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Longitudinal association between children's mastery motivation and cognitive school readiness: Executive functioning and social–emotional competence as potential mediators

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ABSTRACT

This study investigated the direct relationships between kindergarten children's object and social mastery motivation and future cognitive school readiness and the indirect relationships mediated through executive functioning and social–emotional competence in the school context. The participants were 103 Hong Kong kindergarten children (45.6% girls; mean age = 60.4 months) and their teachers. The teachers reported the children's demographic information and object and social mastery motivation at Time 1 (in the middle of the school year). They rated the children's executive functioning, social–emotional competence and cognitive school readiness at Time 2 (at the end of the school year). The results from the path analysis model revealed that the children's object mastery motivation at Time 1, but not their social mastery motivation, directly predicted their cognitive school readiness at Time 2. The indirect relationships between (a) object mastery motivation at Time 1 and cognitive school readiness at Time 2 mediated through executive functioning (indirect effect: β =.32, *SE* =.05, p <.001) and (b) social mastery motivation at Time 1 and cognitive school readiness at Time 2 mediated through social–emotional competence (indirect effect: β =.09, *SE* =.03, p <.01) were significant. The findings highlight the differential roles of object and social mastery motivation in predicting children's cognitive school readiness and propose children's executive functioning and social–emotional competence as processes mediating the

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relationships. The results also suggest the desirability of providing kindergarten children with extensive play opportunities and materials to support their mastery motivation and cognitive school readiness.

Introduction

Growing evidence indicates the relationship between kindergarten children's mastery motivation, defined as their inner desire to gain proficiency in performing various goal-directed behaviors (Morgan et al., 1995), and their cognitive school readiness (MacPhee et al., 2018). Object mastery motivation (i.e., persistence in exploring and manipulating inanimate objects; Wang et al., 2011) can particularly shape children's early cognitive development (Gilmore et al., 2003). Indeed, research has demonstrated how this motivational factor may affect future school achievement (e.g., MacPhee et al., 2018; Martin et al., 2013; Turner & Johnson, 2003). Alternatively, social mastery motivation (i.e., internal desire to start, maintain, and control social interaction; MacTurk et al., 1985) may facilitate children's social–emotional competence (Fung, 2022; Fung & Chung, 2019) and support their cognitive school readiness (Józsa & Barrett, 2018). Although both object and social mastery motivation predict children's cognitive school readiness (Fung & Chung, 2022a), little research has examined the unique contributions of objective and social mastery motivation. Even less research has explored the mediating processes such as executive functioning and social–emotional competence. The current study examined how object and social mastery motivation differentially predict prospective cognitive school readiness in a sample of Hong Kong Chinese kindergarten children. It also investigated the potential mediating roles of executive functioning and social–emotional competence in the relationships of the object and social mastery motivation with cognitive school readiness 6 months later.

Mastery motivation predicts executive functioning and social–emotional competence

Mastery motivation is a psychological impetus that drives children to acquire various skills and competencies (Fung et al., 2018; Morgan et al., 1995). Children with higher levels of object mastery motivation tend to show greater persistence in exploring and manipulating challenging inanimate objects (Wang et al., 2011). These experiences exercise their intellectual capacities and may stimulate their early cognitive development. Research has consistently demonstrated the positive link between children's object mastery motivation and cognitive skills (e.g., Gilmore et al., 2003; Jennings, 1979; Messer et al., 1986). In separate research, executive functioning is a higher-order cognitive skill that includes the components of working memory (holding and operating information mentally), inhibitory control (inhibiting dominant response and performing alternative response), and attention shifting (ignoring distraction and maintaining focus on appropriate target) (e.g., Fung et al., 2020). This executive functioning skill develops rapidly from 2 to 5 years of age (Diamond, 2013; Liu et al., 2019; Zelazo & Müller, 2002). Although the three components of executive functioning appear to be less separable during the early years (Wiebe et al., 2008, 2011), evidence shows that the distinctive components of executive functioning may emerge from 3 years of age (Lerner & Lonigan, 2014). Working memory and inhibitory control are the key components influencing kindergarten children's daily learning (e.g., Chung & McBride-Chang, 2011; Fung et al., 2020). Understanding how object mastery motivation is associated with executive functioning in the kindergarten classroom context, the current study examined their relationship across time by assessing children's working memory and inhibitory control with a teacher-reported measure.

Apart from the orientation to interact with objects in the immediate context, children may also show an orientation to explore their social environment (Combs & Wachs, 1993). Children with advanced social mastery motivation are more eager to initiate and sustain interaction with social

partners (MacTurk et al., 1985). The increased interaction not only enables these children to sharpen their social skills (e.g., prosocial behaviors, impulse regulation, conflict resolution; Campbell et al., 2016) through scaffolding and social referencing (Fung & Chung, 2019; MacTurk et al., 1985) but also provides extra opportunities for children to acquire higher levels of emotion understanding and regulation (e.g., Beck et al., 2012; Pipp-Siegel et al., 2003; Salmon et al., 2013). All these capacities are fundamental to children's social–emotional competence. Recent evidence has demonstrated a positive relationship between social mastery motivation and social–emotional competence (e.g., Fung, 2022; Fung & Chung, 2019). Specifically, both child-assessed (play-based assessment; Fung & Chung, 2019) and informant-reported (questionnaire; Fung, 2022) social mastery motivation were positively associated with the social–emotional competence of kindergarten children. These results, however, were based on cross-sectional data, and the longitudinal relationship between social mastery motivation and social–emotional competence warrants further examination. Furthermore, little attempt has been made to include both object and social mastery motivation in predicting cognitive school readiness and to investigate their collective relationships with executive functioning and social–emotional competence across time.

Executive functioning and social–emotional competence predict cognitive school readiness

Cognitive school readiness is a multidimensional concept covering a wide range of developmental skills such as academic skills (e.g., language, literacy, mathematics) and cognitive skills (e.g., sustained attention and problem solving) (Duncan et al., 2007; Portilla et al., 2014). Children with better executive functioning are more resourceful in processing information and regulating their in-class behaviors, and ample evidence has supported its role in predicting cognitive school readiness (e.g., Korucu et al., 2020; McClelland & Cameron, 2019; Micalizzi et al., 2019; Willoughby et al., 2017).

