefore independent of time and context. The CEQ, consisting of 32 items designed to rate children's global engagement on a four-point Likert scale, records whether the child's behaviour is (1) not at all typical, (2) somewhat typical, (3) typical, or (4) very typical. For each item, examples are provided to further clarify the intent of the item. For example, for the item "Solves problems fast" the example given is: *If a toy falls down behind the couch, the child will find a solution to access the toy.* Only 29 of 32 items from the original questionnaire were used, since feedback from an expert panel indicated that three of the items did not suit the Swedish preschool context. For example, the item *The child continues repetitive movements to make sounds with an object* was removed. This type of engagement behaviour is more frequently observed in infants, who are usually cared for at home during their first year of life.

Since the intention was to analyse two types of engagement (developmental and core) separately, data were first analysed by means of a principal component analysis (PCA) with Varimax rotation, Kaiser normalization and solution by two-factor extraction. The Kaiser-Olkin value was .958, exceeding the recommended value of .6 (Kaiser, 1970, 1974). Barlett's Test of Sphericity (Barlett, 1954) reached statistical significance and supported the factorability of the correlation matrix into developmental and core engagement. The two components explained a total of 52% of the variance. The internal consistency for the two factors was $\alpha=.94$ for developmental engagement and $\alpha=.87$ for core engagement.

The content of the two-factor solution is comparable to the results of an observational study by De Kruif and McWilliam (1999). They found that a positive relationship between complex engagement behaviours such as problem-solving is more common in more mature children, whereas attentional behaviour, which is an example of less complex engagement, was more frequently observed in toddlers. Persistence behaviour was common regardless of the child's age. Their results support our two-component model, in which Component 1, core engagement,

representing engagement related to less complex behaviour (i.e. *seems to be aware about what's going on around the child, watches or listens to adults*), had a lower correlation with developmental age ($r=.28$), whereas Component 2, developmental engagement, representing complex behaviour (*tries to complete things even if it takes a long time to finish, pretends toys are something else*) had a higher correlation with developmental age ($r=.54$).

The independent variables: behaviour difficulties. Children's behaviour difficulties were measured using the SDQ. This instrument consists of 25 items covering five subscales related to emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour (Goodman, 1997). The response options are coded from 0 to 2, where 0="not at all", 1="only a little", and 2="quite a lot". The total score on the behaviour difficulties scales are divided into three subgroups – normal, abnormal and borderline – using cut-off scores. The internal consistency for the SDQ subscales was $\alpha=.58$ for emotional symptoms, $\alpha=.75$ for conduct problems, $\alpha=.84$ for hyperactivity/inattention, $\alpha=.69$ for peer relationship problems, and $\alpha=.84$ for prosocial behaviour. The two subscales, conduct problems and hyperactivity problems, were used to measure externalizing behaviour difficulties. A study using partly the same data as in this study has reported good content and construct validity, as well as intra-rater reliability (Gustafsson B. M., Gustafsson, & Proczkowska-Björklund, 2015). While earlier studies (Hong et al., 2015; Searle et al., 2013) indicate that hyperactivity has a negative impact on engagement, there is a lack of research on how conduct problems may influence the child's engagement. Thus, the respective relationships between engagement and the two subscales were analysed separately.

The mediating factors: social interactions in preschool. Social interactions were measured using a questionnaire, developed by Granlund and Olsson (1998), in which preschool teachers rated their experiences of different types of social interactions in preschool. The instrument consists of a total of 36 items, and responses are based on a five-point Likert scale where 1="seldom", 2="quite often", 3="50% of the time", 4="fairly often", and 5="often". It covers interactions between teacher and child, child and teacher, other children and the child, and the child and other children, and has been found to have a reliability range from .86 to .96 (Almqvist, 2006). In the analysis of the present study, only 15 items measuring the teacher's responsiveness to the child (10 items) and other children's interaction with the child (5 items) were used. The reliability was found to be .77 and .92, respectively.

