

Preschoolers' Profiles of Self-regulation, Social-emotional and Behavior Skills and Its Prediction for a Successful Behavior Adaptation during the Transitional Period from Preschool to Elementary School

Annika Rademacher, Naska Goagoses, Sören Schmidt, Jelena Zumbach & Ute Koglin

To cite this article: Annika Rademacher, Naska Goagoses, Sören Schmidt, Jelena Zumbach & Ute Koglin (2021): Preschoolers' Profiles of Self-regulation, Social-emotional and Behavior Skills and Its Prediction for a Successful Behavior Adaptation during the Transitional Period from Preschool to Elementary School, Early Education and Development, DOI: [10.1080/10409289.2021.1958283](https://doi.org/10.1080/10409289.2021.1958283)

To link to this article: <https://doi.org/10.1080/10409289.2021.1958283>



Published online: 29 Jul 2021.



Submit your article to this journal [↗](#)



Article views: 35



View related articles [↗](#)



View Crossmark data [↗](#)



Preschoolers' Profiles of Self-regulation, Social-emotional and Behavior Skills and Its Prediction for a Successful Behavior Adaptation during the Transitional Period from Preschool to Elementary School

Annika Rademacher ^a, Naska Goagoses^a, Sören Schmidt^b, Jelena Zumbach^c, and Ute Koglin^a

^aFaculty of Educational and Social Sciences, Department of Special Needs Education and Rehabilitation, University of Oldenburg; ^bApplied and Clinical Psychology, Hochschule Fresenius; ^cFamily Law Psychology, Psychologische Hochschule Berlin

ABSTRACT

Research Findings: A successful transition from preschool to elementary school requires a high level of behavioral adaptation. The aim of our study was to analyze child-related factors in preschool that facilitate a positive behavioral adaptation in the transitional period to elementary school. A cluster analysis was conducted with the data from 406 preschoolers, in order to identify profiles based on self-regulation skills, social-emotional competences, and externalizing behavior problems. Using structural equation modeling, we then tested a regression model to examine which preschool profile adequately manages to adapt their behavior for elementary school. The profile clustering showed that behavior problems occurred when self-regulation skills were low, despite existing (moderate) social-emotional competences. Moreover, low levels of self-regulation skills in preschool predicted difficulties in behavioral adaptation at school, especially concerning hyperactivity, even when children possessed moderate social-emotional competences. *Practice or Policy:* Most notably, the results reinforce the relevance of promoting early self-regulation skills to support children in their behavioral adaptation process during the transitional period from preschool to elementary school.

The transitional period from preschool to elementary school is a critical phase in children's lives (Margetts, 2002). As a critical life event, a transition can have a positive or negative impact on a child's development (Belsky & MacKinnon, 1994). In the transitional phase to formal schooling, children face the challenge of having to adapt to new situations (Nelson et al., 2017; Portilla et al., 2014). They are confronted not only with new academic challenges, but also with new behavioral demands (McClelland et al., 2006); children are required to behave in a socially competent manner, follow instructions, and pay attention (Nelson et al., 2017; Petriwskyj et al., 2005). Some children have difficulties meeting the new academic, interpersonal, and behavioral demands. School teachers often report that children do not yet have the required social skills, have problems working in groups, following directions, and controlling their attention (Rimm-Kaufman et al., 2000). The current study contributes to a better understanding of why some preschool children find it easier to adapt and why others struggle to meet the new demands of school.

CONTACT Annika Rademacher  annika.rademacher@uni-oldenburg.de  Faculty of Educational and Social Sciences, Department of Special Needs Education and Rehabilitation, University of Oldenburg, Ammerlaender Heerstr. 114–118, Oldenburg 26111, Germany

Transition from Preschool to Elementary School

Preschool plays a central role in preparing children for a successful transition to school (Hasselhorn & Kuger, 2014). In Germany, children aged around 3 to 7 years can attend kindergarten. The last year of kindergarten is referred to as the preschool year. Kindertagesstätten are play-oriented institutions and, unlike schools, have no curriculum. However, within the preschool year an effort is made to prepare children for the new demands of formal schooling. The educational work in preschool aims to strengthen social-emotional competences and promote basic school-related skills and knowledge. After the preschool year, children enter elementary school. Although the education system in Germany is unique in some respects, preschool and elementary school structures and curricula are comparable to that of other countries.

In the first years of elementary school a focus is placed on academic skills, such as learning to read and write, as well as numerical comprehension and arithmetic. However, it is additionally expected that children display appropriate social and behavior adaptations (Rimm-Kaufman & Pianta, 2000). Children's success at school is primarily reflected in their school grades. Besides academic performance, adaptive and regulated behavior positively influences school grades and is thus deemed important for early school success (Cadima et al., 2015; Duckworth et al., 2012). Previous research has identified individual factors at preschool age that foster a positive behavioral adaptation in elementary school, which include self-regulation and social-emotional competence (Denham et al., 2012b; Kim et al., 2013; Von Suchodoletz et al., 2009; Willoughby et al., 2011). A better understanding of these factors and their interaction will provide new insights for preschool teachers and preschool prevention programs, as they can draw on a cross-domain promotion for optimal development.

By examining longitudinal associations in a sample of typically developing children, we can establish and transfer the far-reaching importance of early preschool skills for subsequent development to several children. Our work is based on the social-emotional learning (SEL) model of Denham et al. (2012a). According to this model, various aspects of social and emotional competence interact to form an interface that determines preschoolers' school readiness and subsequently their success in school. The SEL model includes competences such as the abilities to manage emotions and behavior, as well as relational and prosocial skills (Denham et al., 2010).

Self-Regulation

Self-regulation is often understood as a two-dimensional construct, with hot and cool components (see Denham et al., 2014; Kim et al., 2013; Poland, Monks, & Tsermentseli, 2016; Willoughby et al., 2011). Hot self-regulation refers to the appropriate response to emotional stimuli, whereas cool self-regulation describes a more cognitive form of regulation (Denham et al., 2014; Mischel, Shoda, & Rodriguez, 1989). Appropriate self-regulation includes controlling attention, inhibiting behavior, and regulating emotions in accord with environmental demands (Denham et al., 2014). The development of self-regulation begins in early childhood, changing from an initially externally controlled form to an internally controlled regulation (Cox, Mills-Koonce, Propper, & Gariépy, 2010; Feldman, 2009). Especially during preschool, children's self-regulation abilities increase rapidly (Berger, Kofman, Livneh, & Henik, 2007; Denham et al., 2014; Kopp, 1982); children are increasingly able to control their attention, emotions, and behavior, and engage in planned and goal-oriented behavior (Calkins & Fox, 2002). Thus, preschool represents a crucial time for the development of adequate (or deficient) self-regulation abilities (Montroy et al., 2016).

Studies have shown that gender differences in self-regulatory skills develop early in childhood (Weinberg et al., 1999). Different studies, with both preschoolers and school-aged children, have shown that girls have better self-regulation skills than boys (Duckworth & Seligman, 2006; Matthews et al., 2014). In preschool, this gender difference can be found when using both teacher ratings and direct assessments with children (Matthews et al., 2009). Although self-regulation skills are already required at

preschool (e.g., children are asked to sit still, listen, and wait), the importance of self-regulated behavior increases when children enter school (McClelland et al., 2007). Self-regulation is needed to complete long-term goals, such as finishing school tasks and homework despite boredom or frustration (Edossa et al., 2018). Children with high levels of self-regulation skills are able to follow teachers' instructions and wait for a teacher to finish their question before answering it (Ladd & Dinella, 2009). Furthermore, high levels of self-regulation skills are needed to engage in positive social interactions, which includes getting along with peers and dealing with criticism (Matthews et al., 2009; McClelland & Morrison, 2003). Children who already have difficulties with self-regulation in preschool tend to start school with a disadvantage. In particular, boys who already have poorer self-regulation skills are at an increased risk of adaptation problems at elementary school (Matthews et al., 2009).