Social–emotional competence is often regarded as another important determinant of cognitive school readiness (e.g., Campbell et al., 2016; Denham & Brown, 2010; Eisenberg et al., 2010). Although a separate line of research has regarded social–emotional competence as one of the indicators of children's school readiness (e.g., Hunter et al., 2018; Ren et al., 2021), the current study drew on Blair and Raver's (2015) developmental psychobiological model of school readiness to explore how executive functioning and social–emotional competence jointly predict children's cognitive school readiness. According to the psychobiological framework (Blair, 2002; Blair & Raver, 2015), children with advanced emotion regulation can put their cognitive functions to better use in daily classroom learning, especially when those learning tasks are challenging and stressful. Moreover, socially competent children are more likely to develop better relationships with peers and teachers, facilitating their participation and engagement in various teaching and learning activities (Galindo & Fuller, 2010; Hernández et al., 2016). Taken together, both executive functioning and social–emotional competence can predict children's cognitive school readiness. A recent study revealed how these two factors may differentially affect children's prospective academic outcomes (Perry et al., 2018). The current study extended previous research by examining how children's early object and social mastery motivation predict their subsequent executive functioning, social–emotional competence, and cognitive school readiness.

Mastery motivation and cognitive school readiness

Research has explored whether children's mastery motivation may affect their future cognitive school readiness (e.g., Gilmore et al., 2003; Turner et al., 2003). For example, kindergarten children's object mastery motivation significantly predicts their future school readiness (MacPhee et al., 2018) and academic skills such as vocabulary knowledge, literacy, and mathematics (e.g., Gilmore et al., 2003; Martin et al., 2013; Turner et al., 2003). In contrast, the relationship between social mastery motivation and cognitive school readiness is less clear. For example, Józsa and Barrett (2018) reported that social mastery motivation positively predicts children's later social skills but not their reading and mathematics achievement. Notably, previous studies have mainly considered either object or social mastery motivation in their conceptual framework (e.g., Józsa & Barrett, 2018; MacPhee et al., 2018), and few have taken both motivational factors into account to examine their unique contribution to

cognitive school readiness except a recent study revealing their distinctive concurrent associations (Fung & Chung, 2022a). Moreover, drawing on the evidence supporting the interconnectedness among mastery motivation, executive functioning, social–emotional competence, and cognitive school readiness, the relationship between mastery motivation and cognitive school readiness may also be indirect. The current study expanded on previous work (e.g., Fung & Chung, 2022a; Józsa & Barrett, 2018; MacPhee et al., 2018) by examining the direct and indirect relationships among object mastery motivation, social mastery motivation, and subsequent cognitive school readiness with the consideration of children's executive functioning and social–emotional competence as potential mediators.

The current study

This study examined the direct relationships of object mastery motivation and social mastery motivation with cognitive school readiness across time (6 months) and the indirect relationships mediating through the executive functioning and social–emotional competence of Hong Kong Chinese kindergarten children. Based on the literature reviewed (e.g., Fung, 2022; Fung & Chung, 2019, 2022a; Józsa & Barrett, 2018; MacPhee et al., 2018; Martin et al., 2013), it was expected that the children's object and social mastery motivation at Time 1 would positively predict their executive functioning and social–emotional competence at Time 2; their executive functioning, social–emotional competence, and cognitive school readiness at Time 2 would be positively related (Hypothesis 1). It was also anticipated that the children's object and social mastery motivation at Time 1 would directly predict their cognitive school readiness at Time 2 (Hypothesis 2). Furthermore, it was expected that the indirect relationships among object mastery motivation, executive functioning, and cognitive school readiness, as well as those among social mastery motivation, social–emotional competence, and cognitive school readiness, would be positive and significant (Hypothesis 3). Fig. 1 shows the current conceptual model.

Method

Participants

The participants were 103 Hong Kong kindergarten children (45.6% girls; mean age = 60.4 months) and their class teachers (17 women) from a local kindergarten. Children in Hong Kong usually attend 3 years of kindergarten education. At Time 1, 46 children were in the second kindergarten year (K2), whereas the remaining 57 were in the third year (K3). Most teachers (>85%) held a bachelor's degree in early childhood education, and more than 50% had more than 4 years of teaching experience.

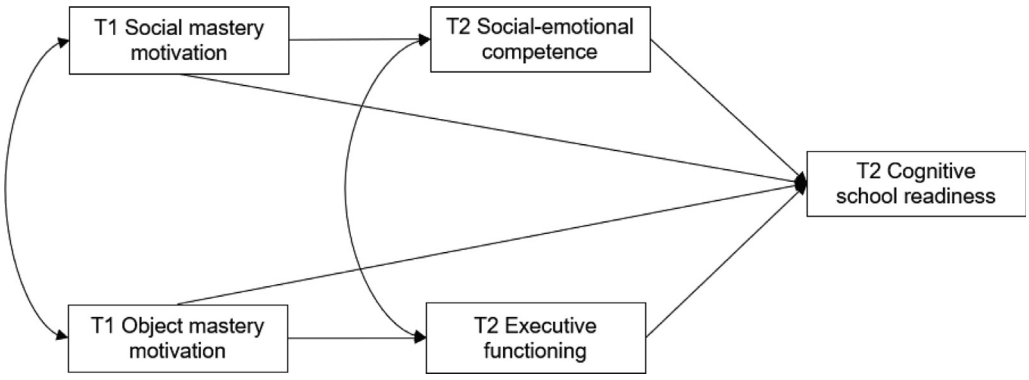

Fig. 1. Conceptual model for predicting the children's cognitive school readiness at Time 2 (T2) from the object and social mastery motivation at Time 1 (T1) and the executive functioning and social–emotional competence at Time 2.

Procedure

Ethical approval was granted by the affiliated university. Approval was also given by the principal of the participating kindergarten, which is located in a middle-socioeconomic-strata district. Informed consent forms were sent to the parents of all K2 and K3 children to invite their participation. Of the 179 K2 and K3 children, 103 parents (57% consent rate) returned positive consent. Upon receiving the positive parental consent, questionnaire forms were mailed to the children's class teachers to invite their participation. All invited class teachers took part in this study. At Time 1 (in the middle of the school year), the teachers reported the demographic information (i.e., age, sex) and rated the children's object and social mastery motivation. At Time 2 (at the end of the school year), the teachers reported the children's executive functioning, social–emotional competence, and cognitive school readiness.

