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Parent-child school-related interactions and helplessness in maths: the role of maths self-efficacy

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Abstract
Although learned helplessness has a long research tradition, neither its contextual predictors nor the ways that they take effect are fully understood. This study inquired into the role of selected aspects of the home learning environment for academic helplessness. We tested whether three dimensions of parent-child school-related interactions—school-related assistance, structure, and responsiveness—predicted helplessness in maths. The study also verified whether student self-efficacy in maths partially mediated the relationships. The analyses were run on a sample of 6726 German secondary school students and used structural equation modelling. They confirmed that higher school-related assistance, structure, and responsiveness in Grade 7 were associated with lower helplessness in maths in Grade 7. Moreover, self-efficacy in maths was a partial mediator of these relationships. Additional analyses with helplessness in maths measured in Grade 9 revealed the same pattern of results for school-related assistance and responsiveness, but only an indirect link was present in the case of structure. The results highlight the protective role that parent-child interactions around school may play against academic helplessness.

Keywords Learned helplessness · parent-child interactions · home learning environment · self-efficacy · parental involvement in education

Learned helplessness has been a topic of scientific debate for over five decades (see e.g., Seligman & Maier, 1967) and it constitutes an important individual characteristic in research on motivation. In the academic domain, helplessness is linked to lower school achievement (e.g., Buzzai et al., 2021; Fincham et al., 1989) and a higher risk of school refusal (Sorrenti et al., 2016). Moreover, helpless students show more depressive symptoms (Rudolph et al., 2001), have less positive attitude towards school, and lower self-efficacy (Sorrenti et al., 2015).

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Although academic helplessness has received much attention in research, neither its contextual predictors nor mechanisms through which those predictors take effect are fully understood. Some studies have inquired into the school environment, for example, teacher aptitude beliefs (Heyder & Brunner, 2018), teacher control and support for autonomy (Filippello et al., 2020), or student school belonging and exclusion (Raufelder & Kulakow, 2022). However, few studies researched the role of the home environment. Filippello and others (2015, 2018) studied the relationship between parental psychological control and school helplessness in adolescence and found that school self-efficacy and frustration intolerance mediated the relationship. Rudolph and others (2001) included a broader array of parenting practices (e.g., rejection, inconsistent discipline) as predictors of academic and social helplessness and confirmed their role in shaping helplessness. However, they did not test the potential mechanisms of the relationships. Moreover, all the above mentioned studies focused only on parenting styles and used a general measure of academic helplessness.

Since academic helplessness may be domain-specific (e.g., Sedek & McIntosh, 1998) and school-related interactions between parents and children—although more closely related to academic helplessness than parenting—have not been examined yet, this study verified the role of parent-child school-related interactions for helplessness in maths. Moreover, it verified whether self-efficacy in maths mediated the relationship. The hypotheses were tested using a nationwide sample of German Grade 7 students. The cross-sectional design was appropriate for testing mediation hypotheses, but it did not allow us to establish temporal precedence between the variables or test long-term associations. Therefore, to strengthen the conclusions, we also verified whether the expected relationships were present when helplessness in maths was measured in Grade 9.

Theoretical framework

Helplessness is a specific psychological state that may appear as a result of the experience that outcomes do not depend on one's actions (Abramson et al., 1978). It manifests with a loss of motivation, negative affect, and the expectation that future action will be futile. Although lack of contingency between own actions and outcomes suggests the role of failure in the development of helplessness, not all failures lead to it. Whether helplessness appears depends on the beliefs on the causes of failures, with particularly detrimental effects of attributions to factors that are uncontrollable, stable, and internal, for example, aptitude (e.g., Abramson et al., 1978; Nolen-Hoeksema et al., 1986). Although helplessness is often considered a generalised characteristic, multiple studies have differentiated between social (e.g., Rudolph et al., 2001) and academic helplessness (Raufelder & Kulakow, 2022), with the latter one considered subject-specific (e.g., Heyder & Brunner, 2018; Sedek & McIntosh, 1998).

Home learning environment and helplessness

To identify factors in the family that may be key for academic helplessness, we drew on the model of home learning environment by Kluczniok and others (2013). The model lists three major components of the home learning environment that affect child development: structural characteristics of the family, parental educational beliefs, and parent-child interactions. Since the model systematises various aspects of the home learning environment and the relationships between them, in this study, it serves as a scaffolding for identifying

factors that may play a role in shaping helplessness, which we derive later from other models and past research.

