

Parent and Teacher Support of Elementary Students' Remote Learning During the COVID-19 Pandemic in Germany

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The aim of the present study was to investigate the associations between parental and teacher support and elementary students' academic skills during the COVID-19 pandemic. Building on data of an ongoing longitudinal study, we studied the roles of children's ($N = 63$) academic skills before the first COVID-19 lockdown in Germany (March–June 2020) as predictors of individual differences in parental schoolwork support during the lockdown, and the contributions of parental and teacher support to students' reading and mathematics skills after the lockdown. Findings indicated that children's reading and mathematics skills before the lockdown predicted parental help, and reading skills predicted parental need-oriented support with schoolwork during the lockdown. Children who received more need-oriented support from parents showed a more favorable development of arithmetic skills across the lockdown. Indicators of teacher support did not explain individual differences in students' academic skills after the lockdown period.

Keywords: *academic achievement, COVID-19, lockdown, remote schooling, elementary students, parental support, teacher support*

In the spring of 2020, many countries decided to close all schools for months in order to stop the spread of the COVID-19 pandemic. The comprehensive school lockdown presented a unique opportunity to study remote teaching and learning in general populations that have neither self-selected into home schooling nor have been prevented from presence schooling, for instance, for health reasons.

The aim of the present study was to investigate the contributions of parental and teacher support during the lockdown and elementary students' academic achievement. In particular, we studied the role of German elementary students' academic skills before the lockdown as predictors of individual

differences in parental schoolwork support during the lockdown, and the contributions of parental and teacher support to the development of students' mathematics and reading skills. Although the emergency lockdown affected students of all age groups, we focused on elementary students. Elementary students, in a medium position between preschoolers and adolescents, already face the pressure of fulfilling curricular academic standards, but at the same time they are strongly dependent on parents' and teachers' guidance and support during their schoolwork due to limited reading abilities, limited self-monitoring skills, as well as limited proficiency and enhanced vulnerability with regard



to risks related to the use of digital media (cf. Irion, 2021; McIntyre et al., 2007; McWayne et al., 2004; Roebbers, 2017). The present study was an add-on to an ongoing longitudinal study on students' development of academic achievement. This approach enabled us to include data on students' achievement before the lockdown.

The School Lockdown in Germany in the Spring of 2020

Due to increasing infection rates in the COVID-19 pandemic in the spring of 2020, the German federal authorities decided to close all schools in order to prevent further spreading of the infection. During this time, children were expected to continue working on a core curriculum with remote support from their teachers. In Germany, this was a unique situation because for many generations, there has been compulsory institutional schooling for all children from age 6 years onward with only rare and strictly regulated exceptions (e.g., chronic illness of the child that does not allow for institutional schooling). Since these emergency school lockdowns were implemented at short notice, clear regulations for the organization of remote schooling were lacking at the beginning of the lockdown (Vodafone Stiftung Deutschland, 2020). Many parents reported that remote schooling during this period was centered on completing assignments rather than on any instruction comparable to classroom instruction (Langmeyer et al., 2020). Hence, it seems that there was a similarity to the homework situation, which might have increased parental influence on children's learning. Moreover, many families faced considerable strain not only due to a conflict between child care and parental occupational obligations but also due to worries more distal to educational processes, such as loss of income related to the economic consequences of the lockdown (cf. Prime et al., 2020). Thus, it was likely that organization and support of children's learning at home would substantially differ across teachers and across parents.

Roles of Parents and Teachers for Student Learning

Social interactions are a crucial context for student learning (Vygotsky, 1978; cf. Erbil, 2020). While children's learning may benefit from peer interactions, the two main groups with a formal responsibility for children's educational achievement are parents and teachers (cf. Urhahne, 2019). While teachers orchestrate instruction, parental involvement in schoolwork is more informal (Urhahne, 2019). Consequently, teacher and parent involvement have mainly been investigated in separate theoretical and empirical frameworks.

Parent Support for Schoolwork. There is a large body of work on the association between parents' involvement and children's academic achievement (cf. Boonk et al., 2018;

Cooper et al., 1998; Karbach et al., 2013; Patall et al., 2008). Since this research has been conducted before the pandemic, it focuses on homework that is done complementary to daily classroom teaching, that is, in the afternoons or at weekends. However, according to a review by Helm et al. (2021) referring to the first lockdown in Germany, Austria, and Switzerland, the prevalent task in remote schooling seemed to have been the completion of worksheets, with online instruction being less frequent for elementary students than for older students (cf. Langmeyer et al., 2020). Thus, there seemed to be parallels to the homework situations, making research on homework a starting point to look at parental support for children's schoolwork during the COVID-19 lockdown. Researchers have looked at various types of parental school-based and home-based involvement (cf. Boonk et al., 2018; Pomerantz et al., 2007). Some have applied very broad definitions including educational expectations and aspirations (Xu et al., 2010) and characteristics of the home learning environment (e.g., reading at home; Aikens & Barbarin, 2008). Others have focused more specifically on parental involvement in children's homework (e.g., Dumont et al., 2014; Katz et al., 2011; Moroni et al., 2015; Silinskas et al., 2013). This approach has been adopted in the present study.

Although it seems intuitive that parental homework involvement should promote children's academic achievement (see Silinskas et al., 2013), findings on the association between the quantity of parent's homework involvement and students' achievement are mixed (cf. Boonk et al., 2018; Pomerantz et al., 2007; Silinskas et al., 2013). A meta-analysis by Patall et al. (2008) found that parents' involvement was positively related to students' achievement in elementary students but not in middle school students. When analyzing their data with respect to subject matter, they found that parental involvement seemed to be helpful with regard to reading achievement, but detrimental to mathematical achievement (Patall et al., 2008). Moreover, Patall et al. (2008) pointed out that the form of involvement matters. Several researchers have distinguished between parental *monitoring* (e.g., checking children's homework for errors and completeness, cf. Patall et al., 2008; Silinskas et al., 2013) and direct parental *aid* or *help* (e.g., guiding a child in completing homework, cf. Silinskas et al., 2013). Several studies reported that parental homework monitoring seems to be detrimental to students' academic achievement, likely because it might be perceived as controlling and might thus undermine students' autonomous motivation (Patall et al., 2008; see, e.g., Moroni et al., 2015, for a similar pattern of findings). Findings regarding the impact of parental homework help seem mixed. Although Patall et al. (2008) report a positive association of parental homework help with students' achievement, Moroni et al. (2015) and Silinskas et al. (2013) reported the opposite pattern.