Social-Emotional Competence and Behavior Problems

Preschool is also a significant phase for the development of children's social-emotional competences (Halberstadt et al., 2001; Saarni, 1999). The development of social-emotional competence at this age includes an increase in the ability to recognize and name emotions in oneself and others, regulate emotions appropriately, understand emotions and build emotion knowledge, to show empathy, and to engage in prosocial behaviors (Denham, 1998). Socially and emotionally competent children show a higher level of behavioral adaptation in school settings (Denham et al., 2014). These children often have more social interactions with peers, demonstrate more positive interactions with teachers, show adequate behaviors, and better social problem solving skills (Denham, 2006; Denham et al., 2012a; Izard et al., 2001). Children with high social-emotional competences tend to be more engaged in (social) school settings and show fewer behavioral problems (Blair & Raver, 2015).

While high levels of social-emotional competences positively influences various developmental outcomes, early behavior problems can undermine positive development. Children with early externalizing behavior problems, such as aggressive behavior, hyperactivity, and impulsivity, show significantly poorer school readiness skills and are disadvantaged in the transition to elementary school (McClelland et al., 2006; Webster-Stratton et al., 2008). Children who enter school with behavior problems are at higher risk of poor academic and social performance, as they have difficulties adapting to the school routine and the new school environment (Montes et al., 2011).

Gender differences are also evident in prior research on social-emotional and behavioral development in preschool and middle childhood. Girls generally demonstrate fewer externalizing emotions (e.g., anger), are more emotionally expressive, and engage in more prosocial behaviors, than boys (Chaplin & Aldao, 2013; Flook et al., 2019). Already in preschool, boys are more likely than girls to exhibit externalizing behaviors, which in turn affects their school readiness and early school success (Chen, 2010).

The Current Study

The body of research on the relationship between social-emotional competences and behavior development is extensive (Denham, 2006; Denham et al., 2012a). Similarly, studies exist that affirm the predictive power of early self-regulation skills for a positive developmental trajectory (Edossa et al., 2018; Sasser et al., 2015; Willoughby et al., 2011). To date, however, it is unclear how these components are intertwined in predicting behavioral adaptation in the transition from preschool to elementary school. Considering that children have a set of skills which they can draw upon in any given situation, and that their behaviors are driven by a range of social, emotional, and cognitive factors, examining components in isolation cannot provide a clear holistic understanding. Hence, the overall aim of the current study is to examine how self-regulation skills, social-emotional competences, and behavior problems in preschool interact to promote or hinder a successful adaptation to interpersonal and

behavioral demands in elementary school. Although variable-centered analyses have provided important information, researchers have previously argued that person-centered analyses are required to understand how different skills encompassed in the profiles of individual preschool children are able to foster or hinder cross-domain development (Denham et al., 2012a). Agreeing with this notion, we followed a person-centered approach to (1) identify profiles in preschool-aged children, based on their level of self-regulation skills, social-emotional competences, and behavior problems, (2) examine how the identified profiles are associated with their behavioral adaptation at elementary school, and (3) examine the role of gender for a successful behavioral adaptation at school.

Previous studies utilizing a variable-centered approach have clearly demonstrated that higher levels of self-regulation skills and social-emotional competences are positively associated with behavioral adaptations, and vice versa for behavior problems (Denham et al., 2014; Rutter et al., 2006; Webster-Stratton et al., 2008; Willoughby et al., 2011). We thus expect to find a similar trend within the identified profiles. Similarly, Martarelli et al. (2018) report that children with high self-regulation skills outperformed other children in school readiness, even when aspects of social-emotional development are high. We hypothesized that high social-emotional skills cannot fully compensate for weak self-regulation skills, thereby reinforcing the central role of early self-regulatory skills for behavioral adaptation in elementary school. Moreover, we hypothesized that early externalizing behaviors can undermine a positive behavioral adaptation during the transition to elementary school (see Montes et al., 2011). Based on previously found gender differences in preschoolers' self-regulatory skills, social-emotional competences, and behavior problems (Chaplin & Aldao, 2013; Chen, 2010; Hosseini-Kamkar & Morton, 2014), we also hypothesized that girls would show better behavioral adaptations in elementary school than boys.

Method

Participants and Procedure

The current study is part of a larger project, for which data was collection from spring 2016 to 2019. Children were recruited from 39 preschools in Northern Germany. The current investigation focuses on longitudinal data, collected in preschool (T1) and in elementary school (T2). The participating children and their families were recruited through the preschools. Study participation was voluntary for children, preschools, and schools, and written parental consent was obtained. At T2, after getting approval from the national school authorities, we contacted the elementary schools that the participating children were by then attending.

At T1, all children were in their last year of kindergarten, i.e., the preschool year. In Germany, children in preschool are usually between 5 to 7 years of age. The total sample included $N = 445$ children. About 8% of the children had missing values at T1 and were excluded for the following analyses. The sample for the current study is thus reduced to $N = 406$ children. The children's average age was $M = 72.46$ months ($SD = 4.21$, ranging from 62 to 88 months, 88.6% of the sample is between 5;5 and 6;5 years old), and 52.71% were male. About 21.11% of the children were born outside of Germany or had a parent that was born in another country. 87.68% of the children speak German at home (for the remaining 12.32% German and/or another language is spoken at home), and 93.72% of the children have grown up in a German-speaking household from birth. 85.64% of the children live with both their parents, and 12.13% of the children live with their mother only. 43.22% of the mothers and 40.82% of the fathers graduated from a more academically oriented secondary school (i.e., a school degree needed to attend university) or have a university degree. Slightly less than 2% of the parents had no school-leaving qualifications. None of the children was diagnosed with a special educational need.

In Germany, children can be enrolled in formal schooling between the ages of 5 and 7 (on average children start school at around 6;5 years of age). At T2, the children were in their second year of elementary school, with a mean age of 92.82 months ($SD = 4.21$, ranging from 83 to 107 months, 90.63% of the sample was between 7;25 and 8;25 years old). At T2, the children were distributed over

69 elementary schools. The beginning of the second grade was chosen as T2, as this can be considered a point at which the children have had time to “arrive” at the school and had some time to deal with and adjust to the new demands; we did not want to capture the initial acclimatization period. Hence, children who show difficulties at T2 have not succeeded in adapting to the new requirements after one year at school. As the data originates from a larger research project, further variables were collected but will not be discussed here as they are not relevant for the current research question.

Measures

To assess preschoolers’ self-regulation skills, social-emotional competences, and level of externalizing behavior problems at T1, their preschool teachers were asked to complete the *Behavior Rating Scales for Preschoolers* (Verhaltensskalen für das Kindergartenalter, VSK; Koglin & Petermann, 2016). The scales have previously been shown to have adequate psychometric properties (Koglin & Petermann, 2016). Preschool teachers were asked to report on the children’s behavior over the past four weeks, on a four-level scale ranging from “not true” to “true.” For this study, the scales *aggressive behavior* (10 items; e.g., “hits other children”; $\alpha = .92$), *hyperactivity and inattention* (5 items; e.g., “hands and feet are constantly in motion”; $\alpha = .78$), *emotion knowledge and empathy* (7 items; e.g., “recognizes when another child is afraid”; $\alpha = .84$), *social competence* (6 items; e.g., “shares toys with other children”; $\alpha = .72$) and *self-regulation* (5 items; e.g., “waits until it is his/her turn”; $\alpha = .76$) were included. The scales assessing aggressive behavior and hyperactivity and inattention were combined to provide an indication of externalizing behavior problems. The scales assessing social competence and emotion knowledge and empathy were combined to provide an indication of social-emotional competences.