Measures

Object and social mastery motivation at Time 1

The object and social mastery motivation of the children was assessed by the teachers' ratings on the object and social persistence subscales of the Dimensions of Mastery Questionnaire–Chinese Version (DMQ-18; Morgan et al., 2017). The DMQ-18 is commonly employed in research on kindergarten children locally (e.g., Fung, 2022; Fung & Chung, 2022a) and internationally (e.g., Józsa & Barrett, 2018; Lunkenheimer & Wang, 2017). In this study, both subscales of social persistence with peers and with adults were included because children's desire to interact with peers and teachers may influence peer interaction and teacher–student connectedness, whereas these relationships may further affect their cognitive school readiness (e.g., Coolahan et al., 2000; Heatly & Votruba-Drzal, 2017). The object persistence subscale consists of 5 items (e.g., "Works long to do something challenging," "Tries to complete toys like puzzles"). The social persistence with peers and social persistence with adults subscales contain 10 items in total (e.g., "Tries to keep adults interested in talking," "Tries to keep play with kids going"). The participating children's class teachers rated each item on a 5-point scale (1 = *totally disagree* to 5 = *totally agree*). The simple average score of the object persistence subscale represented the children's object mastery motivation, whereas the simple average score aggregating the social persistence with peers and social persistence with adults subscales represented the children's social mastery motivation. The Cronbach's alphas of the object persistence, social persistence with peers, and social persistence with adults subscales were .91, .92, and .91, respectively.

Executive functioning at Time 2

As revealed in the classroom context, the children's executive functioning was assessed by their teachers' ratings on the working memory and inhibitory control subscales of the Behavior Rating Inventory of Executive Function–Preschool Version (BRIEF-P; Gioia et al., 2003). The BRIEF-P is commonly employed in local (e.g., Lam et al., 2018) and international (e.g., Chang & Gu, 2018; Ezpeleta et al., 2015; Hu et al., 2017; Spiegel et al., 2017) research on kindergarten children with demonstrated reliability and validity. The working memory subscale consists of 16 items (e.g., "Has trouble with activities or tasks that have more than one step," "Forgets what he/she is doing in the middle of an activity"). In contrast, the inhibitory control subscale contains 17 items (e.g., "Gets out of control more than playmates," "Talks or plays too loudly"). Teachers rated each item on a 5-point scale (1 = *never* to 5 = *often*), and the scores were reversed such that a higher score represented better executive functioning. The simple average score aggregating the working memory and inhibitory control subscales represented the children's executive functioning. The Cronbach's alphas of the working memory and inhibitory control subscales were .97 and .96, respectively.

Social–emotional competence at Time 2

The social–emotional competence of the children was assessed by their teachers' ratings on the prosocial behaviors and peer problems subscales of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) and on the emotion regulation subscale of the Chinese Inventory of Children's Socioemotional Competence (CICSEC; Li et al., 2020). The SDQ and CICSEC were previously employed

in research on local kindergarten children with adequate reliability and validity (e.g., Lai et al., 2010; Li et al., 2020). The SDQ prosocial behaviors subscale (e.g., "Shares readily with other children," "Often volunteers to help others"), the SDQ peer problems subscale (e.g., "Rather solitary, tends to play alone," "Picked on or bullied"), and the CICSEC emotion regulation subscale (e.g., "Takes a long time to recover from disappointment," "Unhappy for no reason") consist of 5 items. Teachers rated each item on a 5-point scale (1 = *totally disagree* to 5 = *totally agree*). The scores were reversed as appropriate such that a higher score indicated a better level of social–emotional competence. The simple average score aggregating the SDQ prosocial behaviors, SDQ peer problems, and CICSEC emotion regulation subscales represented the children's social–emotional competence. The Cronbach's alphas of the three subscales were .93, .75, and .90, respectively.

Cognitive school readiness at Time 2

Cognitive school readiness was assessed by the teachers' ratings on the Gumpel Readiness Inventory (GRI; Gumpel, 1999). The GRI has been shown to have reliability, validity, and unidimensionality in local research (Fung & Chung, 2022a; Ho et al., 2013). This measure contains 6 items (e.g., "Demonstrates understanding of concepts, such as before–after, bigger than–smaller than, more–less," "Can break down a complex task into its constituent parts"). The teachers rated each item on a 5-point scale (1 = *never* to 5 = *always*). The simple average score represented the children's cognitive school readiness. The Cronbach's alpha was .81.

Data analysis plan

The path model (Fig. 1) investigating the possible direct and indirect relationships among object mastery motivation, social mastery motivation, executive functioning, social–emotional competence, and cognitive school readiness was estimated with the lavaan package (Version 0.6–5) in R (Version 3.6.1; R Foundation for Statistical Computing, 2022), with child age and gender considered as covariates. To understand how the nested sampling structure (i.e., children rated by their corresponding class teacher) may influence the target variables, the intraclass correlations of the variables at the class level were examined, and the values ranged from .003 to .196. The multilevel nature of the data was addressed by employing the lavaan survey package (Oberski, 2014), which corrects the parameter estimates and standard errors to account for the nonindependence due to the nested sampling structure. This approach has been employed in existing research (e.g., Jackson & Cunningham, 2017; Stühmann et al., 2020). Overall model fit was assessed by the chi-square index (nonsignificant χ^2), comparative fit index (CFI $\geq$.95), nonnormed fit index (NNFI $\geq$.95), root mean square error of approximation (RMSEA $\leq$.06), and standardized root mean square residual (SRMR $\leq$.08) (Hu & Bentler, 1999). The statistical significance of the indirect relationship was examined by using the bias-corrected bootstrapping approach with 5000 resamplings (Hayes, 2009).

Results

Preliminary analyses

Table 1 shows the descriptive statistics and bivariate correlations among the study variables. The data were complete with no missing values, and the skewness and kurtosis of all variables were inside the range of ± 1.11. The object and social mastery motivation at Time 1 were significantly associated (r = .70, p < .01), and these motivational factors were positively related to social–emotional competence (rs = .46 – .53, p < .01), executive functioning (rs = .30 – .50, p < .01), and cognitive school readiness (rs = .41 – .56, p < .01) at Time 2. The social–emotional competence and executive functioning at Time 2 were positively associated (r = .57, p < .01), and both were significantly correlated with concurrent cognitive school readiness (rs = .57 – .79, p < .01).

Table 1
Descriptive statistics and bivariate correlations of the study variables.