Although the distinction between parental monitoring and help is frequent and seems relevant (Patall et al., 2008; Pomerantz & Eaton, 2001; Silinskas et al., 2013), recent

research has pointed out that a more differentiated investigation of the interaction quality in parental homework involvement could shed further light on the processes explaining the contribution of parental homework support to children's achievement (cf. Dumont et al., 2014; Katz et al., 2011; Moroni et al., 2015). Building on motivational approaches such as self-determination theory (e.g., Ryan & Deci, 2000), it has been suggested that parental support might facilitate students' achievement by satisfying basic psychological needs such as autonomy, competence, and relatedness and thus promote self-regulated learning (cf. Dumont et al., 2014; Katz et al., 2011; Moroni et al., 2015). For instance, Katz et al. (2011) found that parents' need-oriented support during homework (i.e., behaviors facilitating autonomy, competence, and relatedness) was positively related to elementary students' autonomous motivation for doing their homework. Moroni et al. (2015) reported that sixth graders who perceived their parents' homework involvement as supportive showed an increase in academic achievement, whereas students who perceived their parents' involvement as intrusive showed the opposite pattern.

Although these findings support an influence of parental homework involvement on the development of their children's academic achievement, it has also been suggested that there could be an influence of children's performance on parental involvement (Silinskas et al., 2013). Specifically, these authors have suggested that parents of children with relatively low academic performance might feel that their children require more assistance, and thus become more involved. On the other hand, these same students might be at a disadvantage with regard to further learning (Ahmed et al., 2019; Duncan et al., 2007). A potentially favorable effect of parental help might thus be counteracted by their children's disadvantages in further learning. This might partly explain the fact that not all correlational studies have found a positive association between students' achievement and parental homework involvement (cf. Patall et al., 2008). Empirically, Silinskas et al. (2013) have found that children's low mathematics and reading skills at the beginning of elementary school predicted greater parental monitoring and help. Similarly, Dumont et al. (2014) reported that across Grades 5 to 7, children's lower reading performance was associated with more parental control. However, higher reading performance was associated with more parental responsiveness (cf. Dumont et al., 2014).

Teacher Support for Schoolwork. The decision to close schools and to rely on homeschooling was very sudden and did not allow for any forward planning. Thus, at the beginning of the lockdown, teachers were not given any specific guidelines by school authorities, resulting in considerable differences between teachers—even within the same school—with regard to the organization of remote schooling (Vodafone Stiftung Deutschland, 2020; for a summary, see

Voss & Wittwer, 2020). While several frameworks conceptualizing teaching quality exist (for a brief summary, see Praetorius et al., 2018), one well-established framework encompasses three dimensions: *student support*, *classroom management*, and *cognitive activation* (cf. Baumert et al., 2010; Bellens et al., 2019; Pianta & Hamre, 2009; Praetorius et al., 2014; Praetorius et al., 2018; note that some of these authors use slightly different terminology). These dimensions of teaching quality have been associated with positive effects on student performance in many studies (e.g., Fauth et al., 2014; Kunter et al., 2013; cf. Bellens et al., 2019) and, therefore, they served as a framework for the current study. *Student support* is conceptually related to the concept of need-oriented support presented above in the context of parental support. Like with parental need-oriented support, it is assumed that high-quality student support by the teacher facilitates learning through effective feedback and an enhancement of autonomous motivation (cf. Praetorius et al., 2018). A high potential for *cognitive activation* refers to instructional choices that promote students' cognitive engagement with the task at hand, for example, by choosing problems and tasks that build on students' prior knowledge, relate to students' experiences, and facilitate the construction of knowledge (cf. Fauth et al., 2014; Praetorius et al., 2018; Voss & Wittwer, 2020). *Classroom management* refers to the teacher's ability to focus the students' attention on the task at hand, for example, by providing a clear structure and establishing functional rules, dealing with disruptions in an adequate manner, and minimizing the time and attention required for transitions between tasks (cf. Fauth et al., 2014; Pianta & Hamre, 2009).

These dimensions have, of course, been deduced from classroom instruction, and their effectiveness for students' learning has been investigated in this context. However, they may also inform the investigation of relevant features of teacher support in remote instruction. For instance, Voss and Wittwer (2020) suggested that student support via remote schooling might be facilitated via regular exchange with students, for instance, via video chat. Moreover, feedback can also be provided remotely. An example for high cognitive activation in remote schooling might be an assignment that requires students to engage in online discussions with classmates (Voss & Wittwer, 2020). The dimension of classroom management is, of course, closely associated with the presence of students in the classroom. However, providing a clear structure for students' organization of remote learning and thus helping them to allocate their time in an efficient way might have similar effects on students' time on task (cf. Voss & Wittwer, 2020).

For the present study, we have therefore chosen to investigate indices of teacher support in the homeschooling situation that are informed by the three basis dimensions of teaching quality. We attempted to capture pivotal aspects of these three

dimensions that (1) are applicable to the remote schooling situation, (2) mirror the breadth of each dimension, and (3) can be traced to clearly observable behaviors and task characteristics, which promotes valid assessments via parent report. To touch on student support, we captured *personal interaction and feedback* (cf. Praetorius et al., 2018). Informed by the concept of cognitive activation, we investigated *variety and novelty of tasks* and *stimulation of exchange* between students (cf. Fauth et al., 2014; Praetorius et al., 2018; Voss & Wittwer, 2020; Wildemann & Hosenfeld, 2020). In order to mirror the structure provided by good classroom management (cf. Fauth et al., 2014; Pianta & Hamre, 2009) in the remote schooling context, we assessed *regular messages* to students or parents, provision of *learning plans*, and *availability in case of problems*.

Teacher Support and Parent Involvement. It has been suggested that parental involvement might be influenced by teacher behavior (e.g., Oswald et al., 2018). Specifically, parents who are more satisfied with teachers might be more motivated to interact with them, thus promoting parental involvement (Oswald et al., 2018). However, in the specific situation of remote schooling during the lockdown, it may be that parents whose children experienced low teacher support might have felt particularly responsible to be involved in their children's schoolwork. This might imply a higher quantity of parental involvement in parents whose children received lower teacher support. On the other hand, very novel and cognitively activating teacher assignments may have motivated higher parent involvement. Thus, the quality of parental support might have been higher in families where children received higher quality teacher support.