To assess the children’s behavioral adaptation in elementary school at T2, their school teachers were asked to complete the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997). The scales *conduct problems* (e.g., “often loses temper”; $\alpha = .74$), *hyperactivity* (e.g., “restless, overactive, cannot stay still for long”; $\alpha = .87$), and *prosocial behavior* (e.g., “often offers to help others”; $\alpha = .85$) were used, which comprise of 5 items each. Teachers rated the children’s behavior over the last six months or the current school year, on a three-level scale ranging from “not true” to “certainly true.”

Data Analysis

The analyses were calculated with STATA 14. Using cluster analysis, profiles were identified, i.e., children with similar characteristics were assigned to the same cluster. The three scales self-regulation, social-emotional competences and externalizing behavior problems were entered in the cluster analysis. Background variables were not included in the analyses in order to avoid confounding profiles and to strengthen their robustness. Before conducting the analysis, all variables were z-transformed.

For the following cluster analytical procedure, a combination of hierarchical and nonhierarchical (partitioning) procedures was chosen (Hair et al., 2010). In a first step, the single-linkage method (hierarchical) was used to identify outliers, which were eliminated for object fusion to achieve a homogeneous cluster. Graphical dendrogram analysis were used to determine the outliers. Four cases were identified and excluded from further analyses. The ward’s-linkage method (hierarchical) was chosen for cluster fusion and for determining the number of clusters. Graphical dendrogram analysis suggested a two-cluster solution, while the duda-hart-index (as a quantitative criterion) suggested a three-cluster solution. The squared euclidean distance was used as the distance measure for metric data for both the single-linkage method and the ward’s-linkage method. Subsequently, the nonhierarchical *k*-means method with *k* = 3 clusters was applied for cluster optimization. Each observation was assigned to the group (cluster) with the closest mean. Based on this assignment, new group averages can be determined. The squared euclidean distance was again used as the distance measure. By applying χ^2 -test and ANOVA, significant gender and group differences were calculated.

After clustering, structural equation modeling was used to analyze which profile (cluster) of children succeed best in adapting their behavior in the transitional period from preschool to elementary school

(Kline, 2016). The teachers' completed SDQ-scales (Goodman, 1997) for prosocial behavior, conduct problems, and hyperactivity at T2 were selected as the outcome. Due to missing values at T2, the parameters of the structural equation model were estimated using *full information maximum likelihood* (Enders & Bandalos, 2001; Graham, 2009). Missing data varied across the used scales. A subsequent wald-test (χ^2 -test) was used to examine whether the regression coefficients differ significantly from zero; the test is comparable to the *F*-test of an ANOVA or regression analysis (Aichholzer, 2016).

Results

Profile Identification

The cluster analysis revealed three preschool profiles, based on self-regulation skills, social-emotional competences, and level of externalizing behavior problems (see Figure 1). The descriptive statistics for all profiles (clusters) are presented in Table 1. Profile 1 included 136 children with low levels of self-regulation skills, and moderate social-emotional competences and externalizing behavior problems. Profile 2 included 80 children with extremely low levels of self-regulation skills and social-emotional competences, and extremely high levels of externalizing behavior problems. Profile 3 included 186 children with high levels of self-regulation skills and social-emotional competences, and low levels of externalizing behavior problems.

For all three profiles significant group differences emerged regarding the level of self-regulation skills ($F_{(2, 399)} = 493.68, p < .001$), social-emotional competences ($F_{(2, 399)} = 193.14, p < .001$) and externalizing behavior problems ($F_{(2, 399)} = 539.43, p < .001$). Profile 2 includes significantly more boys than girls ($\chi^2 = 41,676, p < .001$), and profile 3 includes significantly more girls than boys ($\chi^2 = 26,989, p < .001$). No gender distribution differences are found for profile 1 ($\chi^2 = .126, p > .05$).

Association with Behavioral Adaptation

After creating the profiles, we analyzed the association with behavioral adaptation at elementary school. Prosocial behavior, conduct problems, and hyperactivity are used as an indication of



Figure 1. Means of clustered factors corresponding to the identified profiles of preschool children.

Table 1. Descriptive statistics for the profiles and the total sample (z-standardized values).

	Profile 1	Profile 2	Profile 3	Total sample
Total sample, n, %	136, 33.83%	80, 19.90%	186, 46.27%	402, 100%
Girls, n, %	66, 34.38%	12, 6.25%	114, 59.38%	192, 100%
Boys, n, %	70, 33.33%	68, 32.38%	72, 34.29%	210, 100%
Self-regulation, <i>M</i> (<i>SD</i>)	-.34 (.05)	-1.34 (.08)	.83 (.03)	.00 (1.00)
Social-emotional competences, <i>M</i> (<i>SD</i>)	.08 (.06)	-1.25 (.08)	.55 (.05)	.01 (.99)
Externalizing behavior problems, <i>M</i> (<i>SD</i>)	.22 (.05)	1.48 (.07)	-.79 (.03)	.01 (1.01)
Self-regulation, <i>M</i> (<i>SD</i>)				
Girls	-.38 (.06)	-1.40 (.22)	.84 (.04)	
Boys	-.30 (.07)	-1.33 (.09)	.81 (.05)	
Social-emotional competences, <i>M</i> (<i>SD</i>)				
Girls	.16 (.09)	-1.36 (.22)	.67 (.06)	
Boys	-.01 (.07)	-1.24 (.09)	.36 (.08)	
Externalizing behavior problems, <i>M</i> (<i>SD</i>)				
Girls	.09 (.06)	1.68 (.19)	-.89 (.04)	
Boys	.34 (.07)	1.44 (.08)	-.64 (.05)	

M = mean, *SD* = standard deviation.

behavioral adaptation at elementary school. Table 2 displays the descriptive statistics for these three variables per preschool profile.

The regression paths from the structural equation modeling illustrate the impact of the profiles on the behavioral adaptation in elementary school. The simultaneous combination of self-regulation skills, social-emotional competences, and externalizing behavior problems in the profiles can predict the development of adaptive (i.e. maladaptive) behavioral adaptation in elementary school. Significant associations emerged for the development of conduct problems ($\beta = -.226$, $SE = .060$, $p < .001$), hyperactivity ($\beta = -.330$, $SE = .056$, $p < .001$), and prosocial behavior ($\beta = .132$, $SE = .063$, $p < .05$; R^2 of the overall model = .162; SDQ-scales). The intercorrelations among the three preschool profile variables and the behavioral adaptation variables at school age are displayed in Table 3, as well as the regression coefficients for the cluster variable and the behavioral adaptation variables. School conduct problems, hyperactivity, and prosocial behavior differed significantly among the profiles (conduct problems: Wald $\chi^2_{(1)} = 13.25$, $p < .001$; hyperactivity: Wald $\chi^2_{(1)} = 30.69$, $p < .001$; prosocial behavior: Wald $\chi^2_{(1)} = 4.27$, $p < .03$).

Table 2. Descriptive statistics for behavioral adaptation variables in elementary school per preschool profile (z-standardized values).