Structural characteristics refer to long-lasting factors that shape the situation in which the family lives, for example, family composition or parental education. Parental educational beliefs pertain to educational values that parents hold and include, among others, aspirations towards the child's education and perceptions of the child. Parent-child interactions encompass these activities and materials that constitute learning opportunities. Since structural characteristics of the family and parental educational beliefs affect student outcomes only indirectly, via their effect on parent-child interactions (Kluczniok et al., 2013), this study focused on parent-child interactions themselves. Taking into account theory and research on parental involvement in education (e.g., Farkas & Grolnick, 2010; Hill & Tyson, 2009; Jeynes, 2007) and parenting (Maccoby & Martin, 1983; Pomerantz & Thompson, 2008), we selected their three aspects: school-related assistance, structure, and responsiveness.

The provision of *school-related assistance*, which pertains to the amount of help with homework, school-related tasks and problems provided to the child, is one of the basic learning opportunities offered by the family and may be of particular importance for helplessness. Limited assistance at home may increase helplessness because lack of help in the face of difficulty may raise the risk of failure. The role of parental support with school for motivation and academic achievement has been confirmed in multiple research on parental involvement in education (e.g., Hill & Tyson, 2009; Jeynes, 2007).

Nevertheless, it may be important not only how much assistance parents provide, but also how they do so. Past research has shown that parental help with homework may cause conflict or tensions (e.g., Corno, 1996; Solomon et al., 2002), have inappropriate forms, or confuse the child (e.g., Balli, 1997; Cooper et al., 2000). Moreover, research on parenting, often relying on Maccoby and Martin's model (1983) has revealed that parenting styles are differently associated with a range of cognitive and non-cognitive outcomes, for instance, academic achievement, self-esteem, adjustment, relational aggression or behavioural problems (e.g., Gimenez-Serrano et al., 2022; Kawabata et al., 2011; Palacios et al., 2022; Pinquart & Kauser, 2018). The model (Maccoby & Martin, 1983) postulates two dimensions of parenting (warmth and strictness) and four parenting styles as combinations of the two. Warmth refers to the degree of parental acceptance, affection, emotional closeness, and communication with the child, whereas strictness—to discipline and demandingness towards the child and maintaining the position of authority as a strategy for controlling their behaviour and promoting compliance (see also e.g., Alcaide et al., 2023; Gimenez-Serrano et al., 2022; Palacios et al., 2022). In Western cultures, the authoritative style (a combination of warmth and strictness) is associated with better psychosocial adjustment (e.g., Palacios et al., 2022; Pinquart & Kauser, 2018), although recent research has also pointed to the beneficial outcomes of the indulgent style (warmth without strictness, e.g., Alcaide et al., 2023; Gimenez-Serrano et al., 2022; Martinez et al., 2020), especially when compared with authoritarian (strictness without warmth) and neglectful (neither strictness nor warmth) parenting. Past research has confirmed the associations of selected aspects of parenting, for instance, parental control, rejection, or inconsistent discipline and helplessness (Filippello et al., 2015, 2018; Rudolph et al., 2001).

In the same vain, multiple studies on home-based parental involvement in education have indicated the importance of taking qualitative dimensions of parental practices and school-related interactions into account while inquiring into student outcomes (e.g., Lorenz & Wild, 2007; Mata et al., 2018; Moroni et al., 2015).Therefore, following research on

parenting and parental involvement in education, we included qualitative characteristics of parent-child school-related interactions in this study.

Two highly relevant quality aspects are structure and responsiveness (Bäumer et al., 2019). The dimensions originate from the model of instructional quality (e.g., Praetorius et al., 2018), which itself draws upon other theoretical models, for instance, self-determination theory. Although developed in the context of classroom instruction, it includes dimensions that are generic and therefore applicable to other learning environments, including the home learning environment (e.g., Bäumer et al., 2019; Linberg, 2018). They also converge with models of parent-child interactions (Linberg, 2018). In contrast to the quantity of parent-child school-related interactions captured by school-related assistance, the two dimensions refer to quality. Similar dimensions (under various labels) have been identified in research on parental involvement in education (e.g., Núñez et al., 2017; Rogers et al., 2009; Silinskas & Kikas, 2019; Wang et al., 2014) and parenting (e.g., Baumrind, 1991; Maccoby & Martin, 1983; Pomerantz & Thompson, 2008; Wolfradt et al., 2003). For instance, the dimensions included in this study correspond to warmth, one of two dimensions of parenting according to Maccoby and Martin's model (1983) although in the study, they are limited to school-related interactions.