Variable	Descriptive statistics						Correlations										
	M	*SD*	Range	Skewness	Kurtosis	Alpha	(1)	(1a)	(1b)	(2)	(3)	(3a)	(3b)	(3c)	(4)	(4a)	(4b)
1. T1 Social mastery motivation	3.64	0.84	1.30–5.00	−0.55	−0.09	.96	–										
a) T1 Social persistence with peers	3.62	0.89	1.00–5.00	−0.51	−0.13	.92	.96**	–									
b) T1 Social persistence with adults	3.66	0.85	1.00–5.00	−0.58	0.13	.91	.96**	.84**	–								
2. T1 Object mastery motivation	3.53	0.76	1.80–5.00	−0.21	−0.60	.91	.70**	.68**	.64**	–							
3. T2 Social–emotional competence	3.61	0.68	1.46–4.67	−0.45	0.32	.92	.53**	.54**	.46**	.46**	–						
a) T2 Prosocial behaviors	3.86	0.81	1.60–5.00	−0.40	−0.11	.93	.57**	.59**	.50**	.46**	.89**	–					
b) T2 Peer problems	1.88	0.72	2.25–5.00	0.54	−0.49	.75	−.58**	−.59**	−.53**	−.37**	−.87**	−.79**	–				
c) T2 Emotion regulation	3.85	0.88	1.33–5.00	−0.70	0.01	.90	.22*	.23*	.19	.34**	.80**	.49**	−.48**	–			
4. T2 Executive functioning	4.07	0.83	2.00–5.00	−0.60	−0.74	.96	.30**	.30*	.27**	.50**	.57**	.44**	−.36**	.63**	–		
a) T2 Working memory	4.22	0.80	1.77–5.00	−1.11	0.63	.97	.37**	.36**	.35**	.44**	.58**	.47**	−.43**	.56**	.83**	–	
b) T2 Inhibitory control	3.91	1.10	1.00–5.00	−0.76	−0.59	.96	.18	.20*	.16	.44**	.44**	.33**	−.23*	.54**	.91**	.53**	–
5. T2 Cognitive school readiness	4.17	0.61	2.67–5.00	−0.47	−0.58	.81	.41**	.42**	.37**	.56**	.57**	.54**	−.40**	.51**	.79**	.69**	.79**

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

Path analysis

An initial path analysis was conducted with reference to Fig. 1, which included all hypothesized direct and indirect paths, with child age and gender statistically controlled. The fit of the model was inadequate: $\chi^2(df = 6, N = 103) = 14.10$, $p = .03$, CFI = .97, NNFI = .91, RMSEA = .11 (90% confidence interval [CI]: .04, .19), SRMR = .09. Based on the path coefficients, only child age was a significant covariate of executive functioning, social–emotional competence, and cognitive school readiness at Time 2, but child gender was not. Moreover, the direct path from social mastery motivation at Time 1 to cognitive school readiness at Time 2 was nonsignificant ($\beta = .06$, $SE = .07$, $p = .50$). To improve the model fit, the nonsignificant covariate (i.e., child gender) and direct path (i.e., social mastery motivation to cognitive school readiness) were trimmed. Fig. 2 shows the parameter estimates and model fit statistics for the final path model of object mastery motivation, social mastery motivation, executive functioning, social–emotional competence, and cognitive school readiness, which demonstrated an adequate fit to the data: $\chi^2(df = 5, N = 103) = 7.28$, $p = .20$, CFI = .99, NNFI = .98, RMSEA = .07 (90% CI: .00, .16), SRMR = .05, $R^2_{\text{Time 2 cognitive school readiness}} = .67$, $R^2_{\text{Time 2 executive functioning}} = .32$, $R^2_{\text{Time 2 social–emotional competence}} = .36$. The object and social mastery motivation at Time 1 were significantly associated ($r = .69$, $p < .001$). Likewise, the relationship between executive functioning and social–emotional competence at Time 2 was significant ($r = .45$, $p < .001$). Aligning with Hypothesis 1, the object and social mastery motivation at Time 1 positively predicted executive functioning ($\beta = .49$, $SE = .08$, $p < .001$) and social–emotional competence ($\beta = .55$, $SE = .07$, $p < .001$) at Time 2, respectively. Moreover, the paths from executive functioning ($\beta = .65$, $SE = .07$, $p < .001$) and social–emotional competence ($\beta = .16$, $SE = .05$, $p < .05$) at Time 2 to concurrent cognitive school readiness both were significant. Partially concurring with Hypothesis 2, the direct path from object mastery motivation at Time 1 to cognitive school readiness at Time 2 was significant ($\beta = .16$, $SE = .05$, $p < .05$). In accordance with Hypothesis 3, the indirect relationship between social mastery motivation and cognitive school readiness mediating through social–emotional competence was significant (indirect effect: $\beta = .09$, $SE = .03$, $p < .01$). The indirect relationship between object mastery motivation and cognitive school readiness via executive functioning was also significant (indirect effect: $\beta = .32$, $SE = .05$, $p < .001$), with a significant total effect ($\beta = .48$, $SE = .06$, $p < .001$).

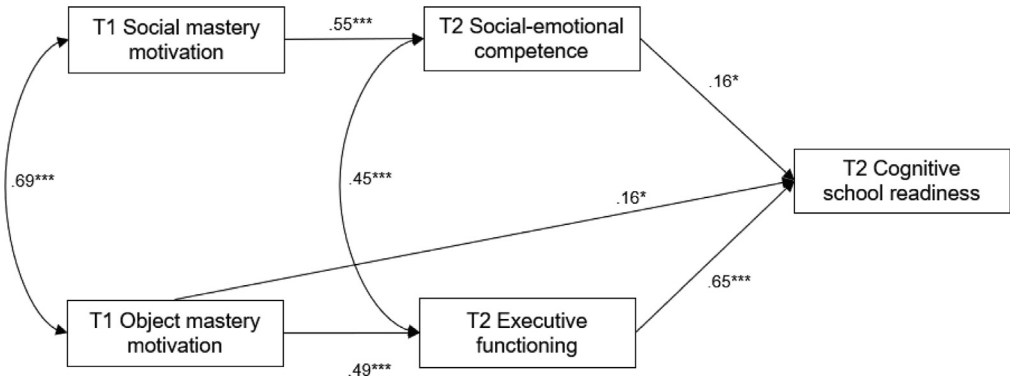

Fig. 2. Path model for predicting the children's cognitive school readiness at Time 2 (T2) from the object and social mastery motivation at Time 1 (T1) and the executive functioning and social–emotional competence at Time 2. Standardized coefficients are reported. Solid paths are statistically significant. Fit indices: $\chi^2(df = 5, N = 103) = 7.28$, $p = .20$, comparative fit index = .99, non-normed fit index = .98, root mean square error of approximation = .07 (90% confidence interval: .00, .16, standardized root mean square residual = .05, $R^2_{\text{Time 2 cognitive school readiness}} = .67$, $R^2_{\text{Time 2 executive functioning}} = .32$, $R^2_{\text{Time 2 social–emotional competence}} = .36$. $^{*}p < .05$; $^{***}p < .001$.</Fig. 2>.