	Profile 1	Profile 2	Profile 3	Total sample
Prosocial behavior, <i>M</i> (<i>SD</i>)	.04 (.11)	-.74 (.14)	.24 (.08)	-.01 (1.00)
Hyperactivity, <i>M</i> (<i>SD</i>)	.08 (.12)	.91 (.17)	-.34 (.07)	.02 (1.01)
Conduct problems, <i>M</i> (<i>SD</i>)	.25 (.12)	.67 (.16)	-.41 (.06)	.01 (1.00)

M = mean, *SD* = standard deviation.

Table 3. Intercorrelations and regression coefficients (z-standardized values).

	1	2	3	4	5	6
1 Profile 1	1					
2 Profile 2	-.352***	1				
3 Profile 3	-.653***	-.456***	1			
4 Conduct problems ¹	.040	.416***	-.357***	1		
5 Hyperactivity ¹	.162**	.315***	-.418***	.575***	1	
6 Prosocial behavior ¹	.035	-.341***	.258***	-.518***	-.386***	1
Cluster variable	-.226***	.060	-.330***	.056	.132*	.063

¹SDQ scales at elementary school age; β = standardized regression coefficient; *SE* = standard error; * $p < .05$; ** $p < .01$; *** $p < .001$.

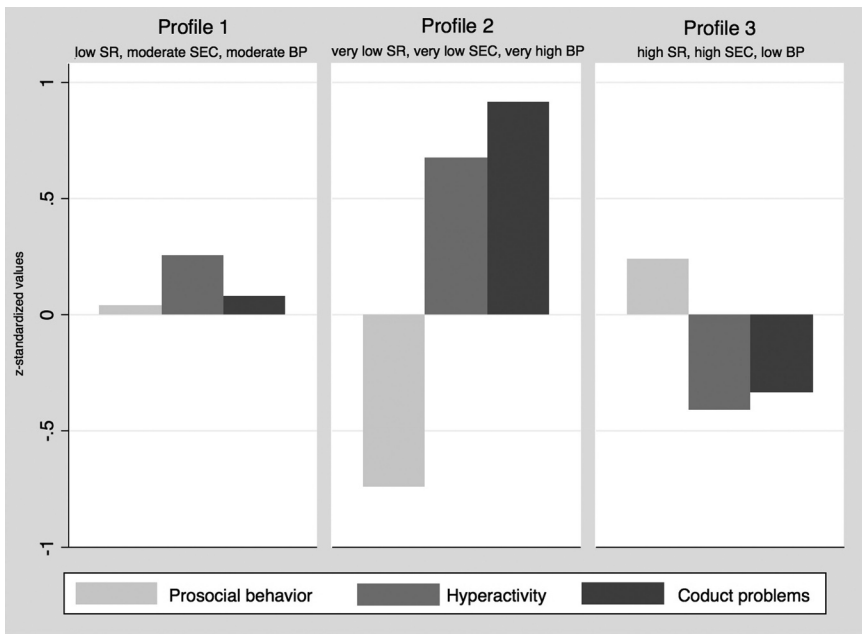


Figure 2. Mean values of school variables for behavioral adaptation for the three different profiles of preschool children. SR = self-regulation; SEC = social-emotional competencies; BP = behavior problems.

The most adaptive behavioral adaptation was achieved by the children who were assigned to profile 3. These children displayed the lowest conduct problems and hyperactivity, and the highest prosocial behavior in elementary school. There is a higher number of girls in this group (around 61%). On the other hand, children assigned to profile 2 had the highest levels of conduct problems and hyperactivity, and the lowest levels of prosocial behavior in elementary school. The gender ratio is roughly balanced in this group (nearly 52% boys). Preschool children assigned to profile 1 demonstrate moderate hyperactivity problems and moderate conduct problems and prosocial behavior in elementary school. This group consists predominantly of boys (85%). **Figure 2** illustrates the three preschool profiles regarding their level of prosocial behavior, hyperactivity, and conduct problems in elementary school.

Discussion

The aim of the current study was to identify profiles in preschool children based on their self-regulation skills, social-emotional competences, and externalizing behavior problems, and to compare the distinct profiles with regards to the longitudinal impact on the children's behavioral adaptation at the beginning of second grade. The assignment to a profile can predict how successful a child can master the behavioral and social demands during the transitional phase from preschool to elementary school. Our results show that the identified preschool profiles were significantly associated with prosocial behavior, hyperactivity, and conduct problems in elementary school. As hypothesized, early externalizing behaviors undermine positive behavioral adaptation during the transition to elementary school. On the other hand, the analyses reveal that children show less conduct problems and hyperactivity, and more prosocial behaviors in elementary school if they display high social-emotional competences and self-regulatory skills, and minor externalizing behavior problems in preschool. Similar results have been shown by Denham et al. (2012a), who found that preschool children who could be assigned to a socially-emotionally competent profile showed less aggressive behavioral later in preschool, compared to those who were considered less competent.

Although studies have found that preschool self-regulation skills and social-emotional competences positively promote behavioral adaptation in school (Denham et al., 2012b; Kim et al., 2013; Von Suchodoletz et al., 2009; Willoughby et al., 2011), the extent to which these interact has rarely been studied. In the current study we found that children who show high levels of behavior problems, as well as low levels of self-regulation skills and social-emotional competences in preschool, show the greatest conduct problems and hyperactivity in school. Children with low levels of self-regulation skills in preschool, combined with moderate social-emotional competences and moderate behavior problems, exhibit higher levels of hyperactivity in elementary school (as well as moderate conduct problems and moderate prosocial behaviors). Thus, despite moderate social-emotional resources (and moderate behavioral problems), low levels of self-regulation skills lead to hyperactive behavior in school.

Behavioral and cognitive process, including attention, play an important role in self-regulation and in hyperactivity. Self-regulatory skills include the ability to control attention and other cognitive processes that are needed for planning, problem solving, and goal-oriented activities (Hofmann et al., 2012; Rueda et al., 2011). Children with hyperactivity and attention deficits often show difficulties in maintaining and inhibiting attention processes, and they demonstrate deficits in suppressing dominant or automatic reaction tendencies on a cognitive or behavioral level (Gawrilow et al., 2011; Lijffijt et al., 2005). Adequate inhibition control is often ascribed to a positive self-regulatory capacity, which enables children to concentrate on relevant stimuli and their processing (Martins et al., 2016; Rueda et al., 2011). If children already demonstrate low self-regulation skills before they enter school, this can result in higher levels of hyperactivity in school. As a consequence, difficulties may arise in social interactions at school and in academic performance (Barkley, 2006; Diamantopoulou et al., 2007). Hyperactivity and inattention problems, particularly in the form of clinical attention deficit/hyperactivity disorder (ADHD), are often associated with lower academic achievement (Daley & Birchwood, 2010). Children find it particularly difficult to focus their attention on a task, which in turn can negatively affect early academic achievement (Papaioannou et al., 2016).

Our study results demonstrate that the ability to self-regulate is an important resource for positive behavioral adaptation in the transition from preschool to elementary school. As expected, the cluster analysis revealed that behavior problems at preschool age occur despite (moderate) social-emotional competences when self-regulation skills are low. Martarelli et al. (2018) analyzed profiles of self-regulation and social skills in the transition to school, and how they are related to school adjustment and academic success in elementary school. Similar to our findings, they reported that high social competences cannot fully compensate for weak self-regulation skills. Successful self-regulation requires cognitive competences, and therefore it is understandable that self-regulatory skills are of central importance, especially for academic success (Blair et al., 2015; Nesbitt et al., 2018). Eisenberg et al. (2010) note that high self-regulation skills positively affect children's social functioning and are negatively related to behavioral adaptation problems at school. Difficulties in appropriately regulating emotions, behavior, and attention hinder successful adaptation of one's behavior to the social and academic demands of school, while successful regulation supports constructive and socially appropriate interactions and behaviors.