Structure in the home learning environment refers to organizing the environment in a way that promotes competence. This is done by providing clear school- and learning-related rules, expectations, and guidelines (with rationales behind them), as well as by adhering to them. Moreover, structure involves providing children with opportunities to meet those expectations and giving them feedback (e.g., Bäumer et al., 2019; Dumont et al., 2014; Farkas & Grolnick, 2010; Grolnick et al., 2015). In such conditions, own actions carry predictable consequences, and therefore it is easier for the child to see behaviour-outcomes dependence (e.g., Buff et al., 2017; Deci et al., 1996; Farkas & Grolnick, 2010), which may result in a lower risk of developing helplessness. Furthermore, such conditions promote academic achievement (Farkas & Grolnick, 2010) because children learn what expected standards are and how to meet them, and therefore, they may help prevent failure in the first place.

Responsiveness in the home learning environment, called sometimes support, refers to responding to the child's learning-related needs, being interested in and acknowledging their learning-related feelings as well as providing encouragement and consolation in the moments of failure (e.g., Bäumer et al., 2019; Dumont et al., 2014; Lorenz & Wild, 2007). As such, it may act as a resource and buffer in times of trouble. First, since responsiveness includes parental availability if assistance is needed, it implicitly assumes assistance provision, which, as already mentioned, rises the chances of averting failure. It may be partially due to facilitating child help-seeking behaviour. It has been shown that students perceiving their parents and teachers as involved, caring, and available when needed, are more probable to seek help in learning when they have difficulties (Du et al., 2016; Marchand & Skinner, 2007; Newman, 2002).

Second, responsiveness, thanks to its role in reducing negative affect in the face of difficulty or failure, may prevent the development of helplessness or alleviate negative affect once it develops. Parental emotional support has been shown to predict lower distress (Chentsova Dutton et al., 2020) and higher achievement in adolescents (Pinquart, 2016).

Self-efficacy as a mediator

As already mentioned, school-related assistance carries a lowered risk of failure and may therefore translate to mastery experiences. Mastery experiences in turn are one of the key sources of self-efficacy (Bandura, 1995). Meanwhile, self-efficacious students, in

comparison to their peers low in self-efficacy, show more persistence in working on tasks, set more challenging learning goals, more easily recover their self-efficacy after failures, and perform better in school (Schunk & Mullen, 2012). All these factors may protect them against helplessness thanks to less frequent setbacks in learning. In other words, since parental assistance may affect self-efficacy and self-efficacy may affect helplessness, the relationship between parental assistance and helplessness may be partially mediated by self-efficacy.

A similar indirect relationship can be also expected in the case of structure and responsiveness. First, structure is also associated with higher academic achievement (e.g., Farkas & Grolnick, 2010; Grolnick et al., 2015), and as mentioned before, mastery experiences are one of the key predictors of self-efficacy (Bandura, 1995). Second, responsiveness, as involving the acknowledgment of learning-related feelings and providing emotional support, plays a role in emotion regulation. Meanwhile, affective states such as emotional tension or stress are often interpreted as indicating vulnerability to failure and lower self-efficacy (Bandura, 1995). Responsiveness, as involving help with managing negative emotional states, may therefore affect student self-efficacy and self-efficacy in turn—affect helplessness.

Present study

To summarize, this study inquired into the role of parent-child interactions around school, a key element of the home learning environment (Kluczniok et al., 2013), for academic helplessness in maths. It also verified the mediating role of maths self-efficacy. It used data gathered from German school students in Grade 7 (cross-sectional analyses) and Grades 7 and 9 (analyses with a delayed measurement of helplessness).

As explained above, we expected school-related assistance (H1.1), structure (H2.1), and responsiveness (H3.1) in the home learning environment to negatively predict helplessness in maths in Grade 7. Moreover, we hypothesised self-efficacy in maths to partially mediate the relationship between assistance (H1.2), structure (H2.2), and responsiveness (H3.2) and helplessness in maths in Grade 7. Moreover, we expected to replicate the results when temporal precedence between the predictors and the outcome was established but with the relationships being weaker due to the delayed measurement of helplessness. In other words, we expected assistance (H1.3), structure (H2.3), and responsiveness (H3.3) in the home learning environment in Grade 7 to negatively predict helplessness in maths in Grade 9. We also expected maths self-efficacy to mediate the effect of assistance (H1.4), structure (H2.4), and responsiveness (H3.4) on helplessness in Grade 9.