The Present Study

Previous findings on associations between parental homework involvement and child performance indicate that students' performance can influence subsequent parental support and vice versa (Silinskas et al., 2013). First, children's performance seems to shape their parents' involvement in their homework (Dumont et al., 2014; Silinskas et al., 2013). Second, high-quality parental support during homework might facilitate students' academic achievement, whereas high parental monitoring might be detrimental (Moroni et al., 2015; Patall et al., 2008; cf. Katz et al., 2011). Regarding help in general, the pattern of findings seems less clear (cf. Moroni et al., 2015; Patall et al., 2008). The first aim of our study was to investigate these associations in the context of parental schoolwork support during the lockdown. (1) With regard to parental need-oriented support (i.e., behaviors facilitating autonomy, competence, and relatedness), we expected that children with higher academic achievement before the lockdown would experience more parental need-oriented support

for their schoolwork during the lockdown, and that more parental need-oriented support would be associated with better performance after the lockdown period. (2) With regard to parental monitoring (checking children's homework for errors and completeness; see Silinskas et al., 2013), we suggested that children with higher performance before the lockdown would experience lower parental schoolwork monitoring during the lockdown, and that lower monitoring would be associated with higher academic skills after the lockdown period. Consequently, we expected that both parental need-oriented support and parental monitoring might partially mediate the association between children's performance before and after the lockdown. (3) With regard to parental help (guiding a child in completing homework, cf. Silinskas et al., 2013), we expected that children with higher performance before the lockdown would receive less parental help during the lockdown. Due to the mixed findings with regard to the contributions of parental homework help students' performance, the association between parental help during the lockdown and children's performance after the lockdown was investigated in an explorative manner.

In the present study, we made a first attempt to approach the basis dimensions of teaching quality in the remote schooling context. Therefore, the second aim of our study was to investigate contributions of teacher support for students' development of academic skills during the lockdown. (4) We expected that higher quality teacher support during the lockdown would be associated with greater gains in students' academic achievement across the lockdown. Although the novelty of the situation did not allow to deduce specific hypotheses on the associations between teacher support and parent support, we (5) explored whether parental need-oriented support, monitoring, and support would be influenced by teacher support.

Material and Methods

Participants

Participants were recruited from a longitudinal study on academic performance in monolingual and bilingual elementary students (Grades 2 to 4) from three cities in Germany. Participants for the original longitudinal study who participated in the present study had been recruited via flyers in elementary schools. Parents and children provided written informed consent and parents provided information about the socioeconomic background of the children. One hundred and five families of children who had participated in a standardized assessment of academic skills between September and November of 2019 (Time 1) were invited via email or phone to extend their participation for two additional waves of data collection focusing on the remote schooling situation. Sixty-seven parent-child dyads agreed to participate (response rate: 63.81%; $n = 19$ with Time 1 in September, $n = 39$ with Time 1 in October, $n = 9$ with Time

1 in November). However, four of the children had not completed performance assessments at Time 3 and were therefore excluded from the present analyses. Therefore, the present study is based on $N = 63$ parent–child dyads (52% girls, 52% monolingual). Children’s mean age was 104.41 months ($SD = 8.71$) at the measurement point in fall 2019 (Time 1). Among the parents, $n = 55$ of the participants were mothers and $n = 8$ were fathers (parents were asked to have the questions answered by the person who mainly helps the child with his or her schoolwork). Sixty-two parents gave information on the child’s mother’s education. Among those, 79% reported an academic degree. Families who chose not to participate were not required to justify this decision.

Procedure

Data on children’s academic skills before the pandemic (Time 1) had been collected at university labs. In May 2020 (Time 2), parents and children were sent online questionnaires implemented in LimeSurvey (Schmitz, 2012) to assess parental support and teacher support. These questionnaires also contained scales and items not analyzed in the current study. Depending on local policies, this was during the school closure period for some children and shortly after this period for others. Children participated in a second standardized assessment of academic skills in June to July, 2020 (Time 3). In accordance with infection protection precautions, this assessment was administered without physical contact. Families were sent test sheets in advance with the instruction of not opening them before a scheduled telephone call with an experimenter. They also were asked to provide the child with a quiet place to participate (i.e., a table and chair in a quiet room in their apartment) and with a pen. During this call, experimenters first talked to a parent and the child to let them know about the procedure and to answer all questions the parents or children might have. The parent was instructed to help the child find her seat, find her pen, and put the phone on speakerphone. After making sure that both parent and child were comfortable with the situation, the experimenter asked parents to leave the room so children would neither be disturbed nor helped during the procedure. The experimenter then guided the child through the test. After completion of the test, the experimenter asked the child to get the parent again in order to make sure that the parent knew the session was over and that there were no more questions.

Measures

Reading Skills. Reading skills were assessed at Time 1 and Time 3 using the same standardized achievement tests. All tests have been developed and published in German and

have been validated with German speaking children of the respective age groups. Reading achievement was measured with the ELFE 1–6 (Ein Leseverständnistest für Erst- bis Sechsklässler; Lenhard & Schneider, 2006). The ELFE 1–6 has three subscales, namely (1) word comprehension, (2) sentence comprehension, and (3) text comprehension. The child has to choose the correct answer out of several options (1) by allocating the right word to a picture (word comprehension, example item: *banana*); (2) by filling in a missing word in a sentence (sentence comprehension, example item: *One [week] has seven days*); or (3) by making the correct inference after reading a short story (text comprehension, example item: *Tim is happy when the sun shines. Then he can play soccer with his friends.*—correct answer: *Tim loves to play soccer*). Reading speed was assessed with the SLS 2–9 (Salzburger Lesescreening für die Schulstufen 2–9; Wimmer & Mayringer, 2014). In this test, children have to identify semantically correct sentences (example item: *A sheet of paper is very heavy*). Proportions of correct responses were used for the analyses. Since all reading indices (e.g., scores of the three ELFE 1–6 subtests as well as the SLS 2–9 score) were highly correlated at each time point (ranging from $r = .595$ to $r = .938$), z -standardized scores of all four scales were combined into one reading indicator. Two children had not completed the SLS at Time 1 and one child had not completed the ELFE word comprehension at Time 3. This value were imputed via single imputation before combining scores.