Gender Differences

Children in profile 2 had the most difficulties for a successful behavioral adaptation in elementary school. This group (profile) constitutes 20% of the whole sample, and 85% of the children in profile 2 are boys; this indicates that boys are at a significantly greater risk for maladjustment. This aligns with previously reported prevalences in children in aged 6 to 8 Germany, with boys showing a significantly higher prevalence for behavior problems (19.1%) compared to girls (14.5%; Klipker et al., 2018). Matthews et al. (2009) report that boys start school with more of a disadvantage than girls because of their self-regulation skills. Within the school year, boys improve in their ability to self-regulate but do not catch up with the girls. Compared to boys, girls are perceived as academically superior in terms of their motivation, ability, achievement, and self-regulation (Hartley & Sutton, 2013; Weis et al., 2013).

Girls appear to build stronger relationships with teachers, achieve better grades, and higher educational attainment (Duckworth & Seligman, 2006; Silverman, 2003). Early socialization and role acceptance is one possible explanation for early gender differences in self-regulation skills, with girls showing a greater willingness to adopt self-regulated behavior in social interactions (Seidl-de-Moura et al., 2012; Von Suchodoletz et al., 2013). However, additional explanations may exist, and an exploration thereof deserves more scientific attention.

Considering the advantage of girls, an examination of the school characteristics on boys' and girls' school performance is of great interest. Focusing on the differential effects of school resources and school practices on reading achievement of girls and boys, Van Heck et al. (2017) found that girls benefit more from the socioeconomic composition of a school than boys do. However, boys and girls benefit equally from highly qualified teachers. It is supposed that highly qualified teachers are more able to create a structured and stimulating classroom environment, and thus better support boys in their learning. These findings suggest a recommendation to further investigate the impact of teachers' pedagogical skills to analyze further evidence of a positive learning environment for boys.

Educational Implications

The link between children's self-regulatory skills and successful behavioral adaptation in school illustrate the value of fostering self-regulatory skills early on. Preschool interventions are particularly important for children identified as at risk for developing difficulties in behavioral adaptation. Compared to more genetically determined factors, such as intelligence, the trainability of self-regulatory skills and social-emotional competences can be used as a resource for early school success (Plomin & von Stumm, 2018; Traverso et al., 2015). There are already various approaches to promote self-regulation skills, most of which aim to strengthen children's competences through play (Tominey & McClelland, 2011). Games in which children are asked to initiate or inhibit behavior in response to oral or visual cues can be used to practice self-regulation skills. For example, in the *freeze game* (musical statues) children are asked to dance to music and immediately freeze as soon as the music stops, or in the *drum beats game* children are instructed to move quickly to fast drums and slowly to slow drums (for more games see Tominey & McClelland, 2011). These games are easy to implement with a group of children who are at different developmental levels and self-regulation skills. However, before such games can be introduced by teachers, there is a need to raise awareness of the importance of self-regulation skills. Teachers should be sensitized in recognizing deficits in self-regulation skills and encouraged to integrate the promotion of self-regulation skills into the kindergarten program; for instance, with the increased use of the above-mentioned games.

Similarly, awareness of the importance of early self-regulation skills for successful behavioral adaptation in school needs to be raised among parents, who often focus only on preparing their children academically for school. Positive parent-child interactions are considered significant influencing factors for the development of self-regulation (Fay-Stammbach et al., 2014; Pauli-Pott et al., 2018). A loving parenting style that promotes autonomy motivates children to self-regulate (Von Suchodoletz et al., 2011). In contrast, strict and punitive parenting styles rely on external forms of control that are associated with reduced use of independent, appropriate forms of self-regulation (Cabrera et al., 2007).

Other approaches could include support at school or preschool, such as school-based prevention programs. Universal school-based programs can be both preventive and promotive, increasing children's social and emotional skills and acting as a protective factor against the development of later problems (Taylor et al., 2017). In this context, emotion coaching strategies are often used to promote self-regulation skills (Ornaghi et al., 2015; Rose et al., 2015). Children who can manage their emotions and demonstrate emotional and behavioral self-regulation engage in more positive peer relations and show fewer behavioral problems (Rose et al., 2015).

Limitations and Future Research

A positive behavioral adaptation in school is an important component in early school success (Rimm-Kaufman & Pianta, 2000). Self-regulation skills are especially vital for meeting new demands and mastering a positive behavioral adaptation in school (cf. Nelson et al., 2017). However, it is not only children's behavioral adaptation which predicts success in school, but also their academic performance. Numerous studies have already been able to show connections between early self-regulation skills and academic performance (Gestsdottir et al., 2014; Morgan et al., 2018; Sasser et al., 2015). Hence future research should simultaneously consider longitudinal associations between self-regulation, academic performance, and behavioral adaptation in school.

Further research should also include family factors, the (pre)school environment, and teacher characteristics to better understand how individual skills develop and interact with contextual factors. Self-regulation skills begin within the home environment and are influenced by family factors, like parenting and parent-child interactions (Fay-Stammach et al., 2014; Pauli-Pott et al., 2018). Attention to social determinants of child development and the complex ways in which these can influence the course of development can provide insights into children's cluster assignments, and how to alter detrimental paths to maladaptive behavioral adaptation.

Previous studies have found that about 17% of children in Germany aged 6 to 8 show behavioral problems (Klipker et al., 2018). Combining the children from profile 1 and 2, shows that nearly 50% of children are at moderate to high risk for not adapting to the behavioral demands of school. Given the number of at-risk children in our sample, despite the majority of whom come from relatively advantaged home environments, we maintain that the benefits of creating an adaptive learning environment at school increases in significance. An effective and structured classroom management creates a positive classroom climate that promotes appropriate behavior (Oliver et al., 2011). Classroom rules and routines define what behaviors are desired from children and thus can reduce problematic behavior. Teachers can use classroom rules to monitor children's behavior and recognize students who exhibit inappropriate behavior and prevent misbehavior from escalating. Integrating these aspects into the learning environment may be able to diminish the amount of children who do not manage to adapt, even when entering with high risk thereof.

Another research focus can be on the relationship between (pre)school teachers and children, as the development of children's social-emotional and self-regulation skills are embedded within social interactions with adults. Co-regulation by teachers, that matches the child's developmental level can help to positively influence children's self-regulatory performance (Silkenbuemer et al., 2018). In everyday situations, teachers can take on an important coaching function. Teachers help children to build a repertoire of effective regulatory strategies and guide them to generate, evaluate, and select alternative appraisals or behavioral responses in specific (social) situations (Silkenbuemer et al., 2016). The quality of preschools and their pedagogical activities are important for the academic and social-emotional development of children, which requires further attention. These include not only developing and maintaining a positive and supportive teacher-child relationship, but also an effective classroom management, and the successful implementation of social and emotional learning routines (Jennings & Greenberg, 2009).

Regarding the educational context, it should be noted that there are differences between schools and education systems in different countries (e.g., school entry age). For this reason, replication studies are needed in order to obtain a higher generalizability of the current findings. Furthermore, a replication with additional measures (e.g., through observation) are needed to extend our findings, as these are based purely on questionnaire data.