Method

Sample and procedure

This study is based on data from Starting Cohort 3 (NEPS Network, 2021) of the National Educational Panel Study (NEPS, Blossfeld & Roßbach, 2019) run in Germany. We used information gathered in Wave 3 (Grade 7) and Wave 6 (Grade 9). The sample is nationwide and longitudinal and includes students followed from Grade 5 onwards. Detailed

information on the sampling design is available in Aßmann et al. (2019) and on panel selectivity and attrition in Zinn et al. (2020).

After excluding special schools, the sample in Grade 7 included 7728 students. We also excluded 47 students who dropped out of the study and 955 students with missing values on all variables. After all exclusions, the sample size in Grade 7 was 6726. On average, students were aged $M = 12.88$ ($SD = 0.52$), 48.60% of them were female (missing data for 0.04%), 45.7% attended an academic track school (missing data for 0.89%), 22.93% had at least one parent born abroad (missing data for 6.05%), 23.41% had at least one parent with a higher education diploma (missing data for 32.02%).

In the case of students who still attended schools in which they were enrolled, data was gathered using paper-and-pencil questionnaires during regular school hours. Students who switched schools and therefore were followed individually, were interviewed via telephone. Informed consent was obtained from all participants of age and from legal guardians of underage participants prior to study enrolment. All participants could withdraw from the study at any time.

Measures

Helplessness in maths

Helplessness in maths (four items, $\alpha_{\text{Grade7}} = .888$, $\alpha_{\text{Grade9}} = .882$) was measured by student reports on how much their learning efforts in the two subjects translated into tangible outcomes (e.g., 'No matter how carefully I do my mathematics homework, I still always make a lot of mistakes.'). The items for maths used a four-point response scale ranging from *does not apply at all* to *applies completely*. They were adapted from a well-validated self-report scale on school-related helplessness (Schwarzer & Jerusalem, 1999) by adding a phrase referring to maths.

Parent-child school-related interactions

The amount of school-related assistance at home was measured in Wave 3 (Grade 7) via student reports (four items, $\alpha = .731$). One item, which used a five-point response scale from *never* and *always,* measured the frequency of parental assistance with homework. Three further items referred to parental help in the case of preparation for school assignments and problems with classmates or teachers (e.g., 'My parents help me when I have problems with my classmates.'). They used a four-point response scale ranging from *completely disagree* to *completely agree*. The items were developed by the NEPS team for the purpose of the Panel.

Structure, which was reported by the students (3 items, $\alpha = .670$), measured if parents provided clear learning-related rules and expectations, and adhered to them (e.g., 'When I study for a class test, I know exactly how much effort my parents expect from me.').

Responsiveness (4 items, $\alpha = .791$) was also student-reported and measured the extent to which parents were empathetic and responsive to the child learning-related needs (e.g., 'If I do not understand something in class, I can talk with my parents about it.'). A four-point response scale ranging from *completely disagree* to *completely agree* was used. The items on both structure and responsiveness come, with some modifications, from previous studies on learning environments (BIKS Forschergruppe, n.d.; Wild, 1999).

Self-efficacy

The scale on maths self-efficacy ($\alpha = .908$) was administered in Grade 7 and included four items that referred to the student's belief on how well they were able to perform in maths (e.g., 'I am convinced that I can master the skills that are taught in math.'). The items used a four-point response scale ranging from *completely disagree* to *completely agree*. The scale comes from a German extension of PISA 2003, where it showed good psychometric properties (Ramm et al., 2006).

Statistical analyses

To verify the hypotheses, we used structural equation modelling (SEM). All constructs were specified as latent variables and item responses served as their observed indicators. We ran analyses separately for each aspect of parent-child interactions, three models in total. Each model included a direct effect of an aspect of parent-child interactions on helplessness in maths in Grade 7 and its indirect (mediation) effect via self-efficacy in maths. We tested each dimension separately instead of including them in one model because we were interested in the role played for helplessness by each dimension, not their role after controlling for the other dimensions. Next, we reran the three models with helplessness in Grade 9 as the dependent variable. Although such models were not optimal for testing mediation hypotheses, they allowed us to verify whether the relationships held if temporal precedence between the predictors and the outcome was established. It also allowed us to verify whether there was a long-term relationship between parent-child school-related interactions and helplessness.

