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Developmental predictors of mathematics achievement at the end of Year 1

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Abstract: This study examined the predictive role of child cognitive, social, emotional, and behavioural dimensions assessed at the age of 4½, as well as of the traditional variables related to academic school readiness before the entry to primary school, on mathematics achievement at the end of Year 1. A sample of 58 Portuguese children and their parents participated in this longitudinal study. Initial correlations indicated significant associations between child intelligence quotient (IQ), inhibitory control, set-shifting, dysregulation profile, academic school readiness, and their subsequent performance in mathematics. A hierarchical regression analysis showed that inhibitory control at 4½ years significantly predicted mathematics achievement at the end of Year 1 over and above the effect of academic school readiness before entering primary school. These results add to the existing literature by highlighting the impact of child executive functioning assessed during the preschool years on subsequent mathematics performance in early school years.

Keywords: Preschool, Executive functioning, Academic school readiness, Mathematics achievement.

Introduction

School readiness has been identified as a key factor for future school success, being traditionally focused on children's readiness and defined as their competencies (cognitive, attentional, self-regulation, and social) upon school entry (Pan et al., 2019). School readiness may refer to other aspects such as community expectations of children, schools being ready for children (i.e., being responsive and providing support), or the way communities provide resources for children and their families (Dockett & Perry, 2009). Furthermore, parents tend to link school readiness to children's academic skills, while teachers associate it with physical health, attitudes towards school and learning, and following school routines (Dockett & Perry, 2004). From an ecological perspective, school readiness includes (i) children's characteristics (skills, approaches to learning, adaptation to school, and emotional, social, and motor development), (ii) contextual factors (family, community, educational system, school environment), and (iii) interactions over time between children and each context (Rimm-Kaufman & Pianta, 2000). In this sense, school readiness is a product of interactions between children and their sociocultural environment, which provide experiences and expectations that affect readiness (Dockett & Perry, 2004).

The specific acquisition of numeracy and knowledge of numbers begins before kindergarten and is indispensable for mathematic learning in early school years, thus providing the foundation

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for more complex mathematic skills needed throughout later school years (Bull et al., 2011; Mejias et al., 2019). In fact, the acquisition of numerical skills, including the ability to count and perform mathematical operations, is integrated into the daily life from an early age and continues throughout life (Friso-van den Bos et al., 2013). Studies have shown that good mathematics abilities are important factors for educational attainment (Magnuson et al., 2016) and employment prospects (Croft et al., 2022).

A comprehensive meta-analysis of 70 longitudinal studies revealed that preschoolers' academic/cognitive skills predicted, on average, 25% of variance in academic/cognitive outcomes in the early years of school (La Paro & Pianta, 2000). Thus, research has since been looking for other factors that might contribute for early academic success (e.g., Blair, 2002; Bull et al., 2008; Graziano et al., 2007). Hence, there is now a consensus in the literature regarding the importance of IQ or general intelligence for mathematics performance (Deary et al., 2007; Jamil & Khalid, 2016). On the other hand, executive functioning (EF) has also been identified as a predictor of academic performance (Martí et al., 2023; Pascual et al., 2019) and, in particular, of mathematics achievement (Braak et al., 2022; Bull & Scerif, 2001) – a meta-analysis by Pascual et al. (2019) revealed that IQ and EF predict school performance in the same degree, with IQ being more relevant for new learning and EF for learning that is focused on competencies.

EF refers to a set of higher-order cognitive processes, such as inhibitory control, cognitive flexibility, and working memory, that guide actions and the responses to new or complex situations (Hughes, 2011). Nesbitt et al. (2015) defend that EF can have a direct – when EF processes affect learning tasks (e.g., inhibition is essential for a correct decoding in reading tasks) – or indirect influence (e.g., on learning-related behaviours, including having an appropriate conduct at school) on learning and achievement. Some EF processes that have been reported to be associated with mathematical achievement are inhibition, cognitive flexibility/shifting, planning, and working memory (Agostino et al., 2010; Clark et al., 2010; Kloo et al., 2022; Lee et al., 2009), with the latter by far the most related to mathematics outcomes (Friso-van den Bos et al., 2013; Fuchs et al., 2010; Monette et al., 2011). There is less consensus on how inhibitory control or set-shifting are related to mathematics achievement (e.g., Blair & Razza, 2007; Bull et al., 2008; Espy et al., 2004). Thus, though some studies have identified inhibition as the EF process most related to problem-solving ability (Agostino et al., 2010) and mathematical competence (Martí et al., 2023), Lee et al. (2009) concluded that only working memory – but not inhibition nor cognitive flexibility – predicted achievement on algebra problems. In addition, Clark et al. (2010) found significant correlations between working memory, inhibition, and executive planning at 4 years old and later mathematics achievement at 6 years old. Conversely, other studies report that cognitive flexibility is needed to enable the switch between different operations (e.g., addition and subtraction) and strategies (i.e., retrieval, decomposition, transformation) in arithmetic problem-solving (Bull & Lee, 2014). Therefore, research is needed to understand the diversity of results found in this domain.