Compliance With Ethical Standards

The study was approved by the Ethics Committee of the University of Oldenburg and received a positive vote from the national school authorities. Informed consent and written parental permission were obtained.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

ORCID

Annika Rademacher  <http://orcid.org/0000-0003-2114-9931>

References

- Aichholzer, J. (2016). *Einführung in lineare Strukturgleichungsmodelle mit Stata* [Introduction to structural equation modelling with stata]. Springer.
- Barkley, R. A. (2006). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (3rd ed.). Guilford Press.
- Belsky, J., & MacKinnon, C. (1994). Transition to school: Developmental trajectories and school experiences. *Early Education and Development*, 5(2), 106–119. https://doi.org/10.1207/s15566935eed0502_3
- Berger, A., Kofman, O., Livneh, U. & Henik, A. (2007). Multidisciplinary perspectives on attention and the development of self-regulation. *Progress in Neurobiology*, 82(5), 256–286. <https://doi.org/10.1016/j.pneurobio.2007.06.004>
- Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Annual Review of Psychology*, 66(1), 711–731. <https://doi.org/10.1146/annurev-psych-010814-015221>
- Blair, C., Ursache, A., Greenberg, M., & Vernon-Feagans, L.; Family Life Project Investigators. (2015). Multiple aspects of self-regulation uniquely predict mathematics but not letter-word knowledge in the early elementary grades. *Developmental Psychology*, 51(4), 459–472. <http://dx.doi.org/10.1037/a0038813>
- Cabrera, N., Shannon, J. E., & Tamis-LeMonda, C. S. (2007). Fathers' influence on their children's cognitive and emotional development: From toddlers to pre-K. *Applied Developmental Science*, 11(4), 208–213. <https://doi.org/10.1080/10888690701762100>
- Cadima, J., Doumen, S., Verschueren, K., & Buyse, E. (2015). Child engagement in the transition to school: Contributions of self-regulation, teacher-child relationships and classroom climate. *Early Childhood Research Quarterly*, 32, 1–12. <https://doi.org/10.1016/j.ecresq.2015.01.008>
- Calkins, S. D., & Fox, N. A. (2002). Self-regulation processes in early personality development: A multilevel approach to the study of childhood social withdrawal and aggression. *Development & Psychopathology*, 14(3), 477–498. <https://doi.org/10.1017/S095457940200305X>
- Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: A meta-analytic review. *Psychological Bulletin*, 139(4), 735–765. <https://doi.org/10.1037/a0030737>
- Chen, J. J. (2010). Gender differences in externalising problems among preschool children: Implications for early childhood educators. *Early Child Development and Care*, 180(4), 463–474. <https://doi.org/10.1080/03004430802041011>
- Cox, M. J., Mills-Koonce, R., Propper, C., & Garipey, J. L. (2010). Systems theory and cascades in developmental psychopathology. *Development and Psychopathology*, 22(3), 497–506. <https://doi.org/10.1017/S0954579410000234>
- Daley, D., & Birchwood, J. (2010). ADHD and academic performance: Why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom? *Child: Care, Health and Development*, 36(4), 455–464. <https://doi.org/10.1111/j.1365-2214.2009.01046.x>
- Denham, S. A. (1998). *Emotional development in young children*. Guilford Press.
- Denham, S. A. (2006). Social-emotional competence as support for school readiness: What is it and how do we assess it? *Early Education and Development*, 17(1), 57–89. https://doi.org/10.1207/s15566935eed1701_4
- Denham, S. A., Bassett, H. H., Mincic, M., Kalb, S., Way, E., Wyatt, T., & Segal, Y. (2012a). Social-emotional learning profiles of preschoolers' early school success: A person-centered approach. *Learning and Individual Differences*, 22(2), 178–189. <https://doi.org/10.1016/j.lindif.2011.05.001>
- Denham, S. A., Bassett, H. H., Way, E., Mincic, M., Zinsser, K., & Graling, K. (2012b). Preschoolers' emotion knowledge: Self-regulatory foundations, and predictions of early school success. *Cognition & Emotion*, 26(4), 667–679. <https://doi.org/10.1080/02699931.2011.602049>
- Denham, S. A., Bassett, H. H., Zinsser, K., & Wyatt, T. M. (2014). How preschoolers' social-emotional learning predicts their school success: Developing theory-promoting, competency-based assessments. *Infant and Child Development*, 23(4), 426–454. <https://doi.org/10.1002/icd.1840>
- Denham, S. A., Brown, C., & Domitrovich, C. (2010). "Plays nice with others": Social-emotional learning and academic success. *Early Education and Development*, 21(5), 652–680. <https://doi.org/10.1080/10409289.2010.497450>
- Diamantopoulou, S., Rydell, A.-M., Thorell, L. B., & Bohlin, G. (2007). Impact of executive functioning and symptoms of attention deficit hyperactivity disorder on children's peer relations and school performance. *Developmental Neuropsychology*, 32(1), 521–542. <https://doi.org/10.1080/87565640701360981>