All of the models used the weighted least square mean and variance adjusted (WLSMV) estimator, which is recommended with ordered-categorical data (Beauducel & Herzberg, 2006), as well as accounted for the non-independence of students clustered within schools and potential multilevel clustering by adjusting to the standard errors using a sandwich estimator (the 'cluster' option). The scales of latent factors were identified by fixing the first loading at 1. To correctly estimate the statistical significance of the indirect effects, we calculated non-symmetric bootstrap confidence intervals based on 10,000 bootstrap draws (Muthén et al., 2016). Additionally, to account for potentially inflated type I error due to estimating several models, we used Bonferroni correction. Missing data were handled using full information maximum likelihood estimation (Muthén et al., 2016). Covariance coverage of data for observed variables varied, depending on the variable and model, between .921 and .984 in cross-sectional analyses and between .725 and .986 in the analyses with a delayed measurement of helplessness in maths.

We assumed that the comparative fit index (CFI) and the Tucker–Lewis index (TLI) values not lower than .95, the standardized root mean squared residual (RMSEA) not higher than .06, and the standardized root mean squared residual (SRMR) not higher than .08 indicated good fit (Hu & Bentler, 1999). Main analyses were run in Mplus 8.4, whereas data preparation and basic analyses (descriptive statistics, reliabilities) were carried out in Stata 16.1.

Results

Table 1 contains descriptive statistics and correlations for the variables in the study. All aspects of parent-child learning-related interactions were weakly correlated with helplessness in maths, although the coefficients were visibly higher when helplessness and interactions were measured at the same time point. Maths self-efficacy and helplessness in maths correlated moderately.

Cross-sectional analyses

The hypothesised model included direct and indirect paths (via maths self-efficacy) between a single aspect of parent-child interactions and helplessness in maths. Therefore, we estimated three cross-sectional models and three models with a delayed measurement of helplessness, six models in total. All of them had a good fit to the data (see Table 2).

As expected (H1.1), school-related assistance in Grade 7 directly and negatively predicted helplessness in maths in Grade 7. Assistance higher by 1 *SD* was associated with helplessness in maths lower by 16.2% of *SD*. Moreover, assistance had also an indirect link to helplessness via self-efficacy (H1.2 supported) and the strength of the relationship equalled 11.0% of *SD*. The total effect of assistance amounted to 27.2% of *SD*.

In the case of structure, the results were similar. Structure in Grade 7 was directly associated with helplessness in maths in Grade 7 (H2.1 supported) and indirectly via self-efficacy in maths (H2.2 supported). Structure higher by 1 *SD* directly predicted helplessness in maths lower by 4.0% of *SD*. Moreover, structure higher by 1 *SD* was indirectly associated with helplessness in maths lower by 11.4% of *SD*. The total effect equalled 15.3% of *SD*.

Analogously, responsiveness in Grade 7 higher by 1 *SD* was associated with helplessness in maths in Grade 7 lower by 14.9% of *SD* (H3.1 supported). Additionally, it predicted helplessness via maths self-efficacy, which supported H3.2. Responsiveness higher by 1 *SD* was indirectly associated with helplessness in German and maths lower by 14.8% of *SD*. The total effect equalled 29.6% of *SD*. Moreover, in the three tested models, domain-specific self-efficacy was negatively associated with helplessness in the respective subject. Detailed results are presented in Table 3.

Table 1 Descriptive Statistics and Correlations

Variable	Mean	SD	Skew	Kurt	(1)	(2)	(3)	(4)	(5)
(1) Helplessness M (G7)	1.67	0.70	1.00	0.54	1				
(2) Helplessness M (G9)	1.72	0.73	0.94	0.34	.373	1			
(3) Structure	2.94	0.66	-0.41	-0.05	-.117	-.044	1		
(4) Responsiveness	3.09	0.69	-0.73	0.22	-.222	-.121	.479	1	
(5) Learning support	3.90	0.79	-0.90	0.74	-.201	-.084	.551	.685	1
(6) Self-efficacy M	2.84	0.72	-0.29	-0.17	-.565	-.375	.135	.183	.119

M = in maths; G = Grade. Calculations based on raw mean scores. All correlations are statistically significant at $p < .05$. Clustered standard errors were used

Table 2 Fit of the Tested Models

Model	n_{par}	χ^2	*df*	RMSEA	CFI	TLI	SRMR	N
Helplessness in Grade 7								
(1) Assistance	55	775.3	51	.046	.994	.992	.024	6725
(2) Structure	47	779.5	41	.052	.993	.991	.027	6710
(3) Responsiveness	51	850.0	51	.048	.993	.991	.022	6712
Helplessness in Grade 9								
(4) Assistance	55	531.6	51	.038	.996	.994	.021	6724
(5) Structure	47	540.5	41	.043	.996	.994	.023	6717
(6) Responsiveness	51	647.4	51	.042	.995	.993	.020	6718

n_{par} = number of parameters

Table 3 The Effect of Parent-Child Interactions on Helplessness in Maths in Grade 7 and Grade 9 via Self-Efficacy in Maths: The Results of SEM