Scarce attention has been paid to the role of other characteristics, including children's socio-cognitive, emotional, and behavioural functioning. Theory of mind (ToM), for example, has received increasing attention, although longitudinal studies that assess this socio-cognitive competence before preschool age and its relation to mathematics achievement in elementary school, are still limited (Blair & Razza, 2007; Lecce et al., 2017; Lockl et al., 2017). ToM is the ability to attribute mental states, such as beliefs, desires, and intentions, to oneself and others to anticipate other behaviours on the basis of other people's mental states (Kloo & Perner, 2008). Research shows that preschoolers' ToM abilities are related to academic performance, though the mechanisms underlying this relationship are not yet fully understood (Lecce et al., 2014). For example, one longitudinal study (Kloo et al., 2022) found a predictive relation between ToM (false belief understanding) at 5 years old and later math performance at 7 years old. One likely explanation is that ToM may enhance social competence (including teacher-child relationships), linguistic abilities (allowing the access to mental state and figurative language), or metacognition (which may increase sensitivity to criticism), that, in turn, support school engagement and improve academic performance (Lecce & Devine, 2021). Another possibility is that the relationship between ToM and academic achievement is moderated by other factors. For example, Martins et al. (2019) found that better ToM abilities assessed in the second preschool year predicted greater academic readiness, but only in girls.

Emotional and behavioural problems are expected to impact learning and academic attainment (Magnuson et al., 2016) and, in this sense, may also be related to mathematics achievement. Two perspectives have been discussed regarding the relation between academic achievement and emotional and behavioural problems. On the one hand, some studies have been defending that an impaired emotional/behavioural self-regulation leads to poor academic outcomes (e.g., Brennan et al., 2012; Zimmermann et al., 2013). On the other hand, it is possible that there is an effect of low academic achievement on emotional/behavioural problems, by which a poor academic performance would cause or exacerbate internalizing and externalizing symptoms. In line with this perspective, having a low academic performance may result in receiving negative feedback from others – i.e., parents, teachers, classmates – which can promote a negative self-perception and trigger negative symptoms such as depression (Dias et al., 2022; Verboom et al., 2014). This negative feedback (in result of poor academic achievement) may also increase behavioural problems, such as aggressive behaviour (Miles & Stipek, 2006). Specifically, research shows that preschoolers who show frequent negative emotions are perceived by their colleagues and teachers as difficult and demonstrating less commitment to learning (Denham et al., 2003; Walker, 2009). Additionally, behavioural problems may lead to conflicts between teacher and child which, in turn, affects academic achievement (Pianta & Stuhlman, 2004). From a systemic perspective, behavioural and academic problems can have a bidirectional relationship, i.e., the development of early academic skills may be supported by positive interactions with peers and teachers in the classroom, which is a consequence of social-emotional-behavioural trajectories (Barriga et al., 2002). Children who show prosocial behaviours and who are able to regulate their emotions tend to have better outcomes (e.g., college degree, employment; Jones et al., 2015) and find it easier to complete academic tasks (Pan et al., 2019).

The number of longitudinal studies focusing on identifying which early developmental factors affect later mathematics achievement has recently increased. Yet, most research tends to focus on a reduced number of predictors during the kindergarten years (Duncan et al., 2007; Krajewski & Schneider, 2009; Xenidou-Dervou et al., 2018). However, as it is well documented that EF, ToM, and the ability to regulate emotions and behaviours undergo the greatest development between three to five years of age (Bub et al., 2007; Denham et al., 2003; Zelazo & Carlson, 2012), it is relevant to focus on those variables in early preschool years.