Analysis

The current analysis consisted of the following: a) A hierarchical linear model (HLM) was used to investigate the amount of variance in core engagement and developmental engagement accounted for by child level and classroom level; b) Using AMOS 21.0 (Arbuckle, 2012), we performed a structural equation model using maximum likelihood estimation methods to examine the hypothesized mediation role of social interactions on the relations between behaviour difficulties and engagement. We performed the path analysis using a complete-case approach (Hair, Anderson, Tatham, & William, 1998); by using cases with complete data (N=640).

According to Baron and Kenny (1986), the first step in testing mediating effects is to establish a significant direct effect between the predictors and the outcome variable. The second and third steps are to establish significant effects between predictor and mediator, and between mediator and outcome. Finally, to test the mediating effect we used the bias-corrected bootstrap resampling method, which corrects for the bias in the central tendency of the estimate and accommodates the non-normal distribution of the estimator of the indirect effects (MacKinnon, Lookwood, & Williams, 2004).

To assess model fit we considered multiple fit indices, including χ^2 statistics, root mean square error of approximation (RMSEA), and the comparative fit index (CFI; Bentler, 1990). Non-significant chi-square values indicated a good model fit; i.e. no difference between the model and the data (Byrne, 2013). RMSEA values less than 0.05 indicate a good model fit, and between 0.05 and 0.08 indicate a moderate model fit (Browne & Cudeck, 1993). CFI values above 0.90 indicate good model fit (Byrne, 2013).

Finally, to test the mediating effect in the modified model we relied on bootstrap standardized indirect effect with confidence intervals and significance test. Evidence of significant mediation exists when lower and upper confidence intervals of each indirect effect do not include zero. The strength of the mediation effect is estimated using ratio of the direct effect to the total (Shrout & Bolger, 2002).

RESULTS

Analytic approach

To investigate the effects of nested data in the classrooms in this study, two unconditional models were used for analysing children's *core engagement* and *developmental engagement*, respectively. The multilevel models were run in HLM7 (Raudenbush, Bryk, & Congdon, 2010). The first unconditional model determined that 25% of the variance in children's core engagement was accounted for by classroom effects. The second unconditional model determined that 44% of the variance in children's developmental engagement was attributable to classroom differences. The remaining amount of variance, 75% and 56% respectively, was attributed to child-level differences and could be modelled with child-level covariates. This resulted in an adjustment of the standard error (McCoach & Adelson, 2010). This procedure indicates the degree to which the standard error needed to increase to account for the clustering effect. First the actual sample size was calculated, using the equation $\frac{N}{1+\rho(nj-1)}$, where ρ is the ICC and n_j is the average sample size within classrooms. Next, in order to determine the degree to which the standard errors needed to increase to account for the clustering effect, the square root of the above equation was calculated. The standard errors were then adjusted by multiplying them with the calculated adjustment coefficient. The average sample size was 8.81, and the ICC was .25 for core engagement and .44 for developmental engagement. Thus, the following equations were used to adjust for the standard errors: $\sqrt{1 + .25 \times (8.81 - 1)} = 1.72$, and $\sqrt{1 + .44 \times (8.81 - 1)} = 2.32$.

Descriptive statistics

The means, standard deviations, and correlations between demographic variables, covariates and predictors are presented in Table 2. Inspection of the correlation matrix revealed a number of moderate to strong correlations between the two types of engagement (core and developmental), behaviour difficulties (hyperactivity and conduct problems), and proximal factors (teacher-child interaction and child-child interaction).

Although an examination of the matrix revealed high correlations between the independent variables, teacher-child and child-child interaction, the collinearity statistics (VIF=3.395,

Tolerance=.295) were within acceptable limits. Residuals and scatter plots indicated the assumption of normality, linearity and homoscedasticity (Brace, Kemp, & Snelgar, 2009).

Table 2. Pearson correlations between demographic variables, covariates and predictors. Including descriptive statistics.