Model	Grade 7 (model)			Grade 9 (model)		
	B	95% CI	Beta	B	95% CI	Beta
School-related assistance		(1)			(4)	
Direct effects						
Assistance -> Helplessness [a]	**-0.171**	-0.208; -0.134	-.162	**-0.047**	-0.092; -0.001	-.044
Assistance -> Self-efficacy [a]	**0.185**	0.139; 0.230	.170	**0.180**	0.136; 0.227	.168
Self-efficacy[b] -> Helplessness [a]	**-0.629**	-0.664; -0.591	-.648	**-0.451**	-0.494; -0.408	-.449
Indirect effect via self-efficacy [a]						
Assistance -> Helplessness [a]	**-0.116**	-0.146; -0.088	-.110	**-0.081**	-0.104; -0.062	-.076
Total effect of assistance	**-0.287**	-0.317; -0.242	-.272	**-0.128**	-0.175; -0.081	-.119
R^2 Helplessness [a]			**.482**			**.210**
R^2 Self-efficacy [a]			**.029**			**.028**
Structure		(2)			(5)	
Direct effects						
Structure -> Helplessness [a]	**-0.046**	-0.088; -0.010	-.040	0.029	-0.027; 0.083	.025
Structure -> Self-efficacy [a]	**0.204**	0.153; 0.258	.170	**0.197**	0.147; 0.250	.170
Self-efficacy[a] -> Helplessness [a]	**-0.648**	-0.682; -0.610	-.669	**-0.462**	-0.505; -0.420	-.461
Indirect effect via self-efficacy [a]						
Structure -> Helplessness [a]	**-0.133**	-0.146; -0.088	-.114	**-0.091**	-0.118; -0.067	-.078
Total effect of structure	**-0.181**	-0.234; -0.129	-.153	**-0.062**	-0.122; -0.007	-.054
R^2 Helplessness [a]			**.458**			**.209**
R^2 Self-efficacy [a]			**.029**			**.029**
Responsiveness		(3)			(6)	
Direct effects						
Responsiveness -> Helplessness [a]	**-0.159**	-0.199; -0.119	-.149	**-0.069**	-0.115; -0.020	-.062
Responsiveness -> Self-efficacy [a]	**0.255**	0.212; 0.298	.231	**0.258**	0.212; 0.298	.231
Self-Efficacy[a] -> Helplessness [a]	**-0.622**	-0.658; -0.584	-.641	**-0.444**	-0.487; -0.401	-.442
Indirect effect via self-efficacy [a]						
Responsiveness -> Helplessness [a]	**-0.158**	-0.188; -0.130	-.148	**-0.115**	-0.135; -0.094	-.102
Total effect of responsiveness	**-0.318**	-0.365; -0.271	-.296	**-0.184**	-0.209; -0.134	-.164
R^2 Helplessness [a]			**.477**			**.212**
R^2 Self-efficacy [a]			**.053**			**.053**

Unstandardised coefficients in bold type are statistically significant at $p <= .05$. 95% CI = 95% bootstrap non-symmetric clustered confidence interval (Bonferroni correction was used)

[a]In maths

Analyses with a delayed measurement of helplessness

The analyses for helplessness in Grade 9 replicated the results of cross-sectional models in the case of school-related assistance and responsiveness. However, as expected, the relationships of both aspects of parent-child school-related interactions to helplessness in maths were weaker. The direct effects for assistance and responsiveness equalled 4.4%

(H1.3) and 6.2% of *SD* (H3.3), respectively, whereas the indirect ones—7.8% (H1.4) and 10.2% of *SD* (H3.4), respectively. Structure showed only an indirect link to helplessness in maths in Grade 9 (β = –.08; H2.3 not supported, H3.4 supported).

Discussion

The goal of this study was to verify if three dimensions of parent-child school-related interactions in Grade 7, constituting key processes in the home learning environment, predicted helplessness in maths in Grade 7. Moreover, it aimed at testing whether self-efficacy in maths partially mediated the relationship. To strengthen conclusions, the study used a large-scale dataset and included additional analyses with helplessness in maths in Grade 9 as the dependent variable, which allowed us to see whether the relationships held if temporal precedence was established between the predictors and the outcome.