The present research aims to fill these gaps in the literature, by focusing on several constructs such as ToM, IQ, EF, and dysregulation assessed before the kindergarten period. It encompasses three waves of assessment: (i) at 4½ years of age – a sensitive period when the competencies mentioned emerge and/or evolve (e.g., Jones et al., 2003); (ii) four months before entering primary school when academic school readiness was assessed; (iii) and at the end of Year 1, when mathematics achievement was assessed by the children's teachers. Second, our research seeks to contribute to a more comprehensive understanding of academic performance by simultaneously assessing cognitive, social, emotional, and behavioural variables as potential predictors of mathematics achievement, over and above any impact of academic school readiness, thus going beyond previous research focusing on the individual impact of these factors (Barriga et al., 2002; Bull & Scerif, 2001; Lecce et al., 2017).

In line with the existing research, we hypothesise that behavioural/emotional problems and working memory would be more predictive of math outcomes than other developmental dimensions (e.g., ToM). We also expected that the predictive value of EF would be stronger than that of the dimensions linked to academic school readiness assessed before entry to primary school.

Method

Participants and procedure

Between 2011 and 2012, 77 typically developing preschoolers (50.6% boys) were recruited from preschools in the north of Portugal to participate in a longitudinal study focused on the developmental predictors of the initial performance in mathematics. Children were assessed at three timepoints: at 4½ years of age (T1); four months before the beginning of formal schooling (T2); and at the end of Year 1 (T3). Fifty-eight children (58.6% boys), aged between 53 and 60 months at T1 (M=55.12, SD=1.65) completed the three rounds of assessment. At recruitment, parents were mostly highly educated: 87.9% (n=51) of mothers and 58.6% (n=34) of fathers reported having at least a bachelor's degree.

This study was approved previously by the Portuguese National Data Protection authority. Parents were explained the purposes of the study and its detailed procedures, and gave their written consent for their own and their children's participation at all timepoints.

Measures

First timepoint (T1).

IQ was assessed using the short version of the *Wechsler Preschool and Primary Scale of Intelligence-Revised* (WPPSI-R; Sattler, 1992). Tasks used were the Information scale, which tests children's vocabulary and verbal fluency with a set of questions; and the Block Design, where children are asked to reproduce patterns using coloured blocks.

Inhibitory control was measured with the *Head-Toes-Knees-Shoulder* task (HTKS; Ponitz et al., 2009), which includes 20 trials. First, children are asked to respond to two oral commands (head/toes; items 1-5). Each time the experimenter says "touch your head", the correct answer is to touch his/her feet. Next, children are asked to respond to a novel command (knees/shoulders; items 6-10). This time, whenever the experimenter says "touch your knees", the correct answer is to touch his/her shoulders. The complexity of the task increases in items 11-20, where children are asked to respond to one of four commands (head/toes/knees/shoulders). The items are scored as incorrect response (0), self-corrected response (1), or correct response (2). Higher scores indicate higher levels of inhibitory control.

Set-shifting or cognitive flexibility was evaluated using the *Dimensional Change Card Sort Test* (Zelazo, 2006), where children are asked to put a set of cards in the appropriate box, following a rule. For example, at the beginning, children are asked to place the red star and the blue car cards in the matching boxes. This task has seven levels of complexity and as the level increases, children are asked to sort the cards according to certain dimensions (e.g., colours, shapes, borders), sometimes in the reverse order. To reach the next level, children have to sort at least four correct cards in each condition. Higher scores indicate higher levels of cognitive flexibility.

Theory of mind was measured with a battery of six scales: (1) the *Diverse Beliefs* task assesses the child's capacity to perceive that people can have different beliefs; (2) the *Knowledge Access* task assesses the child's capacity to understand that people can perceive reality differently; (3) the *Contents False Belief I* task assesses whether the child can understand a representational change concerning another person; (4) the *Explicit False Belief* task assesses the child's capacity to recognise the false belief of another person; (5) the *Unexpected Contents II* task assesses whether the child can understand his/her own representational change; (6) the *Unexpected Location* task assesses the child's capacity to recognise that a person's belief can be different from reality. The first four tasks are from Wellman and Liu (2004), the last two are from Hughes et al. (2000). Each task was coded in terms of success (1) or failure (0). A ToM composite was calculated based on the sum of the child's score on the six tasks, with higher score indicating better ToM.

Dysregulation profile (CBCL-DP; Althoff et al., 2010) was assessed with the *Child Behavior Checklist* (CBCL; Achenbach & Rescorla, 2000), a 99-item scale that describes emotional and behavioural difficulties that are rated by parents on a 3-point scale: 0 (not true), 1 (sometimes/somewhat true), or 2 (very/frequently true). As done elsewhere (Baptista et al., 2016), we calculated the dysregulation profile (DP) composite through the mean of standardized scores of the items reported by parents in the scales anxious/depressed, attention problems, and aggressive behaviour of the CBCL.