Mathematics Skills. To capture mathematics skills, children’s *arithmetic skills* and *performance in mathematical word problems* was measured at Time 1 and Time 3 with the respective items of a DEMAT test (Deutscher Mathematiktest, in English: German mathematics tests). DEMAT is a series of standardized mathematics assessments based on the German elementary school mathematics curriculum. The tests have been developed and validated with children from Germany. Since the DEMAT series is curriculum-based, there are different DEMAT versions. Depending on children’s grade, we therefore used DEMAT 1+ (Krajewski et al., 2002), DEMAT 2+ (Krajewski et al., 2004), DEMAT 3+ (Roick et al., 2004), or DEMAT 4 (Gölitz et al., 2006). At Time 1, $n = 10$ children were tested with DEMAT 1+, $n = 32$ children were tested with DEMAT 2+ and $n = 20$ children were tested with DEMAT 3+. In accordance with the DEMAT manual, each child was tested with the following DEMAT version at Time 3. DEMAT manuals report T -standardized scores, but not for all subsets of the four DEMAT versions used in the present study. For our analyses, we therefore created z -standardized scores for arithmetic skills and mathematical word problems separately for each DEMAT version. These z -standardized scores were used in our analyses.

Parental Schoolwork Support. Quantity of parental monitoring and help during the lockdown was assessed via parent ratings with six items from the questionnaire by Silinskias et al. (2013). There were two subscales *monitoring* (three items, e.g., “Do you check your child’s homework?”) and *help* (three items used here, e.g., “Do you help or guide your child in his/her homework?”). Responses were given on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*always*). In contrast to the original version, the word *homework* (German: *Hausaufgaben*), which in the German context refers to assignments children complete in their own time after having spent a day at school, was replaced with the word *schoolwork* (German: *Schulaufgaben*), which was a more appropriate term for the school assignments children were doing at home during the lockdown. Cronbach’s alpha of the *help* subscale was excellent, Cronbach’s $\alpha = .93$. For the monitoring subscale, there was a lower internal consistency with Cronbach’s $\alpha = .66$. Although Cronbach’s alpha should generally be greater than .70 (cf. Tavakol & Dennick, 2011, for a summary), it seems acceptable given the low number of items. Mean scores were used in the analyses.

Quality of parental support was assessed via child rating using 10 items of the scale measuring children’s perceptions of parental need-supportive behavior developed by Katz et al. (2011) for elementary students. In accordance with self-determination theory (e.g., Ryan & Deci, 2000), this scale includes items tapping autonomy support (e.g., “My parent tries to allow me to do the homework that matches my interests, or change the homework so that the assignment is interesting to me”), support of competence (e.g., “My parent tells me that s/he believes I’m able to overcome difficulties in homework”) and relatedness (e.g., “My parent tells me that I can come to her/him with any question or problem in relation to homework.”). Responses were given on a 5-point Likert-type scale ranging from 1 (*does not at all apply*) to 5 (*applies exactly*). Items were translated to German and back-translated to English by trained psychologists proficient in both languages. Again, we used the term *schoolwork* instead of the original *homework* to match the specific homeschooling situation during lockdown. Although the original scale consists of 11 items, we had to work with 10 items because of an error in the production of the online questionnaire. Nevertheless, the questionnaire showed a satisfying internal consistency, $\alpha = .73$. A mean score was used in the analyses.

Teacher Support. We selected nine parent report items (cf. Wildemann & Hosenfeld, 2020) for the present study to capture broad aspects of student support (e.g., “Since the beginning of the lockdown, the teacher has spoken to my child [e.g., via videochat or telephone]”), cognitive activation (e.g., “Are your child’s German/Math assignments rich in variety?”), and classroom management (e.g., “The teacher provides students with a learning plan for a longer period of time [e.g., for a week]”).

Most participants reported that the child was taught German and Mathematics by the same teacher, but $n = 15$ participants reported that the child’s German teacher was not her Mathematics teacher. Most items were asked separately for each subject matter. However, participants who had reported that the child was taught by the same teacher in both German and Mathematics were asked two questions capturing aspects of classroom management (“The teacher provides students with a learning plan for a longer period of time [e.g., for a week]” and “When I contact the teacher with a question or problem, I can rely on receiving a response”) only once. Items were analyzed separately for German and Mathematics. For participants who reported that their child was taught by the same teacher in both German and Mathematics, the same ratings on the two items capturing classroom management of the German and Mathematics teacher were used for German and Mathematics scores. Thus, classroom management scores for both subject matters are not independent. For one item intended to capture frequency of feedback as an aspect of cognitive activation, we combined answers on two questions, namely “Does the teacher give ungraded feedback?” and “Does the teacher give graded feedback?” We used the higher of the two scores for our combined variable, with only two parents reporting more graded feedback. Additionally, one filter question was included before this question: “Is your child’s completed schoolwork sent back to the teacher?” For children whose schoolwork was never sent back to the teacher, it was assumed that the teacher would not be able to give feedback on this schoolwork, and the score was set to *never*. Due to the structure of the survey, some items were answered on a 5-point Likert-type scale and some were answered on a 4-point Likert-type scale. For our analyses, we used standardized scores on each variable. Exploratory factor analyses were run separately for items tapping on teacher report in German and Mathematics. Inspection of scree plots suggested one factor for teacher support in German and Mathematics, respectively. Thus, all items were combined into one scale for German and Mathematics. Cronbach’s alpha for the combined teacher support scales were $\alpha = .73$ for German and $\alpha = .71$ for mathematics.

Data Analyses

Hypotheses were tested separately for each achievement outcome (literacy, arithmetic, and mathematical word problems) using parallel mediation models in the PROCESS macro (Hayes, 2018) in SPSS. Children’s achievement at Time 3 was regressed on achievement at Time 1 in the same domain. Since children’s achievement at Time 1 was expected to influence parental support during the lockdown, and parental support during the lockdown was expected to influence children’s achievement after the lockdown, each indicator of parental support (i.e., need-oriented support,

TABLE 1
Descriptive Statistics of the Study Variables

Study variable	Min	Max	<i>M</i>	<i>SD</i>
Reading T1	-2.39	1.54	0.00	0.92
Reading T3	-2.85	1.23	0.00	0.92
Mathematical word problems T1	-2.38	1.00	-0.06	0.98
Mathematical word problems T3	-2.20	1.58	-0.04	1.01
Arithmetic T1	-2.15	1.51	-0.05	0.97
Arithmetic T3	-2.27	1.69	-0.01	0.98
Monitoring	2.67	5.00	4.40	0.63
Help	1.33	5.00	3.39	0.90
Need-oriented support	3.00	5.00	4.13	0.59
Teacher support (G)	-1.39	1.23	-0.00	0.56
Teacher support (M)	-1.31	1.40	-0.03	0.55

Note. T = Time; G = German; M = Math.

monitoring, and help) was included as mediator. Teacher support was not expected to be influenced by student's pre-lockdown achievement, but was suggested to influence achievement after the lockdown. Therefore, teacher support in the respective area (i.e., German teacher's support for reading, and Mathematic teacher's support for arithmetic and mathematical word problems) was not included as a mediator, but as a covariate. One child had not completed the mathematics assessment at Time 1, another had not completed it at Time 2. Missing data were handled using single imputation for these two cases (using information on the other mathematics assessment), since the process macro cannot handle multiple imputation. Two parents had not reported on mothers' education. Since we were unable to fit a valid imputation model for this variable, these data were not imputed.