With respect to the main goal, the three dimensions of parent-child interactions were negatively associated with helplessness in maths in Grade 7, supporting hypotheses on their link to helplessness. Moreover, the relationships were partially mediated by student self-efficacy in maths. The explained variance of helplessness in maths amounted to over 40% in all three models.

The results correspond with findings reported by Filippello et al. (2015) who found that general self-efficacy fully mediated the relationship between parental control and school helplessness. The similarity holds even though Filippello et al. (2015) focused on a different and not school-specific dimension of parent-child interactions, with a different mechanism behind the link, and used measures of self-efficacy and helplessness that were not specific to school subjects.

The association between the home learning environment and helplessness in maths found in this study remains in accordance with a vast body of research indicating an important role that such environment plays for manifold student outcomes, for example, school achievement (e.g., Dimosthenous et al., 2020; Dubow & Ippolito, 1994; Sammons et al., 2015), behavioural adjustment (Dubow & Ippolito, 1994), or school motivation and engagement (Farkas & Grolnick, 2010; Grolnick et al., 2015). However, to our knowledge, it is the first study that focused on school-related assistance, structure, and responsiveness as contextual predictors of helplessness. Therefore, it extends this strand of research by providing evidence on the role of parents for another important school-related outcome.

In this study, a higher amount of school-related assistance provided to the child was associated with lower helplessness in maths, which highlights the link between everyday practices and student socio-emotional outcomes. With respect to qualitative aspects of parent-child learning-related interactions, according to theory, and in line with the results, students experiencing a structured home learning environment, with clear expectations, study-related rules, and feedback, are supposed to hold a stronger notion that actions carry predictable consequences (e.g., Bäumer et al., 2019; Farkas & Grolnick, 2010), which the exact opposite to what helplessness is. Providing such an environment may be one of the channels through which parents pass on to children the notion that school-related tasks, or more specifically—maths-related tasks, are controllable.

The role of responsiveness was also expected since parental availability and responsiveness to school-related needs may help the child build a notion that she or he is not alone in the face of trouble and can rely on others, also strengthening the sense of controllability

even if the child is not able to deal with the task alone. It is also understandable that students, when faced with a difficulty they cannot overcome and feeling left without assistance from their parents, may feel frustrated, left alone and—most importantly—helpless.

Since self-efficacy in maths partially mediated the relationship of school-related assistance, structure, and responsiveness to helplessness in maths, the study gives further evidence on the mechanism of this relationship. Although the effect was relatively small, it still allowed predicting helplessness in maths lower by between 7% and 15% of *SD*. This result brings up questions on other potential mediators, for instance, student emotion regulation or help-seeking behaviour. The topic requires further research.

Nevertheless, in this study, self-efficacy in maths negatively predicted helplessness in maths, which is in line with findings reported by Filippello et al. (2015). Students who feel academically self-efficacious remain motivated and engaged in learning, set more challenging learning goals, and show greater persistence in dealing with school tasks (Schunk & Mullen, 2012; Sökmen, 2021). These characteristics may be responsible for a strong link between self-efficacy and helplessness. Moreover, the result extends previous research by confirming that self-efficacy, if low, may become a breeding ground for negative outcomes. Helplessness was such an outcome in this study, whereas previous studies have indicated depression (e.g., Bandura et al., 1999), lack of effort and persistence, or procrastination (e.g., Honicke & Broadbent, 2016; Liu et al., 2020).

Moreover, the current study gives further evidence of family antecedents of self-efficacy. According to theory and research (e.g., Schunk & Mullen, 2012; Weiser & Riggio, 2010; Yap & Baharudin, 2016), providing the child with school-related help and being responsive to their school-related needs may increase self-efficacy thanks to, among others, facilitating mastery experiences, verbal persuasion, or developing the child's strategies of dealing with difficulties and negative affect. However, the three dimensions of parent-child interactions explained only a small amount of variance in self-efficacy (between 2% and 5%), which highlights that the family is not the only context that shapes self-efficacy.

The analyses with a delayed measurement of helplessness revealed that school-related assistance and responsiveness directly and indirectly predicted helplessness in maths two years later. Since such a design establishes temporal precedence between the variables, the result additionally strengthens the conclusions based on cross-sectional data and suggests a protective role of the two dimensions of parent-child learning-related interactions. However, although these analyses did not confirm a direct link between structure and helplessness in maths in Grade 9, the result should not be interpreted as indicating a lack of such a link because the time span between the measurements was long (two years). Nevertheless, since the relationship of structure to helplessness in maths in cross-sectional analyses was relatively weaker compared to the other dimensions, we also cannot exclude that it wanes over time.