Second timepoint (T2).

Academic school readiness. The *Lollipop Test* (Chew & Morris, 1984), a screening test of variables considered to be associated with academic readiness in preschool-aged children, includes 52 questions, divided in four subtests: (a) knowledge about colours and shapes and ability to copy shapes (14 items); (b) description of images and spatial recognition (10 items); (c) knowledge about numbers and counting (14 items); (d) knowledge about letters and writing (14 items). A total final score, ranging from 0 to 69, was calculated based on the sum of the items. Higher scores indicate better academic school readiness.

Third timepoint (T3).

Mathematics achievement was assessed through the grades provided by the children's primary school teachers at the end of Year 1. In the Portuguese education system, and depending on the schools, mathematics achievement is assessed based on the child's abilities in various domains (e.g., mental calculation, geometry concepts) on a quantitative (1 to 4 or A to F) or qualitative (insufficient, sufficient, good, very good) scale. In our study, we converted the results in all assessed domains into grades between 1 and 4. A final score for mathematics achievement was obtained through the mean of all available results.

Results

Descriptive statistics and bivariate correlations between the study variables can be found in Table 1. No significant associations were found between children's mathematics achievement and parental education. Better academic school readiness predictors before entering primary school (T2) were associated with greater mathematics achievement at the end of Year 1 (r=.40, p=.002). As for variables assessed at 4½ years (T1), higher IQ (r=.49, p<.001), inhibitory control (r=.46, p<.001), and set-shifting (r=.29, p=.03), but lower emotional/behavioural dysregulation (r=-.27, p=.04) were associated with higher mathematics achievement at the end of Year 1. No other significant associations were found.

Table 1

Descriptive and correlations values

	M (*SD*)	Range	1.	2.	3.	4.	5.	6.	7.	8.
Social demographics										
1. Maternal education at T1[a]	4.02 (.58)	2-5								
2. Paternal education at T1[a]	3.59 (1.01)	1-5	.22							
Assessment at 4½ years (T1)										
3. IQ	119.86 (11.71)	79-139	.08	.19						
4. Inhibitory control	26.02 (10.74)	1-38	.14	.23	.41**					
5. Set shifting	45.31 (12.67)	10-71	.14	.38**	.32*	.24				
6. Dysregulation profile	.00 (.57)	-1.27-1.59	-.26*	-.30*	-.27*	-.10	-.32*			
7. Theory of Mind[a]	3.38 (1.51)	1-6	-.02	.04	.16	.02	.27*	.12		
Assessment before entering primary school (T2)										
8. Academic school readiness	61.97 (4.18)	48-69	.16	.16	.39**	.07	.25	-.20	.14	
Assessment at the end of Year 1 (T3)										
Mathematics achievement	3.62 (.51)	2-4	.14	.25	.49**	.46**	.29*	-.27*	.12	.40**

Note. [a]Spearman correlation; Remaining are all Pearson correlation. *p<.05; **p<.01; ***p<.001.

Prediction of mathematics achievement at the end of Year 1

A multiple hierarchical regression with variables linked to academic school readiness (T2) in the first step, and IQ, inhibitory control, set-shifting, and dysregulation profile (T1) in the final step was carried out (see Table 2).

Table 2

Predictors of Mathematics Achievement

	Model	*B*	SE	β	*T*
Block 1	R^2=.16 (Adj. R^2=.15), F(1, 56)=10.73**				
Academic school readiness (T2)		.05	.02	.40	3.28**
Block 2	R^2=.41 (Adj. R^2=.35), F(5, 52)=7.07***				
Academic school readiness (T2)		.03	.02	.27	2.23*
IQ (T1)		.01	.01	.21	1.57
Inhibitory control (T1)		.02	.01	.34	2.86**
Set-shifting (T1)		.002	.01	.04	.31
Dysregulation profile (T1)		-.10	.10	-.11	-.98

Note. *p<.05; **p<.01; ***p<.001.

Traditional variables linked to academic school readiness (T2) proved to be significant predictors of mathematics achievement at the end of Year 1 (β=.40, t=3.28, p=.002), explaining 16.1% of the variance. The inclusion of the earlier developmental variables in the model accounted for an additional 24.4% of the variance, with inhibitory control (β=.34, t=2.86, p=.006) emerging as the only significant predictor.