Discussion

The current study examined the relationships between kindergarten children's object and social mastery motivation and their subsequent cognitive school readiness by considering their executive functioning and social–emotional competence as mediators. The results revealed that the children's object and social mastery motivation predicted their subsequent executive functioning and social–emotional competence, which in turn were related to their cognitive school readiness. Moreover, the relationship between social mastery motivation and cognitive school readiness was fully mediated by social–emotional competence. Nevertheless, object mastery motivation may relate to a factor other than executive functioning. The current findings have expanded the existing studies (e.g., Fung, 2022; Fung & Chung, 2019; Fung & Chung, 2022a; Józsa & Barrett, 2018; MacPhee et al., 2018; Martin et al., 2013) by demonstrating executive functioning and social–emotional competence as the plausible mediating processes. These processes possibly mediate the differential predictive relationships of kindergarten children's object and social mastery motivation with their cognitive school readiness.

Object mastery motivation, executive functioning, and cognitive school readiness

Concurring with the hypotheses, the children's object mastery motivation directly and indirectly (via executive functioning) predicted their subsequent cognitive school readiness. Emerging evidence has demonstrated the positive link between object mastery motivation and cognitive school readiness (e.g., Fung & Chung, 2022a; Gilmore et al., 2003; MacPhee et al., 2018; Martin et al., 2013), but these studies have seldom investigated the mediating process. Children with higher object mastery motivation tend to be more eager to explore and manipulate moderately challenging inanimate objects (Fung et al., 2018). These experiences are conducive to their cognitive development (Gilmore et al., 2003). More specifically, during exploration and manipulation, children need to inhibit their impulses to stay on task and retrieve relevant information from long-term memory to generate probable solutions. These processes involve their inhibitory control and working memory and, thus, may contribute to their executive functioning. Notably, the current results extend previous work and reveal the indirect relationship among object mastery motivation, executive functioning, and cognitive school readiness. Nonetheless, caution should be taken in interpreting the current results given that executive functioning was operationalized as teacher-reported classroom behaviors indicating the children's inhibitory control and working memory instead of directly assessing these executive functioning processes.

The significant direct path between object mastery motivation and cognitive school readiness pointed to the possibility of additional factors mediating their relationship. For example, a growing body of evidence has revealed the unique contribution of visuomotor integration to kindergarten children's cognitive school readiness above and beyond the impact of executive functioning (e.g., Cameron et al., 2015; Duran et al., 2018; McClelland & Cameron, 2019). Supposedly, children high in object mastery motivation engage in extensive object manipulation. Therefore, it is likely that they may also develop advanced visual perception and fine motor coordination (i.e., visuomotor integration). Future research may consider examining the mediating role of visuomotor integration in the relationship between object mastery motivation and cognitive school readiness.

Social mastery motivation, social–emotional competence, and cognitive school readiness

As expected, the children with higher levels of social mastery motivation at Time 1 exhibited better social–emotional competence and cognitive school readiness at Time 2. Although social mastery motivation was positively correlated with cognitive school readiness (Table 1), this relationship was indirect and fully mediated by children's social–emotional competence in the path model. Previous research has indicated a link between child-assessed social mastery motivation and vocabulary knowledge (e.g., Fung & Chung, 2019; Fung et al., 2018). However, a recent study revealed that informant-reported social mastery motivation was unrelated to the children's receptive and expressive vocabulary (Fung, 2022). Given that language skills such as vocabulary knowledge are important indicators of cognitive school readiness, the current null direct relationship between social mastery

motivation and cognitive school readiness may be due to the method of assessment, and future work is needed to address this possibility. Alternatively, contextual factors may also influence the interrelationships among the concerned variables. The current study focused on children's social mastery motivation in kindergarten. Given that children can behave differently at home and at school (e.g., play behaviors; Berndt & Bulleit, 1985), it is possible that these children displayed varying levels of social mastery motivation across different contexts, and such a variation may explain the null direct relationship.

Aligned with Józsa and Barrett's (2018) findings, the children with advanced social mastery motivation developed better social–emotional competence, which might further support their cognitive school readiness. In particular, children with higher levels of social–emotional competence tend to develop positive peer relationships and teacher–student relatedness. These factors can promote their engagement in school activities and internalization of knowledge (Galindo & Fuller, 2010; Hernández et al., 2016). More important, the current path model has considered children's object mastery motivation and executive functioning in predicting their cognitive school readiness. The path model explained more than 67% of the variance in cognitive school readiness. The current results further suggest the differential roles of the children's object and social mastery motivation in predicting their cognitive school readiness (Fung & Chung, 2022a) and, at the same time, underscore their executive functioning and social–emotional competence as plausible mediating processes.

Limitations

The current study has at least three limitations. First, the time lag between the two assessment points was short (i.e., 6 months), whereas the mediators (i.e., executive functioning and social–emotional competence) and outcome (i.e., cognitive school readiness) all were assessed at Time 2. Therefore, the results did not represent a proper longitudinal mediation, and caution should be taken in interpreting the findings. All variables were assessed only once; thus, the children's levels of executive functioning, social–emotional competence, and cognitive school readiness at Time 1 were not statistically controlled. Moreover, alternative models could be used to explain the interrelationships between the variables studied. For example, children who demonstrate higher levels of executive functioning are more likely to persist in facing challenges. Equally likely, children with advanced social–emotional competence tend to interact more with peers and teachers in the school context. This study aimed to examine the direct and indirect relationships among the variables and to propose a framework that guides upcoming research. Future longitudinal studies with repeated measures across a longer period or experimental studies are necessary to better inform the direction of effects and the underlying mechanisms. Specifically, the predictors (i.e., object and social mastery motivation), the mediators (i.e., executive functioning and social–emotional competence), and the outcome variable (i.e., cognitive school readiness) should be measured repeatedly at three time points to ascertain the temporal precedence in testing mediation while controlling for the initial estimates (Cole & Maxwell, 2003; MacKinnon et al., 2007).

Second, children's object and social mastery motivation, executive functioning, social–emotional competence, and cognitive school readiness were reported by teachers. Although this approach sufficiently anchors the choice of assessment to the relevant context (teachers' observation of children's behaviors in school; Campbell et al., 2016), correlations among the measures may be subject to biases such as shared method variance (Podsakoff et al., 2003, 2012). Future studies should employ cross-informant ratings (Muschkin et al., 2007; Renk & Phares, 2004) or independent measures (e.g., systematic observation, behavioral assessment) to validate the current findings.