- Duckworth, A., & Seligman, M. E. (2006). Self-discipline gives girls the edge: Gender in self-discipline, grades, and achievement test scores. *Journal of Educational Psychology*, 98(1), 198–208. <https://doi.org/10.1037/0022-0663.98.1.198>
- Duckworth, A. L., Quinn, P. D., & Tsukayama, E. (2012). What no child left behind leaves behind: The roles of IQ and self-control in predicting standardized achievement test scores and report card grades. *Journal of Educational Psychology*, 104(2), 439–451. <https://doi.org/10.1037/a0026280>
- Edossa, A. K., Schroeders, U., Weinert, S., & Artelt, C. (2018). The development of emotional and behavioral self-regulation and their effects on academic achievement in childhood. *International Journal of Behavioral Development*, 42(2), 192–202. <https://doi.org/10.1177/0165025416687412>
- Eisenberg, N., Valiente, C., & Eggum, N. D. (2010). Self-Regulation and school readiness. *Early Education and Development*, 21(5), 681–698. <https://doi.org/10.1080/10409289.2010.497451>
- Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modelling*, 8(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5
- Fay-Stammback, T., Hawes, D. J., & Meredith, P. (2014). Parenting influences on executive function in early childhood: A review. *Child Development Perspectives*, 8(4), 258–264. <https://doi.org/10.1111/cdep.12095>
- Feldman, R. (2009). The development of regulatory functions from birth to 5 years: Insights from premature infants. *Child Development*, 80(2), 544–561. <https://doi.org/10.1111/j.1467-8624.2009.01278.x>
- Flook, L., Zahn-Waxler, C., & Davidson, R. J. (2019). Developmental differences in prosocial behavior between preschool and late elementary school. *Frontiers in Psychology*, 10, 876. <https://doi.org/10.3389/fpsyg.2019.00876>
- Gawrilow, C., Gollwitzer, P. M., & Oettingen, G. (2011). If-then plans benefit delay of gratification performance in children with and without ADHD. *Cognitive Therapy and Research*, 35(5), 442–455. <https://doi.org/10.1007/s10608-010-9309-z>
- Gestsdottir, S., von Suchodoletz, A., Wanless, S. B., Hubert, B., Guimard, P., Birgisdottir, F., Gunzenhauser, C., & McClelland, M. (2014). Early behavioral self-regulation, academic achievement, and gender: Longitudinal findings from France, Germany, and Iceland. *Applied Developmental Science*, 18(2), 90–109. <https://doi.org/10.1080/10888691.2014.894870>
- Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry*, 38(5), 581–586. <https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60(1), 549–576. <https://doi.org/10.1146/annurev.psych.58.110405.085530>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. Pearson Education.
- Halberstadt, A. G., Denham, S. A., & Dunsmore, J. C. (2001). Affective social competence. *Social Development*, 10(1), 79–119. <https://doi.org/10.1111/1467-9507.00150>
- Hartley, B. L., & Sutton, R. M. (2013). A stereotype threat account of boys' academic underachievement. *Child Development*, 84(5), 1716–1733. <https://doi.org/10.1111/cdev.12079>
- Hasselhorn, M., & Kuger, S. (2014). Wirksamkeit schulrelevanter Förderung in Kindertagesstätten [Effectiveness of the advancement of school relevant skills in early childhood education and care]. *Zeitschrift für Erziehungswissenschaft*, 17(S2), 299–314. <https://doi.org/10.1007/s11618-013-0473-2>
- Hofmann, W., Schmeichel, B. J., & Baddeley, A. D. (2012). Executive functions and self-regulation. *Trends in Cognitive Sciences*, 16(3), 174–180. <https://doi.org/10.1016/j.tics.2012.01.006>
- Hosseini-Kamkar, N., & Morton, J. B. (2014). Sex differences in self-regulation: An evolutionary perspective. *Frontiers in Neuroscience*, 8, 233. <https://doi.org/10.3389/fnins.2014.00233>
- Izard, C., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstrom, E. (2001). Emotion knowledge as a predictor of social behavior and academic competence in children at risk. *Psychological Science*, 12(1), 18–23. <https://doi.org/10.1111/1467-9280.00304>
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research*, 79(1), 491–525. <https://doi.org/10.3102/0034654308325693>
- Kim, S., Nordling, J. K., Yoon, J. E., Boldt, L. J., & Kochanska, G. (2013). Effortful control in “hot” and “cool” tasks differentially predicts children's behavior problems and academic performance. *Journal of Abnormal Child Psychology*, 41(1), 43–56. <https://doi.org/10.1080/10409289.2016.1148481>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.
- Klipker, K., Baumgarten, F., Göbel, K., Lampert, T., & Hölling, H. (2018). Mental health problems in children and adolescents in Germany. Results of the cross-sectional KiGGS Wave 2 study and trends. *Journal of Health Monitoring*, 3(3), 37–45. <https://doi.org/10.17886/RKI-GBE-2018-077>
- Koglin, U., & Petermann, F. (2016). *Verhaltensskalen für das Kindergartenalter* [Behavior Rating Scales for Preschoolers]. Hogrefe.
- Kopp, C. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*, 18(2), 199–214. <https://doi.org/10.1037/0012-1649.18.2.199>
- Ladd, G. W., & Dinella, L. M. (2009). Continuity and change in early school engagement: Predictive of children's achievement trajectories from first to eighth grade? *Journal of Educational Psychology*, 101(1), 190–206. <https://doi.org/10.1037/a0013153>

- Lijffijt, M., Kenemans, J. L., Verbaten, M. N., & van Engeland, H. (2005). A meta-analytic review of stopping performance in attention-deficit/hyperactivity disorder: Deficient inhibitory motor control? *Journal of Abnormal Psychology, 114*(2), 216–222. <https://doi.org/10.1037/0021-843X.114.2.216>
- Margetts, K. (2002). Transition to school – Complexity and diversity. *European Early Childhood Education Research Journal, 10*(2), 103–114. <https://doi.org/10.1080/13502930285208981>
- Martarelli, C. S., Feurer, E., Dapp, L. C., & Roebers, C. M. (2018). Profiles of executive functions and social skills in the transition to school: A person-centred approach. *Infant and Child Development, 27*(6), e2114. <https://doi.org/10.1002/icd.2114>
- Martins, E. C., Osório, A., Veríssimo, M., & Martins, C. (2016). Emotion understanding in preschool children: The role of executive functions. *International Journal of Behavioral Science, 40*(1), 1–10. <https://doi.org/10.1177/0165025414556096>
- Matthews, J. S., Marulis, L. M., & Williford, A. P. (2014). Gender processes in school functioning and the mediating role of cognitive self-regulation. *Journal of Applied Developmental Psychology, 35*(3), 128–137. <https://doi.org/10.1016/j.appdev.2014.02.003>
- Matthews, J. S., Ponitz, C. C., & Morrison, F. J. (2009). Early gender differences in self-regulation and academic achievement. *Journal of Educational Psychology, 101*(3), 689–704. <https://doi.org/10.1037/a0014240>
- McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly, 21*(4), 471–490. <https://doi.org/10.1016/j.ecresq.2006.09.003>
- McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*(4), 947–959. <https://doi.org/10.1037/0012-1649.43.4.947>
- McClelland, M. M., & Morrison, F. J. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood Research Quarterly, 18*(2), 206–224. [https://doi.org/10.1016/S0885-2006\(03\)00026-7](https://doi.org/10.1016/S0885-2006(03)00026-7)
- Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244*(4907), 933–938. <https://doi.org/10.1126/science.2658056>
- Montes, G., Lotyczewski, B. S., Halterman, J. S., & Hightower, A. D. (2011). School readiness among children with behavior problems at entrance into kindergarten: Results from a US national study. *European Journal of Pediatrics, 171*(3), 541–548. <https://doi.org/10.1007/s00431-011-1605-4>
- Montroy, J. J., Bowles, R. P., Skibbe, L. E., McClelland, M. M., & Morrison, F. J. (2016). The development of self-regulation across early childhood. *Developmental Psychology, 52*(11), 1744–1762. <https://doi.org/10.1037/dev0000159>
- Morgan, P. L., Farkas, G., Wang, Y. Y., Hillemeier, M. M., Oh, Y., & Maczuga, S. (2018). Executive function deficits in kindergarten predict repeated academic difficulties across elementary school. *Early Childhood Research Quarterly, 46*, 20–32. <https://doi.org/10.1016/j.ecresq.2018.06.009>
- Nelson, T. D., Nelson, J. M., James, T. D., Clark, C. A. C., Kidwell, K. M., & Espy, K. A. (2017). Executive control goes to school: Implications of preschool executive performance for observed elementary classroom learning engagement. *Developmental Psychology, 53*(5), 836–844. <https://doi.org/10.1037/dev0000296>
- Nesbitt, K. T., Fuhs, M. W., & Farran, D. C. (2018). Stability and instability in the co-development of mathematics, executive function skills, and visual-motor integration from prekindergarten to first grade. *Early Childhood Research Quarterly, 46*, 262–274. <http://dx.doi.org/10.1016/j.ecresq.2018.02.003>
- Oliver, R. M., Wehby, J. H., & Reschly, D. J. (2011). The effects of teachers classroom management practices on disruptive, or aggressive student behavior. *Campbell Systematic Reviews, 7*(1), 1–55. <http://dx.doi.org/10.4073/csr.2011.4>
- Ornaghi, V., Grazzani, I., Cherubin, E., Conte, E., & Piralli, F. (2015). 'Let's talk about emotions!'. The effect of conversational training on preschoolers' emotion comprehension and prosocial orientation. *Social Development, 24*(1), 166–183. <https://doi.org/10.1111/sode.120911>
- Papaioannou, S., Mouzaki, A., Sideridis, G. D., Antoniou, F., Padeliadu, S., & Simos, P. G. (2016). Cognitive and academic abilities associated with symptoms of attentiondeficit/hyperactivity disorder: A comparison between subtypes in a Greek non-clinical sample. *Educational Psychology: An International Journal of Experimental Educational Psychology, 36*(1), 138–158. <https://doi.org/10.1080/01443410.2014.915931>
- Pauli-Pott, U., Schloss, S., & Becker, K. (2018). Maternal responsiveness as a predictor of self-regulation development and attention-deficit/hyperactivity symptoms across preschool ages. *Child Psychiatry & Human Development, 49*(1), 42–52. <https://doi.org/10.1007/s10578-017-0726-z>
- Petriwskyj, A., Thorpe, K., & Tayler, C. (2005). Trends in construction of transition to school in three western regions, 1990-2004. *International Journal of Early Years Education, 13*(1), 55–69. <https://doi.org/10.1080/09669760500048360>
- Plomin, R., & von Stumm, S. (2018). The new genetics of intelligence. *Nature Reviews Genetics, 19*(3), 148–159. <https://doi.org/10.1038/nrg.2017.104>
- Poland, S. E., Monks, C. P., & Tsermentseli, S. (2016). Cool and hot executive function as predictors of aggression in early childhood: Differentiating between the function and form of aggression. *British Journal of Developmental Psychology, 34*(2), 181–197. <https://doi.org/10.1111/bjdp.12122>