	1	2	3	4	5	6	7	8	<i>M</i>	<i>SD</i>
1. Age									44.40	15.41
2. Gender	-.05								-	-
3. Child in need of special support	-.08*	.05							-	-
4. Core engagement (mean score, range 1-4)	.28***	-.11**	.23**						3.40	.51
5. Dev engagement (mean score, range 1-4)	.54***	-.02	.15**	.76***					3.09	.72
6. Conduct problems (sum score, range 0-10)	-.12***	.07*	-.18**	-.24**	-.17***				1.35	1.87
7. Hyperactivity problems (sum score, range 0-10)	-.21***	.12***	-.26**	-.45***	-.39***	.56***			2.30	2.41
8. Teacher responsiveness (mean score, range 1-5)	.19***	.09*	.11**	.55***	.50***	-.15***	-.35***		4.56	.36
9. Peer interaction (mean score, range 1-5)	.48***	.06	.16**	.65**	.77***	-.17***	-.57***	.57.3**	4.07	.93

Note: Gender: 0=boy, 1=girl. Child in need of special support; 0=no special support, 1=special support. *** $p < .001$, ** $p < .01$, * $p < .05$

The hypothesized and modified mediation models

The hypothesized model (see Figure 1) examined the mediating roles of teacher responsiveness and peer interactions in the relationship between hyperactivity and conduct problems and the two types of engagement. The results show that all the direct and indirect beta coefficients for hyperactivity were significant at $p < .01$, indicating significant mediation. Meanwhile, the direct and indirect paths from conduct problems to teacher responsiveness, core engagement, and developmental engagement were non-significant at $p < .05$, indicating non-significant mediation. However, the path from conduct problems to peer interaction was significant at $p < .01$, indicating significant mediation effect between conduct problems and both types of engagement.

Figure 1. Standardized regression weights for direct effect in the hypothesized model.

Note: $N = 640$. Significant, non-significant, and covariance paths are shown. $^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

The overall model fit of the hypothesized model was not fully satisfactory ($\chi^2(1)=172.54$, $p < .001$; CFI=.909; RMSEA=.518). Thus, to improve the overall model, it was modified by deleting the non-significant direct paths from conduct problems to core engagement, developmental engagement, and teacher responsiveness.

The modified model, as shown in Figure 2, fits the data well ($\chi^2(3)=3.00$, $p < .001$; CFI=1.0; RMSEA=.002). Positive direct paths were found from conduct problems to peer interaction, and from both types of social interactions to both types of engagement. Specifically, peer interaction

was a strong, statistically significant predictor for both core engagement and developmental engagement. Teacher responsiveness was a strong predictor for core engagement, but a slightly weaker predictor for developmental engagement.

Higher hyperactivity scores were negatively related to both types of engagement and to both types of social interaction. The paths indicate that high hyperactivity scores were a statistically significant predictor for poor core engagement and developmental engagement, which was not the case for conduct problems.

Figure 2. Standardized regression weights for direct effect in the modified model. Note: N = 640. Only significant and covariance paths are shown. $***p < .001$. $**p < .01$. $*p < .05$.

Finally, six indirect paths were tested: (1) Peer interaction as a mediator of hyperactivity and core engagement; (2) Peer interaction as a mediator of hyperactivity and developmental engagement; (3) Teacher responsiveness as a mediator of hyperactivity and core engagement; (4) Teacher responsiveness as a mediator of hyperactivity and core engagement; (5) Peer interaction as a mediator of conduct problems and core engagement; and (6) Peer interaction as a mediator of conduct problems and developmental engagement.

Social interaction as mediating effect between behaviour difficulties and engagement

As shown in Table 3, the confidence interval for each mediated path did not include zero, indicating significant mediation. That is, peer interaction significantly mediated the relations of hyperactivity

to core and developmental engagement. The mediating effect explained 56% of the total effect for core engagement and 78% for developmental engagement. Moreover, teacher responsiveness mediated the relations of hyperactivity to core and developmental engagement. The paths explained 33% of the total effect for core engagement and 34% for developmental engagement. The results show that there was an indirect significant association between conduct problems and both types of engagement through peer interaction.

Table 3. Summary of the mediated paths tested from the bias-corrected bootstrap resampling method in the modified model.