Last, the current sample size was small, and the participants were recruited from a single local kindergarten. A post hoc power analysis (Moshagen & Erdfelder, 2016) revealed that the current sample size had a power of .71 to reject a wrong model with an amount of misspecification corresponding to an alpha of .05 and an RMSEA of .08. Therefore, the current study can be regarded as a pilot work revealing the interconnectedness among the variables. The small sample size also precluded the employment of more sophisticated statistical approaches (e.g., structural equation modeling) to model the variables and investigate their interrelationships. Moreover, whether the findings can be

generalized to other regions or cultural contexts remains an open question, and replication studies are needed to test the robustness of the findings. Future studies with larger samples recruiting from more diverse backgrounds are required to increase the statistical power and examine how the individual aspects of social mastery motivation, social–emotional competence, and executive functioning may contribute to the children's cognitive school readiness.

Conclusions and implications

Despite these limitations, the current results contribute to the literature by revealing the processes that may mediate the distinctive relations of the object and social mastery motivation with kindergarten children's cognitive school readiness. Our findings offer a new perspective for understanding the interlinks among kindergarten children's object mastery motivation, social mastery motivation, and cognitive school readiness, with their executive functioning and social–emotional competence considered. Practically, given that play is a prominent context for the development of object and social mastery motivation (e.g., Fung et al., 2018; Morgan et al., 1995), parents and teachers may consider providing increased play opportunities (Fung & Chung, 2022a; Lunkenheimer & Wang, 2017) and showing more responsiveness to their children (Fung, 2022). The increased employment of play-based activities through adults' responsiveness and support may facilitate children's mastery motivation and formal school transition by shaping their cognitive and social–emotional skills. Other than rote learning and drills, there might be alternative ways to support children's cognitive school readiness (Fung & Chung, 2022b). The current results propose a natural and engaging approach that stimulates children's object and social mastery motivation through play-based activities.

Data availability

The authors do not have permission to share data.

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References

Beck, L., Kumschick, I. R., Eid, M., & Klann-Delius, G. (2012). Relationship between language competence and emotional competence in middle childhood. *Emotion, 12*(3), 503–514. https://doi.org/10.1037/a0026320.

Berndt, T. J., & Bulleit, T. N. (1985). Effects of sibling relationships on preschoolers' behavior at home and at school. *Developmental Psychology, 21*(5), 761–767. https://doi.org/10.1037/0012-1649.21.5.761.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127. https://doi.org/10.1037/0003-066X.57.2.111.

Blair, C., & Raver, 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.

Cameron, C. E., Brock, L. L., Hatfield, B. E., Cottone, E. A., Rubinstein, E., LoCasale-Crouch, J., & Grissmer, D. W. (2015). Visuomotor integration and inhibitory control compensate for each other in school readiness. *Developmental Psychology, 51*(11), 1529–1543. https://doi.org/10.1037/a0039740.

Campbell, S. B., Denham, S. A., Howarth, G. Z., Jones, S. M., Whittaker, J. V., Williford, A. P., ... Darling-Churchill, K. (2016). Commentary on the review of measures of early childhood social and emotional development: Conceptualization, critique, and recommendations. *Journal of Applied Developmental Psychology, 45*, 19–41. https://doi.org/10.1016/j.appdev.2016.01.008.

Chang, M., & Gu, X. (2018). The role of executive function in linking fundamental motor skills and reading proficiency in socioeconomically disadvantaged kindergarteners. *Learning and Individual Differences, 61*, 250–255. https://doi.org/10.1016/j.lindif.2018.01.002.

Chung, K. K. H., & McBride-Chang, C. (2011). Executive functioning skills uniquely predict Chinese word reading. *Journal of Educational Psychology, 103*(4), 909–921. https://doi.org/10.1037/a0024744.

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*(4), 558–577. https://doi.org/10.1037/0021-843X.112.4.558.

Combs, T. T., & Wachs, T. D. (1993). The construct validity of measures of social mastery motivation. In D. J. Messer (Ed.), *Mastery motivation in early childhood: Development, measurement and social processes* (pp. 168–185). Routledge.

Coolahan, K., Fantuzzo, J., Mendez, J., & McDermott, P. (2000). Preschool peer interactions and readiness to learn: Relationships between classroom peer play and learning behaviors and conduct. *Journal of Educational Psychology, 92*(3), 458–465. https://doi.org/10.1037//0022-0663.92.3.458.

Denham, S. A., & Brown, 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.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., ... Japel, C. (2007). School readiness and later achievement. *Developmental Psychology, 43*, 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428.

Duran, C. A., Byers, A., Cameron, C. E., & Grissmer, D. (2018). Unique and compensatory associations of executive functioning and visuomotor integration with mathematics performance in early elementary school. *Early Childhood Research Quarterly, 42*, 21–30. https://doi.org/10.1016/j.ecresq.2017.08.005.

Eisenberg, N., Valiente, C., & Eggum, N. (2010). Self-regulation and school readiness. *Early Education and Development, 21*, 681–698. https://doi.org/10.1080/10409289.2010.497451.

Ezpeleta, L., Granero, R., Penelo, E., de la Osa, N., & Domènech, J. M. (2015). Behavior Rating Inventory of Executive Functioning-Preschool (BRIEF-P) applied to teachers. *Journal of Attention Disorders, 19*(6), 476–488. https://doi.org/10.1177/1087054712466439.

Fung, W. K. (2022). Social mastery motivation mediates the link between parental responsiveness and children's social–emotional competence. *Early Education and Development, 33*(5), 846–857. https://doi.org/10.1080/10409289.2021.1957628.

Fung, W., & Chung, K. K. (2019). The direct and indirect relationships among kindergarten children's social mastery motivation, receptive vocabulary, and socioemotional skills. *Current Psychology, 40*(11), 5559–5566. https://doi.org/10.1007/s12144-019-00523-3.

Fung, W. K., & Chung, K. K. H. (2022a). Association between children's home play opportunity and school readiness: Object and social mastery motivation as mediators? *Early Education and Development*. https://doi.org/10.1080/10409289.2022.2153354.

Fung, W. K., & Chung, K. K. H. (2022b). Parental play supportiveness and kindergartners' peer problems: Children's playfulness as a potential mediator. *Social Development, 31*(4), 1126–1137. https://doi.org/10.1111/sode.12603.