- Portilla, X. A., Ballard, P. J., Adler, N. E., Boyce, W. T., & Obradović, J. (2014). An integrative view of school functioning: Transactions between self-regulation, school engagement, and teacher-child relationship quality. *Child Development, 85*(5), 1915–1931. <https://doi.org/10.1111/cdev.12259>
- Rimm-Kaufman, S. E., & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology, 21*(5), 491–511. [https://doi.org/10.1016/S0193-3973\(00\)00051-4](https://doi.org/10.1016/S0193-3973(00)00051-4)
- Rimm-Kaufman, S. E., Pianta, R. C., & Cox, M. J. (2000). Teachers' judgments of problems in the transition to kindergarten. *Early Childhood Research Quarterly, 15*(2), 147–166. [https://doi.org/10.1016/s0885-2006\(00\)00049-1](https://doi.org/10.1016/s0885-2006(00)00049-1)
- Rose, J., McGuire-Snieckus, R., & Gilbert, L. (2015). Emotion Coaching - a strategy for promoting behavioural self-regulation in children/young people in schools: A pilot study. *The European Journal of Social and Behavioural Sciences, 13*(2), 1766–1790. <http://dx.doi.org/10.15405/ejsbs.159>
- Rueda, M. R., Posner, M. I., & Rothbart, M. K. (2011). Attentional control and self-regulation. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation. Research, theory, and applications* (2nd ed., pp. 284–299). The Guilford Press.
- Rutter, M., Kim-Cohen, J., & Maughan, B. (2006). Continuities and discontinuities in psychopathology between childhood and adult life. *Journal of Child Psychology and Psychiatry, 47*(3–4), 276–295. <https://doi.org/10.1111/j.1469-7610.2006.01614.x>
- Saarni, C. (1999). *The development of emotional competence*. Guilford.
- Sasser, T. R., Bierman, K. L., & Heinrichs, B. (2015). Executive functioning and school adjustment: The mediational role of pre-kindergarten learning-related behaviors. *Early Childhood Research Quarterly, 30*, 70–79. <https://doi.org/10.1016/j.ecresq.2014.09.001>
- Seidl-de-Moura, M. L., Bandeira, T. T. A., de Marca, R. G. D., Pessôa, L. F., Mendes, D. M. L. F., Vieira, M. L., & Kobarg, A. P. R. (2012). Self-recognition and self-regulation: The relationship with socialization trajectories and children's sex. *Spanish Journal of Psychology, 15*(2), 604–612. https://doi.org/10.5209/rev_sjop.2012.v15.n2.38871
- Silkenbuemer, J., Schiller, E.-M., Holodynski, M., & Kärtner, J. (2016). The role of co-regulation for the development of social-emotional competence. *Journal of Self-Regulation and Regulation, 2*, 16–31. <https://doi.org/10.11588/josar.2016.2.34351>
- Silkenbuemer, J., Schiller, E.-M., & Kärtner, J. (2018). Co- and self-regulation of emotions in the preschool setting. *Early Childhood Research Quarterly, 44*, 72–81. <https://doi.org/10.1016/j.ecresq.2018.02.014>
- Silverman, I. W. (2003). Gender differences in delay of gratification: A meta-analysis. *Sex Roles, 49*(9/10), 451–463. <https://doi.org/10.1023/A:1025872421115>
- Taylor, R. D., Oberle, E., Durlak, J. A., & Weissberg, R. P. (2017). Promoting positive youth development through school-based social and emotional learning interventions: A meta-analysis of follow-up effects. *Child Development, 88*(4), 1156–1171. <https://doi.org/10.1111/cdev.12864>
- Tominey, S. L., & McClelland, M. M. (2011). Red light, purple light: Findings from a randomized trial using circle time games to improve behavioral self-regulation in preschool. *Early Education and Development, 22*(3), 489–519. <https://doi.org/10.1080/10409289.2011.574258>
- Traverso, L., Viterbori, P., & Usai, M. C. (2015). Improving executive function childhood: Evaluation of a training intervention for 5-year-old children. *Frontiers in Psychology, 6*, 525. <https://doi.org/10.3389/fpsyg.2015.00525>
- Van Heck, M., Kraaykamp, G., & Pelzer, B. (2017). Do school affect girls' and boys' reading performance differently? A multilevel study on the gendered effects of school resources and school practices. *School Effectiveness and School Improvement, 29*(1), 1–21. <https://doi.org/10.1080/09243453.2017.1382540>
- von Suchodoletz, A., Gestsdottir, S., Wanless, S. B., McClelland, M. M., Birgisdottir, F., Gunzenhauser, C., & Ragnarsdottir, H. (2013). Behavioral self-regulation and relations to emergent academic skills among children in Germany and Iceland. *Early Childhood Research Quarterly, 28*(1), 62–73. <https://doi.org/10.1016/j.ecresq.2012.05.003>
- von Suchodoletz, A., Trommsdorff, G., & Heikamp, T. (2011). Linking maternal warmth and responsiveness to children's self-regulation. *Social Development, 20*(3), 486–503. <https://doi.org/10.1111/j.1467-9507.2010.00588.x>
- von Suchodoletz, A., Trommsdorff, G., Heikamp, T., Wieber, F., & Gollwitzer, P. M. (2009). Transition to school: The role of kindergarten children's behavior regulation. *Learning and Individual Differences, 19*(4), 561–566. <https://doi.org/10.1016/j.lindif.2009.07.006>
- Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: Evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry, 49*(5), 471–488. <https://doi.org/10.1111/j.1469-7610.2007.01861.x>
- Weinberg, M. K., Tronick, E. Z., Cohn, J. F., & Olson, K. L. (1999). Gender differences in emotional expressivity and self-regulation during early infancy. *Developmental Psychology, 35*(1), 175–188. <https://doi.org/10.1037//0012-1649.35.1.175>
- Weis, M., Heikamp, T., & Trommsdorff, G. (2013). Gender differences in school achievement: The role of self-regulation. *Frontiers in Psychology, 4*, 442. <https://doi.org/10.3389/fpsyg.2013.00442>
- Willoughby, M., Kupersmidt, J., Voegler-Lee, M., & Bryant, D. (2011). Contributions of hot and cool self-regulation to preschool disruptive behavior and academic achievement. *Developmental Neuropsychology, 36*(2), 162–180. <https://doi.org/10.1080/87565641.2010.549980>