Mediated path tested	Lower CI	Upper CI	Indirect effect (β)	Total effect (β) ($ab + c'$)
Modified model				
1. Hyperactivity to CE through PI	-.323	-.219	-.286***	-.503***
2. Hyperactivity to DE through PI	-.419	-.291	-.355***	-.455***
3. Hyperactivity to CE through TR	-.194	-.122	-.156***	-.470***
4. Hyperactivity to DE through TR	-.178	-.108	-.140***	-.410***
5. Conduct problems to CE through PI	.007	.106	.058**	.058**
6. Conduct problems to DE through PI	.009	.140	.076**	.076**

Note: CE=Core Engagement; DE=Developmental Engagement; TR=Teacher Responsiveness; PI=Peer Interaction; CI=confidence interval. ** $p < .01$. *** $p < .001$.

To conclude, the results revealed that peer interaction acts as a mediator between both types of behaviour difficulties and both types of engagement. Meanwhile, teacher responsiveness works as a mediator only between hyperactivity and the two types of engagement. The relationship between hyperactivity and engagement was significantly mediated through both types of social interactions in preschool. The results indicate that children who displayed hyperactive behaviour showed low levels of engagement and were met with less teacher responsiveness as well as less frequencies of positive peer interaction.

Discussion

Findings showed that differences in child engagement and externalizing behaviour difficulties were influenced by variations in environmental factors, which is consistent with Ben-Arieh and Frones (2011); Bronfenbrenner and Evans (2000); Claessens (2012) regarding the manner in which proximal processes function as a mechanisms influencing child development. Our analyses yielded four important findings. First, the direct effect of the two types of behaviour difficulties on the two types of engagement differed. Second, hyperactivity and conduct difficulties have different direct associations with teachers' responsiveness and peer interaction. Third, peer interaction was the strongest mediating factor between the two types of behaviour difficulties and the two types of engagement. Fourth, teacher responsiveness was only a mediating factor between hyperactivity and two types of engagement.

The results underscore the importance of how proximal factors within the microsystem work as mediating predictors for child engagement among children who display externalizing behaviour difficulties. However, only hyperactivity seems to have a statistically strong negative direct impact on teachers' responsiveness, peer interaction and both types of engagement. One explanation for this may be that both social interaction and engagement require a certain level of self-regulation for everyday functioning. Searle et al. (2013) found that low self-regulation, i.e. hyperactivity, has a strong negative impact on both social interaction and the time the child stays actively engaged in play activities with other children. It is likely that both teacher responsiveness and positive interactions with other children are facilitated when the child stays focused on the same topic as the interaction partner for a period long enough to provide feedback to the partner. However, social interaction is a two-way process, involving mutual feedback loops. By providing positive responses to the child in interaction, both teachers and peers may support the hyperactive child in staying in interaction. Knowledge is needed about how special support in preschool should be designed to contribute to positive interaction to promote children's engagement, especially for children with hyperactivity.

The result showing that conduct difficulties did not have a negative impact on either social interaction or engagement is inconsistent with previous studies (Buhs et al., 2006; Denham et al., 1990; Lillvist, 2010; Nurmi, 2012; Olson, 1992). This may be related to type of activities in and proportion of free play (Corsaro, 1988; Jonsdottir, 2007; Lillvist,

2010; Olausson, 2012). Free play probably involve a low frequency of adult instruction that could trigger oppositional behaviour. Children with conduct difficulties who can focus their attention and stay in activities can probably exhibit relatively high engagement in these activities despite their difficulties.

The different strengths in the associations between the two types of externalizing behaviour difficulties and core engagement and development engagement confirm the relevance of treating conduct difficulties and hyperactivity, as well as core engagement and developmental engagement, as separate but related constructs. The stronger negative indirect effect of hyperactivity on developmental engagement through teacher responsiveness and peer interaction, compared to the indirect effect of hyperactivity on core engagement through teacher responsiveness and peer interaction, indicates that developmental engagement requires more self-regulation and less hyperactivity in children. Core engagement is related to less complex types of activities, e.g. being an onlooker or persisting in asking for something, and does not require sustained problem-solving and social interaction. In contrast, developmental engagement, which is related to more complex behaviour – e.g. pretending toys are something else or role-based play – requires sustained attention and complex social interaction. These results support the results of the meta-analysis by Allan et al. (2015), who found a strong negative relationship between hyperactivity and preschoolers' executive functions and self-regulatory behaviour; i.e. the ability to shift focus, block out unnecessary stimuli, and sustain attention. The results also indicate a relatively strong correlation between conduct problems and hyperactivity. Children who display both types of externalizing behaviour difficulties are probably more vulnerable and even more in need of special support in preschool, e.g. teacher responsiveness and positive peer interactions, to promote everyday functioning.