Discussion

Our main goal was to examine whether 4-year-olds' developmental competencies predicted mathematics achievement at the end of Year 1 in a sample of Portuguese children, over and above the traditional construct of academic school readiness before entry to primary school.

Results showed significant correlations between IQ, inhibitory control, set-shifting, and child dysregulation profiles assessed at age 4½ years, as well as academic school readiness assessed four months before entering primary school, and subsequent mathematics achievement. Thus, after controlling for the significative effect of academic school readiness prior to entering primary school, higher inhibitory control at 4½ years of age predicted mathematics achievement at the end of Year 1. These results are in line with those obtained by Espy et al. (2004) who found that among different executive abilities, preschoolers' inhibitory control was the one that best predicted the development of the children's mathematical skills. Gashaj et al. (2019) also discovered a relation between inhibition and numerical skills, and Gómez et al. (2015) found that a stronger inhibition was associated with higher standardized mathematics marks (from Years 5 to 7). Yet, the influence of inhibitory control, a fundamental characteristic in the development of executive functioning (e.g., Cameron et al., 2019; Diamond et al., 2005) on mathematics achievement is not consensual. Indeed, other studies stated that inhibitory control accounted for a small percentage of variance in mathematical performance after controlling for other variables (Bull & Scerif, 2001; Cragg et al., 2017; Friso-van den Bos et al., 2013). Given the disparity of results, more longitudinal research is needed to analyse which components of executive functioning at preschool age are the best predictors of academic performance.

IQ at 4½ years did not stand once controlling for academic school readiness. This particular finding seems to contrast with a recent meta-analysis (Lozano-Blasco et al., 2022) in which intelligence has been identified as the most stable predictor of school performance, and with some previous studies that indicate the influence of the child's IQ on math performance not only in preschool years (Xenidou-Dervou et al., 2018) but also in formal schooling (Deary et al., 2007; Geary, 2011; Jamil & Khalid, 2016; Magalhães et al., 2020; Tikhomirova et al., 2018). However, it is also true that, in our sample, the traditional construct of academic school readiness was significantly related with IQ, which might suggest that these two constructs tap on the same core and, thus, only one comes out as significant predictor in the final model.

We also sought to assess how children's behaviours and emotions are related to their academic performance, by using a previously developed dysregulation profile. The literature on the CBCL-Dysregulation Profile has been mostly informed by clinical samples, suggesting that children with greater regulatory problems show more maladaptive behaviours later on, such as impulsiveness, bipolarity, manipulation, or suicidal ideation (Althoff et al., 2010; De Caluwé et al., 2013). Furthermore, children with emotional and behavioural problems are perceived by their parents, colleagues, and teachers as being difficult and less willing to learn (Barriga et al., 2002; Denham et al., 2003; Walker, 2009). Likewise, children with a dysregulation profile have more punitive and controlling parents (Kim et al., 2012). In our study, the dysregulation profile assessed at 4½ years was negatively related to mathematics achievement at Year 1. This result extends what Baptista et al. (2016) reported in this same sample where emotional and behavioural problems mediated the relationship between executive functioning and academic school readiness. Additionally, Dias et al. (2022) found that academic achievement and internalising/externalising problems were negatively correlated. On the other hand, Valiente et al. (2008) highlighted the impact of regulatory abilities on school participation, as children with greater emotional regulation challenges participated less in class and had lower grades. In this sense, these personal/social attributes (i.e., self-regulation, emotional development) seem to be a key factor for academic achievement, in particular for children who show less cognitive skills than their peers. For instance, Pan et al. (2019) found that children who had poorer cognitive skills – and therefore worse academic achievement than their peers – but adequate personal attributes, were able to close this gap by the end of Year 2 of primary school and improve their academic performance. Our results also revealed a negative relationship between parental education and the child's dysregulation profile, suggesting that parents with higher education might have more resources to help their children control their behaviours and emotions. Interestingly, no association was found between maternal/paternal education and mathematics achievement. These results contradict previous findings where children with parents with higher education show higher mathematics achievement and a faster increase in this subject as they grow older (Sung & Wickrama, 2018). In contrast to this, Garon-Carrier et al. (2018) found that only the paternal education predicted number knowledge, but not maternal education. It is conceivable that we did not find a significant correlation between these dimensions due to low variance in our sample in parental education. Finally, we found no association between ToM and Year 1 mathematics achievement, a result consistent with a previous finding where ToM skills assessed at 4½ years of age were not significantly related to boys' academic readiness (Martins et al., 2019). Likewise, Lecce et al. (2021) found that ToM was related to reading comprehension but not with mathematical ability. Still, there is evidence that better ToM skills at preschool age are related to higher levels of academic performance years later including mathematics achievement (Lecce et al., 2011, 2014; Lockl et al., 2017). The longitudinal study by Smogorzewska et al. (2022) revealed that ToM is an important ability for academic development since higher levels of ToM in primary school students predicted mathematics achievement after 30 and 40 months of age. Considering the disparity of empirical findings, it would be relevant to carry out more studies that can contribute to clarifying the relationship between these two variables.