Fung, W., Chung, K. K., & Cheng, R. W. (2018). Gender differences in social mastery motivation and its relationships to vocabulary knowledge, behavioral self-regulation, and socioemotional skills. *Early Education and Development, 30*(2), 280–293. https://doi.org/10.1080/10409289.2018.1544004.

Fung, W. K., Chung, K. K. H., & Lam, C. B. (2020). Mathematics, executive functioning, and visual–spatial skills in Chinese kindergarten children: Examining the bidirectionality. *Journal of Experimental Child Psychology, 199*. https://doi.org/10.1016/j.jecp.2020.104923 104923.

Galindo, C., & Fuller, B. (2010). The social competence of Latino kindergartners and growth in mathematical understanding. *Developmental Psychology, 46*(3), 579–592. https://doi.org/10.1037/a0017821.

Gilmore, L., Cuskelly, M., & Purdie, N. (2003). Mastery motivation: Stability and predictive validity from ages two to eight. *Early Education and Development, 14*(4), 411–424. https://doi.org/10.1207/s15566935eed1404_2.

Gioia, G., Espy, K. A., & Isquith, P. K. (2003). *Behavior Rating Inventory of Executive Function-Preschool Version (BRIEF-P)*. Psychological Assessment Resources.

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.

Gumpel, T. P. (1999). Use of item response theory to develop a measure of first-grade readiness. *Psychology in the Schools, 36*, 285–293. https://doi.org/10.1002/(SICI)1520-6807(199907)36:4<285::AID-PITS2>3.3.CO;2-D.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*(4), 408–420. https://doi.org/10.1080/03637750903310360.

Heatly, M. C., & Votruba-Drzal, E. (2017). Parent– and teacher–child relationships and engagement at school entry: Mediating, interactive, and transactional associations across contexts. *Developmental Psychology, 53*(6), 1042–1062. https://doi.org/10.1037/dev0000310.

Hernández, M. M., Eisenberg, N., Valiente, C., VanSchyndel, S. K., Spinrad, T. L., Silva, K. M., ... Southworth, J. (2016). Emotional expression in school context, social relationships, and academic adjustment in kindergarten. *Emotion, 16*(4), 553–566. https://doi.org/10.1037/emo0000147.

Ho, D. S. T., Leung, C., & Lo, S. K. (2013). Validation of the Gumpel Readiness Inventory for preschool children in Hong Kong. *Research in Developmental Disabilities, 34*, 3066–3076. https://doi.org/10.1016/j.ridd.2013.05.039.

Hu, B. Y., Fan, X., Wu, Z., LoCasale-Crouch, J., Yang, N., & Zhang, J. (2017). Teacher–child interactions and children's cognitive and social skills in Chinese preschool classrooms. *Children and Youth Services Review, 79*, 78–86. https://doi.org/10.1016/j.childyouth.2017.05.028.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118.

Hunter, L. J., Bierman, K. L., & Hall, C. M. (2018). Assessing noncognitive aspects of school readiness: The predictive validity of brief teacher rating scales of social–emotional competence and approaches to learning. *Early Education and Development, 29*(8), 1081–1094. https://doi.org/10.1080/10409289.2018.1495472.

Jackson, S. L., & Cunningham, S. A. (2017). The stability of children's weight status over time, and the role of television, physical activity, and diet in elementary school. *Preventive Medicine, 100*, 229–234. https://doi.org/10.1016/j.ypmed.2017.04.026.

Jennings, K. D. (1979). Exploratory play as an index of mastery motivation: Relationships to persistence, cognitive functioning, and environmental measures. *Developmental Psychology, 15*(4), 386–394. https://doi.org/10.1037/0012-1649.15.4.386.

Józsa, K., & Barrett, K. C. (2018). Affective and social mastery motivation in preschool as predictors of early school success: A longitudinal study. *Early Childhood Research Quarterly, 45*, 81–92. https://doi.org/10.1016/j.ecresq.2018.05.007.

Korucu, I., Litkowski, E., & Schmitt, S. A. (2020). Examining associations between the home literacy environment, executive function, and school readiness. *Early Education and Development, 31*(3), 455–473. https://doi.org/10.1080/10409289.2020.1716287.

Lai, K. Y. C., Luk, E. S. L., Leung, P. W. L., Wong, A. S. Y., Law, L., & Ho, K. (2010). Validation of the Chinese version of the Strengths and Difficulties Questionnaire in Hong Kong. *Social Psychiatry and Psychiatric Epidemiology, 45*(12), 1179–1186. https://doi.org/10.1007/s00127-009-0152-z.

Lam, C. B., Chung, K. K. H., & Li, X. (2018). Parental warmth and hostility and child executive function problems: A longitudinal study of Chinese families. *Frontiers in Psychology, 9*. https://doi.org/10.3389/fpsyg.2018.01063. Article 1063.

Lerner, M. D., & Lonigan, C. J. (2014). Executive function among preschool children: Unitary versus distinct abilities. *Journal of Psychopathology and Behavioral Assessment, 36*(4), 626–639. https://doi.org/10.1007/s10862-014-9424-3.

Li, X., Lam, C. B., Chung, K. K. H., Cheung, R. Y. M., Leung, C., & Fung, W. K. (2020). Development and validation of the Chinese Inventory of Children's Socioemotional Competence (CICSEC). *Early Education and Development, 31*(6), 854–872. https://doi.org/10.1080/10409289.2020.1715735.

Liu, C., Chung, K. K. H., & Fung, W. K. (2019). Bidirectional relationships between children's executive functioning, visual skills, and word reading ability during the transition from kindergarten to primary school. *Contemporary Educational Psychology, 59*. https://doi.org/10.1016/j.cedpsych.2019.101779 101779.

Lunkenheimer, E., & Wang, J. (2017). It's OK to fail: Individual and dyadic regulatory antecedents of mastery motivation in preschool. *Journal of Child and Family Studies, 26*(5), 1481–1490. https://doi.org/10.1007/s10826-016-0633-0.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology, 58*, 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542.

MacPhee, D., Prendergast, S., Albrecht, E., Walker, A. K., & Miller-Heyl, J. (2018). The child-rearing environment and children's mastery motivation as contributors to school readiness. *Journal of Applied Developmental Psychology, 56*, 1–12. https://doi.org/10.1016/j.appdev.2018.01.002.

MacTurk, R. H., Hunter, F. T., McCarthy, M. E., Vietze, P. M., & McQuiston, S. (1985). Social mastery motivation in Down syndrome and nondelayed infants. *Topics in Early Childhood Special Education, 4*(4), 93–109. https://doi.org/10.1177/027112148500400409.