In analysing the results of this study, it is important not to infer that hyperactivity is a direct negative causal factor for children's chances of being highly engaged in preschool activities. The results indicate that the indirect effect between hyperactivity and both types of engagement through teachers' and peers' interaction differed. According to earlier studies, especially teacher responsiveness has been reported to be related to children's engagement in preschools in both Sweden and other countries (Aguiar & McWilliam, 2013; Almqvist & Granlund, 2005). The strong indirect effect of peer interaction on the relation between hyperactivity and both types of engagement was not expected, however. Again, this might be explained by the proportionally large amount of

time spent in free play activities. Most free play activities, especially for older children, involve two or more children. The results indicate that it is important to develop a methodology for promoting positive peer interaction among children who have problems with hyperactivity.

To conclude, the results partly supported our hypotheses that both teachers' responsiveness and positive peer interactions have a positive influence on the relations of hyperactivity and conduct problems to the two types of engagement (core and developmental). A high level of hyperactivity was a stronger predictor for low frequencies of both social interaction and engagement than a high level of conduct difficulties. For young children, not staying in activities long enough likely affects interaction and engagement to a greater extent than having a tendency to display oppositional behaviour. This pattern may change with age; older children are exposed to more complex rule-based play and adult instructional activities, which require more collaboration.

Peer interaction and teacher responsiveness explained a large percentage of the total negative effect from hyperactivity to core engagement and developmental engagement. It is vital to identify the function of social interaction in this pattern. It may be that positive social interaction can support hyperactive children in focusing and sustaining attention in activities. It might also be related to characteristics of the activities, such as the number of elements they include or how long they last.

Limitations and implications for practice

Our data on children's engagement, behaviour difficulties and social interaction are based on survey data and staff estimates of individual children's functioning in preschool. More fine-grained qualitative methods or observations could be employed to investigate how different types of social interactions and activities can be linked to engagement and behaviour difficulties. For example, assessing how conversational turns between preschool teacher and child, and between children, influence children's behaviour would provide more specific information on how the social climate may influence the negative relationship between behaviour difficulties and engagement. In other words, investigating the content of the social climate as teacher and child interactions during different types of activities and different preschool units might provide a more nuanced picture.

Overall, our results suggest that both teacher-child and child-peer interaction in preschool classrooms contribute to children's engagement, whether or not they exhibit behaviour difficulties. Our sample is taken from inclusive preschools, which may imply a

supportive environment for children's engagement and everyday functioning. However, the results showed a negative relationship between hyperactivity and teacher responsiveness on the one hand and hyperactivity and peer interaction on the other, indicating a less supportive environment. The results suggest interventions and professional development focusing on positive peer interaction and staff responsiveness. It is probably necessary for staff to adapt their behaviour to the child's level of functioning. It is likely not only the behaviour difficulties that have a negative impact on the responsiveness of teachers and peer interaction; other studies (Sheridan & Pramling Samuelsson, 2013) have suggested that structural factors such as large groups of children increase stress among both adults and children, which in itself can be particularly sensitive for children who show behaviour difficulties. Both teachers and children require frequent opportunities to jointly create a positive social climate in the classroom.

Finally, our work suggests that teacher-child interaction and child-child interaction need to be studied over time in order to provide a clearer picture of causality between preschool teachers' responsiveness, other children's interactions, behaviour difficulties and engagement. Based on such studies, different types of special support could be designed and implemented to enhance children's engagement and functioning.

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