In general, the objectives of our investigation were met, and three strengths are noteworthy: (i) by integrating data from three waves of assessment, this study allows for a better understanding of how the variables relate over time; (ii) by adopting a comprehensive stance on understanding how cognitive, emotional, social, and behavioural variables predict maths achievement, this study offers a more holistic view of the relationship between these constructs; (iii) by assessing developmental predictors at 4½ years of age, this study used a younger sample than most literature available. However, it is only fair to mention that the sample size can be an issue in the generalization of the results; therefore, future longitudinal research should seek to replicate these results with a larger sample and could assess the same variables in all timepoints so to better understand its developmental trajectories. On the other hand, future research should explore the role of children's sociocultural context, as literature has been increasingly shifting the attention from the traditional concept of readiness to school – where children's skills were considered essential – to the notion of transition to school. Transition to school is thus characterised as a continuous process of changing identities and roles (Dockett & Perry, 2015), and the importance of the relationships between all contexts (e.g., parents, teachers, school, community) has been highlighted. It is worth mentioning that, although the present study was only centered on the knowledge dimensions of school readiness, data on different contextual factors (e.g., mother/father, teachers, parents-child's interactions) have been collected and are currently being analysed, possibly resulting in relevant information on the topic of transition to school in the future.

Early academic skills, including mathematics, is a foundation for later learning and achievement (Magnuson et al., 2016). Hence, preschool education programs should provide an adequate environment for the development of school readiness skills (cognitive, emotional, and social; Pan et al., 2019). Primary school teachers should have a detailed knowledge about children's abilities as well, so that they may adapt their learning methods to their individual needs (Mejias et al., 2019). On the other hand, it is important for teachers to recognise the importance of the domains that have been associated with better academic achievement, including executive functioning and self-regulation, in order to create classroom practices that foster these abilities (Martí et al., 2023).

The development and improvement of executive functioning and adjusted behaviours can be promoted through verified early childhood programs such as Promoting Alternative Thinking Strategies (Diamond & Lee, 2011) and Tools of Mind (Diamond et al., 2007). In addition to teachers, the process of transition to school should involve other context agents who shape the transition experience (e.g., family, school staff, community). A supportive transition, adjusted to the uniqueness of children, is the foundation for their academic and social development and for coping with future transitions (OECD, 2017).

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Authors contribution

Conceptualization: JB, CM; Methodology: SM, MF, CM; Project administration: CM; Supervision: CM; Validation: CM; Funding acquisition: CM; Writing – Original draft: SM, CAA; Writing – Review and edit: JB, CM.

All the authors read and approved the final manuscript.

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Preditores desenvolvimentais do desempenho na Matemática no final do 1.º ano

Resumo: O presente estudo analisou o papel preditor das dimensões cognitivas, sociais, emocionais e comportamentais de crianças avaliadas aos 4 anos e meio de idade, bem como das variáveis tradicionalmente associadas à prontidão escolar académica antes da entrada no ensino primário, no desempenho da Matemática no final do 1.º ano. Participaram neste estudo longitudinal um total de 58 crianças Portuguesas e respetivos pais. As correlações iniciais demonstraram associações significativas entre o quociente de inteligência (QI) da criança, controlo inibitório, flexibilidade cognitiva, perfil de desregulação, prontidão escolar académica e o seu desempenho subsequente na Matemática. Através de uma análise de regressão hierárquica verificou-se que o controlo inibitório aos 4 anos e meio previu significativamente o desempenho na Matemática no final do 1.º ano, superando o efeito da prontidão escolar académica antes da entrada no ensino primário. Estes resultados contribuem para a literatura existente, salientando o impacto do funcionamento executivo da criança, avaliado durante a idade pré-escolar, no desempenho posterior na Matemática nos primeiros anos do ensino formal.

Palavras-chave: Pré-escolar, Funcionamento executivo, Prontidão escolar académica, Desempenho na matemática.

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