Results

Preliminary Analyses

Descriptive statistics of all study variables are presented in Table 1. Bivariate correlations of all study variables are presented in Table 2. In a first step, we investigated whether boys and girls, children of mothers with and without academic degree, and monolingual and multilingual children differed with regard to the outcome variables (see Table 3). Findings of mean differences tests showed no significant differences referring to gender, maternal education, or language status. These variables were therefore not included as covariates in subsequent analyses. Moreover, we investigated associations between children's elementary grades and ages and all outcomes (see Table 2). There were no significant correlations of children's elementary grade or age and mathematics achievement. The latter finding is in line with the conceptualization of the DEMAT mathematics test series

that we used to assess mathematics achievement. As explained above, children in different grades received different test versions consistent with the curricular demands of the respective grade. However, older children and children in more advanced elementary grades showed better reading skills after the lockdown. Moreover, parents of younger children and children in lower grades reported more monitoring of their child's schoolwork and more teacher support in mathematics, and parents of younger children reported more homework help. Since children's age and grade were highly correlated, we included only children's age as a covariate in our main analyses.

Associations Between Parental Support and Children's Academic Achievement

Findings of the three mediation models are shown in Figures 1, 2, and 3 and Table 4. Children's achievement in reading, arithmetic, and mathematical word problems before the lockdown was significantly associated with their achievement in the respective domain after the lockdown.

With regard to parental need-oriented support, we had expected that children's achievement before the lockdown would be associated with higher parental need-oriented support during the lockdown, which would in turn be associated with higher achievement after the lockdown. In line with these expectations, children's reading skills before the lockdown were positively associated with parental need-oriented support during the lockdown. Also, children who received more need-oriented support during the lockdown showed better arithmetic achievement after the lockdown. The other associations between children's achievement indicators and parental need-oriented support were however not significant. Also, there was no significant indirect effect of children's domain-specific achievement before and after the lockdown via parental need-oriented support. Contrary to our suggestions, there was no significant association between children's academic achievement before or after the lockdown and parental monitoring during the lockdown. Consistently, there was no significant indirect effect of children's achievement before the lockdown on achievement after the lockdown via parental monitoring. In line with our expectations, we found that children with comparatively high academic achievement received less parental help with schoolwork during the lockdown. This finding was consistent across all the domains. To check for robustness of our findings after the *z*-standardization of DEMAT scores and imputation of missing values, we repeated the analyses for all models without imputed values and based the proportion of correct items instead of *z*-standardized scores. The pattern of findings remained consistent in terms of the directions of significant effects. However, the direct negative effect of children's achievement before the lockdown on parental help was significant only at the $p < .10$ level in the model on

TABLE 2
Bivariate Correlations (Pearson's r)

Study variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Reading T1	1.00	.											
2. Reading T3	.911**	1.00											
3. Math word problems T1	.426**	.502**	1.00										
4. Math word problems T3	.323**	.351**	.379**	1.00									
5. Arithmetic T1	.340**	.418**	.384**	.448**	1.00								
6. Arithmetic T3	.305*	.299*	.228	.419**	.488**	1.00							
7. Monitoring	-.266*	-.195	.091	-.166	-.142	-.217	1.00						
8. Help	-.428**	-.408**	-.198	-.275*	-.266*	-.252*	.482**	1.00					
9. Need-oriented support	.302*	.291*	.063	.049	-.134	.095	.290*	.060	1.00				
10. Teacher support (G)	-.225	-.123	-.001	.000	.129	-.057	-.163	-.077	.004	1.00			
11. Teacher support (M)	-.210	-.073	-.095	.087	.050	-.080	-.035	-.056	.108	.867**	1.00		
12. Child age	.391**	.249*	-.088	-.128	.055	.026	-.336**	-.264*	-.097	-.213	-.346**	1.00	
13. Grade level	.542**	.413**	.014	.009	-.020	.002	-.306*	-.243	.041	-.224	-.276*	.872**	1.00

Note. T = Time; G = German; M = Math.
 * $p < .05$. ** $p < .01$.

arithmetic achievement estimated with z-standardized scores without imputed values (standardized effect: $-.23$, $SE = 0.12$, $p = .065$) as well as in the models on mathematical word problems without imputed values (z-scores: standardized effect: $-.24$, $SE = 0.12$, $p = .062$; proportion of correct items: standardized effect: $-.24$, $SE = 0.00$, $p = .060$). Also, the positive direct effect of children's previous performance in mathematical word problems on performance after the lockdown was significant only at the $p < .10$ level in the model calculated with proportion of correct items without imputed values (standardized coefficient: $.23$, $SE = 0.12$, $p = .072$). All other models replicated the pattern of results.

Associations Between Teacher Support, Parental Support, and Children's Achievement

The role of teacher support for children's achievement after the lockdown was investigated as part of the comprehensive models for each achievement outcome (see Figures 1, 2, and 3). Contrary to our expectations, teacher support did not significantly predict children's reading, arithmetic, or mathematical word problems achievement while controlling for children's previous performance, age, and parental support. Teacher support during the lockdown thus did not seem to explain individual differences in academic skills after the lockdown period. Parents of children who received better support from their German teachers reported less monitoring of their children during the lockdown. Apart

from this, teacher support did not significantly predict indicators of parental support.

Discussion

In this study, we investigated associations between parent and teacher support and elementary students' academic achievement across the emergency lockdown period in Germany in the spring of 2020. Building on an ongoing longitudinal study, we were able to include data on students' achievement measured prior to the lockdown. Although our data were collected in Germany, we believe that the situation might be comparable to the experiences made by teachers and families in many countries used to presence schooling during the lockdown (e.g., Burke, 2020; Daniela et al., 2021). In interpreting the findings, it is important to keep in mind the relatively small sample size, warranting confirmation in a larger sample. Also, it is important to note that we controlled for children's prior domain-specific achievement, which was a strong predictor of postlockdown achievement particularly for reading and arithmetic achievement and thus reduced variance to be explained by parental and teacher support.