Martin, A., Ryan, R. M., & Brooks-Gunn, J. (2013). Longitudinal associations among interest, persistence, supportive parenting, and achievement in early childhood. *Early Childhood Research Quarterly, 28*(4), 658–667. https://doi.org/10.1016/j.ecresq.2013.05.003.

McClelland, M. M., & Cameron, C. E. (2019). Developing together: The role of executive function and motor skills in children's early academic lives. *Early Childhood Research Quarterly, 46*, 142–151. https://doi.org/10.1016/j.ecresq.2018.03.014.

Messer, D. J., McCarthy, M. E., McQuiston, S., MacTurk, R. H., Yarrow, L. J., & Vietze, P. M. (1986). Relation between mastery behavior in infancy and competence in early childhood. *Developmental Psychology, 22*(3), 366–372. https://doi.org/10.1037/0012-1649.22.3.366.

Micalizzi, L., Brick, L. A., Flom, M., Ganiban, J. M., & Saudino, K. J. (2019). Effects of socioeconomic status and executive function on school readiness across levels of household chaos. *Early Childhood Research Quarterly, 47*, 331–340. https://doi.org/10.1016/j.ecresq.2019.01.007.

Morgan, G. A., Liao, H., Nyitrai, A., Huang, S., Wang, P., Blasco, P. M., ... Józsa, K. (2017). The revised Dimensions of Mastery Questionnaire (DMQ 18) for infants and preschool children with and without risks or delays in Hungary, Taiwan and the US. *Hungarian Educational Research Journal, 7*(2), 48–67. https://doi.org/10.14413/HERJ/7/2/4.

Morgan, G. A., MacTurk, R. H., & Hrncir, E. J. (1995). Mastery motivation: Overview, definitions, and conceptual issues. In R. H. MacTurk & G. A. Morgan (Eds.), *Mastery motivation: Origins, conceptualizations, and applications* (pp. 1–18). Ablex.

Moshagen, M., & Erdfelder, E. (2016). A new strategy for testing structural equation models. *Structural Equation Modeling, 23*, 54–60. https://doi.org/10.1080/10705511.2014.950896.

Muschkin, C. G., & Malone, P. S. (2007). Multiple teacher ratings: An evaluation of measurement strategies. *Educational Research and Evaluation, 13*(1), 71–86. https://doi.org/10.1080/13803610601058215.

Oberski, D. (2014). lavaan.survey: An R package for complex survey analysis of structural equation models. *Journal of Statistical Software, 57*(1), 1–27. https://doi.org/10.18637/jss.v057.i01.

Perry, R. E., Braren, S. H., Blair, C., Vernon-Feagans, L., Cox, M., Blair, C., Burchinal, M., Garrett-Peters, P., Greenberg, M., Mills-Koonce, R., & Willoughby, M. (2018). Socioeconomic risk and school readiness: Longitudinal mediation through children's social competence and executive function. *Frontiers in Psychology, 9*. https://doi.org/10.3389/fpsyg.2018.01544. Article 1544.

Pipp-Siegel, S., Sedey, A. L., VanLeeuwen, A. M., & Yoshinaga-Itano, C. (2003). Mastery motivation and expressive language in young children with hearing loss. *Journal of Deaf Studies and Deaf Education, 8*(2), 133–145. https://doi.org/10.1093/deafed/eng008.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*(1), 539–569. https://doi.org/10.1146/annurev-psych-120710-100452.

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.

R Foundation for Statistical Computing. (2022). *The R project for statistical computing.* https://www.R-project.org.

Ren, L., Chen, J., Li, X., Wu, H., Fan, J., & Li, L. (2021). Extracurricular activities and Chinese children's school readiness: Who benefits more? *Child Development, 92*(3), 1028–1047. https://doi.org/10.1111/cdev.13456.

Renk, K., & Phares, V. (2004). Cross-informant ratings of social competence in children and adolescents. *Clinical Psychology Review, 24*(2), 239–254. https://doi.org/10.1016/j.cpr.2004.01.004.

Salmon, K., Evans, I. M., Moskowitz, S., Grouden, M., Parkes, F., & Miller, E. (2013). The components of young children's emotion knowledge: Which are enhanced by adult emotion talk? *Social Development, 22*(1), 94–110. https://doi.org/10.1111/sode.12004.

Spiegel, J. A., Lonigan, C. J., & Phillips, B. M. (2017). Factor structure and utility of the Behavior Rating Inventory of Executive Function-Preschool Version. *Psychological Assessment, 29*(2), 172–185. https://doi.org/10.1037/pas0000324.

Stühmann, L. M., Paprott, R., Heidemann, C., Ziese, T., Hansen, S., Zahn, D., Scheidt-Nave, C., & Gellert, P. (2020). Psychometric properties of a nationwide survey for adults with and without diabetes: The "disease knowledge and information needs–diabetes mellitus (2017)" survey. *BMC Public Health, 20*(1), 192. https://doi.org/10.1186/s12889-020-8296-6.

Turner, L. A., & Johnson, B. (2003). A model of mastery motivation for at-risk preschoolers. *Journal of Educational Psychology, 95*(3), 495–505. https://doi.org/10.1037/0022-0663.95.3.495.

Wang, P., Hwang, A., Liao, H., Chen, P., & Hsieh, W. (2011). The stability of mastery motivation and its relationship with home environment in infants and toddlers. *Infant Behavior and Development, 34*(3), 434–442. https://doi.org/10.1016/j.infbeh.2011.04.005.

Wiebe, S. A., Espy, K. A., & Charak, D. (2008). Using confirmatory factor analysis to understand executive control in preschool children: I. Latent structure. *Developmental Psychology, 44*(2), 575–587. https://doi.org/10.1037/0012-1649.44.2.575.

Wiebe, S. A., Sheffield, T., Nelson, J. M., Clark, C. A., Chevalier, N., & Espy, K. A. (2011). The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology, 108*(3), 436–452. https://doi.org/10.1016/j.jecp.2010.08.008.

Willoughby, M. T., Magnus, B., Vernon-Feagans, L., & Blair, C. B. (2017). Developmental delays in executive function from 3 to 5 years of age predict kindergarten academic readiness. *Journal of Learning Disabilities, 50*(4), 359–372. https://doi.org/10.1177/0022219415619754.

Zelazo, P. D., & Müller, U. (2002). Executive function in typical and atypical development. In U. Goswami (Ed.), *Blackwell handbook of childhood cognitive development* (pp. 445–469). Blackwell. https://doi.org/10.1002/9780470996652.ch20.