Overall, the study gives important insight into the role that contextual (home-related) factors play for helplessness, which is a topic that has been rarely examined. Moreover, if seen as pertaining to parental involvement in education, it contributes to the body of knowledge on the role of the quantity (school-related assistance) and quality (school-related structure and responsiveness) of such involvement for non-cognitive outcomes (helplessness and self-efficacy). To date, the importance of parental involvement has been widely acknowledged in research on cognitive outcomes, for example, school achievement (e.g., Castro et al., 2015; Hill & Tyson, 2009; Moroni et al., 2015). However, research on its non-cognitive outcomes, although present (see e.g., Gonzalez-DeHass et al., 2005), is a lot less frequent.

Additionally, the dimensions of parent-child school-related interactions included in this study represent selected aspects of parenting styles, including parental warmth and control. Although the dimensions referred only to school-related interactions, the study may still contribute to research on parenting as its results converge with recent evidence on the positive associations of parental warmth without strictness with student adjustment in European and Latin American samples (e.g., Gimenez-Serrano et al., 2022; Martinez et al., 2020; Palacios et al., 2022).

Limitations & future research directions

This study has several limitations that need to be noted. First, although it focused on the role of parent-child interactions around school, which is an advancement in comparison to studies that inquired into the role of parenting for academic helplessness, it did so irrespective of the subject to which such interactions pertained. Meanwhile, it cannot be excluded that such interactions differ to some extent depending on the school subject. Past research has shown that such interactions are shaped, among others, by past student achievement (e.g., Dumont et al., 2014; Silinskas et al., 2013), which implies potential between-subject differences if the child experiences difficulties in selected subjects. Therefore, future studies should focus to a greater extent on subject-specific interactions. Moreover, including parental perspective, as it may differ from the child one, would provide a more comprehensive picture of parent-child interactions. Third, the study did not include other school-related processes in the home learning environment that might affect helplessness, for example, the provision of access to other learning environments (e.g., private tutoring). They should be included in future research. Furthermore, the scales on the structure and amount of school-related assistance at home had acceptable but not very high reliability. However, the use of latent modelling allowed us to account for measurement error and provided results that were free of it. Finally, including more than one measurement occasion for each variable would allow stronger conclusions with respect to causality, which are limited in this study.

Practical implications & conclusion

This study carries practical implications for parental school-related practices at home. It suggests that providing school-related assistance, adequate structure in the home learning environment as well assuring that the child's school-related needs are satisfied may be important in preventing academic helplessness. Since such practices are malleable, they could be addressed in school-based interventions or become part of home-school collaboration. Moreover, the study also highlights the importance of providing students with opportunities to develop school-related self-efficacy, both at home and at school.

However, since parent-child school-related interactions did not explain all variation in helplessness and self-efficacy, they are not the only factors shaping them. Therefore, assuring that they are present in the home learning environment, although beneficial for students, cannot be considered an ultimate solution. Initiating and strengthening protective factors in other learning environments, especially in school, should be considered. Nevertheless, parent-child school-related interactions still carry a protective potential.

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Data availability The data that supports the findings of this study is available from the Leibniz Institute for Educational Trajectories (https://www.neps-data.de/Data-Center/Data-Access). Restrictions apply to the availability of this data, which is the reason why it cannot be provided by the authors of the study. Survey questionnaires are available on the NEPS study website (https://www.neps-data.de/Data-Center/Data-and-Documentation).

Declarations

Ethics approval Written informed consent was obtained from all participants of age and from legal guardians of underage participants prior to study enrolment. All participants could withdraw from the study at any time. There is no ethics committee at the LIfBi and no ethics approval was required for the analyses presented in the paper. All the analyses are secondary analyses of data published previously.

Conflicts of interest The authors have no conflicts to disclose.

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Current themes of research:

The role of various learning environments for student cognitive and non-cognitive outcomes.

Most relevant publications:

Hawrot, A., & Zhou, J. (2023). Do changes in perceived teacher behaviour predict changes in intrinsicreading motivation? A five-wave analysis in German lower secondary school students.*Reading andWriting*Advance online publication.https://doi.org/10.1007/s11145-023-10472-w
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Current themes of research:

Learning motivation and relevant contextual factors, self-regulated learning, and large-scale analysis.

Most relevant publications:

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