With regard to the quality of parental support, we found that children with better reading abilities reported significantly higher parental need-oriented support. This finding is consistent with the study by Dumont et al. (2014). Contrary to our expectations, children's mathematics skills before the

TABLE 3
Mean Differences in the Study Variables With Regard to Child Gender, Child Language Status, and Mothers' Education

Study variable	Child gender				Child language status				Mothers' academic degree			
	Girls <i>M (SD)</i>	Boys <i>M (SD)</i>	<i>t(df)</i>	<i>p</i>	Monolingual <i>M (SD)</i>	Multilingual <i>M (SD)</i>	<i>t(df)</i>	<i>p</i>	Without degree <i>M (SD)</i>	With degree <i>M (SD)</i>	<i>t(df)</i>	<i>p</i>
Reading T1	0.08 (0.76)	-0.08 (1.08)	0.67 (51.80) ^a	.51	0.12 (0.76)	-0.14 (1.07)	1.10 (52.06)	.28	-0.08 (0.91)	0.01 (0.94)	-0.31 (60)	.76
Reading T3	0.04 (0.80)	-0.05 (1.06)	0.38 (61)	.71	0.15 (0.73)	-0.17 (1.08)	1.35 (50.28)	.18	-0.08 (0.68)	0.02 (0.99)	-0.34 (60)	.74
Mathematical word problems T1	-0.17 (1.06)	0.07 (0.89)	-0.94 (61)	.35	-0.08 (0.93)	-0.03 (1.06)	-0.17 (61)	.87	-0.17 (1.19)	-0.01 (0.94)	-0.51 (60)	.61
Mathematical word problems T3	-0.26 (1.10)	0.21 (0.86)	-1.90 (61)	.06	0.08 (1.01)	-0.17 (1.01)	0.98 (61)	.33	-0.32 (0.77)	0.08 (1.03)	-1.32 (60)	.19
Arithmetic T1	-0.15 (0.87)	0.06 (1.08)	-0.86 (61)	.39	0.01 (1.07)	-0.11 (0.87)	0.47 (61)	.64	0.02 (0.78)	-0.03 (1.01)	0.16 (60)	.87
Arithmetic T3	-0.19 (0.94)	0.20 (0.98)	-1.59 (61)	.12	0.20 (1.06)	-0.24 (0.83)	1.83 (61)	.07	0.05 (0.78)	0.00 (1.02)	0.17 (60)	.86
Monitoring	4.36 (0.57)	4.44 (0.69)	-0.51 (61)	.61	4.41 (0.58)	4.39 (0.68)	0.16 (61)	.87	4.67 (0.45)	4.34 (0.65)	1.69 (60)	.10
Help	3.40 (0.77)	3.37 (1.04)	0.16 (61)	.87	3.43 (0.82)	3.33 (0.99)	0.44 (61)	.66	3.79 (0.93)	3.29 (0.88)	1.83 (60)	.07
Need-oriented support	4.03 (0.53)	4.24 (0.64)	-1.42 (61)	.16	4.14 (0.64)	4.12 (0.53)	0.17 (61)	.86	4.25 (0.46)	4.11 (0.62)	0.76 (60)	.45
Teacher support (G)	0.00 (0.52)	-0.01 (0.61)	0.65 (61)	.95	0.00 (0.55)	-0.01 (0.58)	0.07 (61)	.94	-0.05 (0.62)	0.03 (0.53)	-0.49 (60)	.62
Teacher support (M)	-0.03 (0.53)	-0.02 (0.59)	-0.64 (61)	.95	-0.02 (0.51)	-0.40 (0.60)	0.15 (61)	.88	0.02 (0.68)	-0.02 (0.50)	0.26 (60)	.80

Note. T = Time; G = German; M = Math.

^aVariances not equal (Levene test for equal variances significant with $p < .05$).

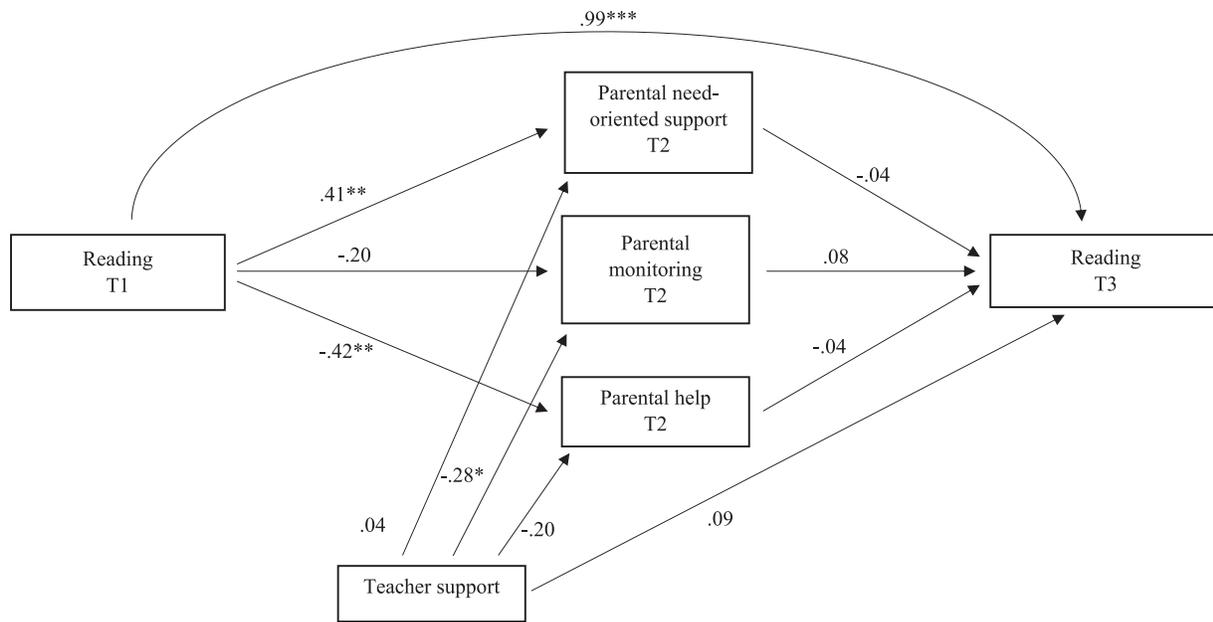


FIGURE 1. Associations between reading achievement, parent support, and teacher support.

Note. $F(6, 56) = 54.22, p < .001$. Only paths referring to our hypotheses are depicted. Indirect total effect of Reading T1 on Reading T3: $-.01$ (CI: $[-0.10, 0.08]$). All coefficients are standardized. T = Time.

* $p < .05$. ** $p < .01$. *** $p < .001$. See Table 4 for exact p values.

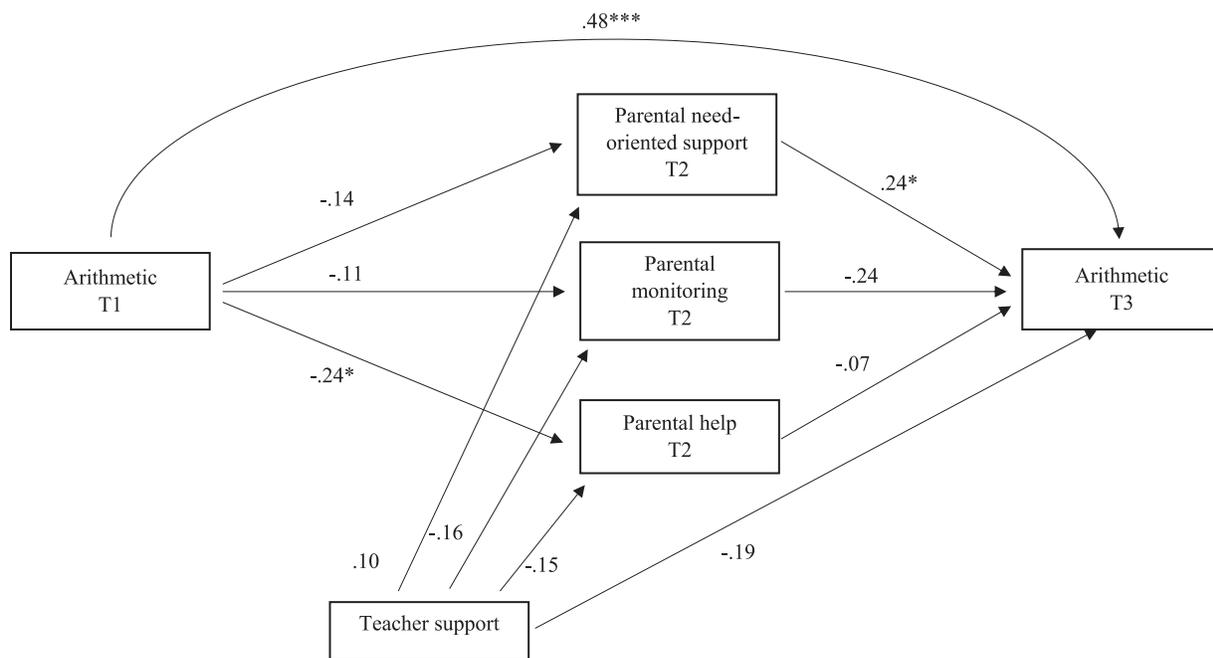


FIGURE 2. Associations between arithmetic achievement, parent support, and teacher support.

Note. $F(6, 56) = 4.83, p < .001$. Only paths referring to our hypotheses are depicted. Indirect total effect of Arithmetic T1 on Arithmetic T3: 0.01 (CI: $[-.10, .11]$). All coefficients are standardized. T = Time.

* $p < .05$. ** $p < .01$. *** $p < .001$. See Table 4 for exact p values.

lockdown did not significantly predict parental need-oriented support for schoolwork during the lockdown. Further research is needed to clarify whether this is a robust finding.

However, it seems plausible that children's reading skills (which were also the domain investigated in Dumont et al., 2014) might be particularly likely to stimulate need-oriented

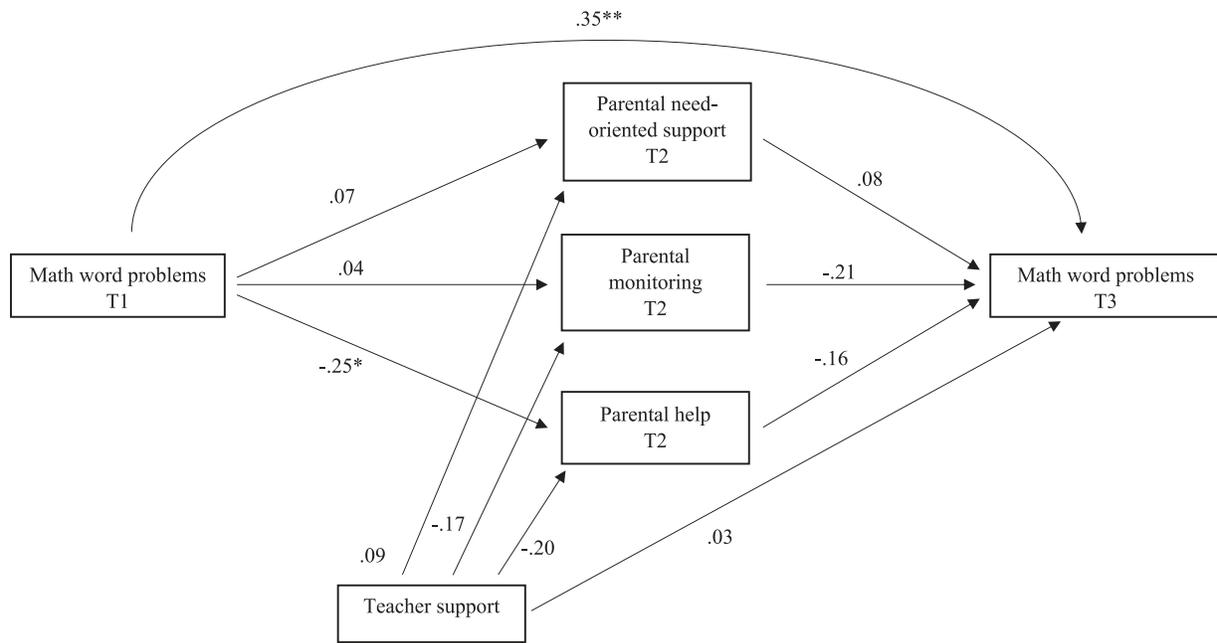


FIGURE 3. Associations between achievement in mathematic word problems, parent support, and teacher support. Note. $F(6, 56) = 2.96, p = .014$. Only paths referring to our hypotheses are depicted. Indirect total effect of Mathematic word problems T1 on Mathematic word problems T3: .04 (CI: [-0.07, 0.15]). All coefficients are standardized. T = Time. * $p < .05$. ** $p < .01$. *** $p < .001$. See Table 4 for exact p values.

support by the parent because reading is an activity that many children and adults enjoy as a leisure activity above and beyond school assignments. Therefore, it might offer many opportunities for parents and children to bond and to strengthen a supportive relationship (e.g., Xie et al., 2018). This effect might have been even magnified by the lockdown situation, where many other pastime activities were no longer possible. With regard to student’s achievement after the lockdown, children who experienced high parental need-oriented support experienced a more favorable development of arithmetic skills. The latter finding is in line with theorizing that suggests that high-quality parental involvement might facilitate student performance via favorable motivational effects (cf. Moroni et al., 2015; Katz et al., 2011). However, parental need-oriented support did not significantly predict changes in children’s reading skills and mathematical word problems solving skills. Although this finding seems hard to bring into line with previous findings (cf. Dumont et al., 2014; Moroni et al., 2015), one explanation could again lie in the unique role of the reading domain during lockdown. Possibly, the motivation of becoming a good reader and thus gain an enjoyable leisure activity compatible with lockdown requirements might have been so great in itself as to render parental encouragement less necessary. This effect might also have influenced mathematical word problem solving as a task that involves not only mathematical but also reading competence (cf. Saalbach et al., 2016). However, these explanations need further investigation.

Specifically, it seems plausible that some aspects tapped by the measure we used (e.g., parents’ efforts to modify homework to match children’s interests) might be more readily applicable to some subject domains (e.g., reading) than to others. In this context, it might also be desirable for future research to measure parental schoolwork support separately for each subject matter.

As two indicators capturing the quantity of frequently investigated forms of parental involvement, we investigated parental monitoring and help. Contrary to our expectations, neither children’s reading nor mathematics achievement before the lockdown significantly predicted parental monitoring of schoolwork during the lockdown. This finding differed from studies on homework done complementary to traditional classroom teaching (cf. Dumont et al., 2014; Silinskas et al., 2013). One explanation might however be one discrepancy between the homework situation and the remote schooling situation. During the lockdown the teachers’ opportunities to structure assignments and notice forgotten tasks or mistakes were limited. In this situation, parents might have felt a greater responsibility to monitor their children’s schoolwork independent of their child’s competence. This is also consistent with the rather high mean value of monitoring in our sample. Contrary to our suggestions, results revealed no significant detrimental effects of parental monitoring (cf. Moroni et al., 2015). However, it might be advisable to interpret this finding in conjunction with its counterpart: As discussed above, parental monitoring during

TABLE 4

Associations Between Parent and Teacher Support and Academic Achievement: Standardized Coefficients, Standard Errors, and Exact p Values

Associations between reading achievement, parent support, and teacher support												
Study variable	Parental need-oriented support T2			Parental monitoring T2			Parental help T2			Reading T3		
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p
Reading T1	.41	0.08	.003	-.20	0.09	.114	-.42	1.23	.002	.99	0.07	.000
Teacher support	.04	0.13	.730	-.28	0.14	.025	-.20	0.19	.933	.09	0.09	.135
Parental need-oriented support T2										-.04	0.10	.532
Parental monitoring T2										.08	0.10	.246
Parental help T2										-.04	0.10	.498
Associations between arithmetic achievement, parent support, and teacher support												
Study variable	Parental need-oriented support T2			Parental monitoring T2			Parental help T2			Arithmetic T3		
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p
Arithmetic T1	-.14	0.08	.295	-.11	0.08	.353	-.24	0.11	.049	.48	0.11	.000
Teacher support	.10	0.15	.488	-.17	0.15	.209	-.15	0.21	.250	-.19	0.21	.111
Parental need-oriented support T2										.24	0.19	.043
Parental monitoring T2										-.24	0.21	.083
Parental help T2										-.07	0.14	.584
Associations between achievement in mathematic word problems, parent support, and teacher support												
Study variable	Parental need-oriented support T2			Parental monitoring T2			Parental help T2			Math word problems T3		
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p
Math word problems T1	.07	0.08	.611	.04	0.08	.736	-.25	0.11	.044	.35	0.13	.007
Teacher support	.09	0.15	.499	-.16	0.15	.207	-.20	0.21	.119	.03	0.24	.823
Parental need-oriented support T2										.08	0.21	.546
Parental monitoring T2										-.21	0.24	.166
Parental help T2										-.16	0.16	.262

Note. T = Time.

the COVID-19 lockdown might not be directly comparable to parental monitoring in regular homework situations, because parents might have felt a greater responsibility to oversee their child's schoolwork in a situation where no teacher was present on a regular basis. In line with our hypotheses, children with better reading and mathematics skills received less parental help with their schoolwork during the lockdown. This is consistent with findings reported by Silinskas et al. (2013) and also seems rather intuitive: Children who are less competent might struggle with their assignments and therefore receive more help from their parents. With regard to previous research on regular homework, findings on the effect of parental help on students' academic achievement were mixed (Moroni et al., 2015; Patall et al., 2008; Silinskas et al., 2013). In our study, there was no

significant effect of parental help on students' development of academic skills. As elaborated above, this could also be a result of opposing processes: On the one hand, students with lower initial performance received more parental help. On the other hand, students with lower previous domain-specific knowledge are at a disadvantage with regard to further learning (Ahmed et al., 2019; Duncan et al., 2007). Thus, a potentially beneficial effect of parental help might not have been strong enough to surpass these disadvantages.

Although parents might have taken a proximal role in supporting students' learning during the lockdown, learning contents and assignments were still provided by teachers. In contrast to our expectations, we did not find any significant effects of teacher support on students' achievement. Although parental monitoring of children's schoolwork was

reduced in families with better support by the German teacher, there were no other significant effects of teacher support on parent support. Our indices capturing cognitive activation, student support, and classroom management were informed by existing theories and empirical studies on teaching quality and it seems obvious that these dimensions should be relevant for the remote schooling context (cf. Voss & Wittwer, 2020). Nevertheless, this finding might in part be due to methodological reasons. Since we could not draw on an existing measure, we cannot rule out that our measure did not capture teaching quality adequately. Moreover, we used parent ratings to capture teacher support. This might explain the association between better support by the German teacher and lower parental monitoring: parents who perceive that their child is adequately supported by the teacher might feel that it would be safe to reduce their own monitoring efforts. However, it is a substantial difference to studies on the quality of instruction in presence schooling. Although it can be expected that parents of elementary students should be informed of most interactions between children and their teachers during the lockdown period, parents might underestimate some teacher efforts. For instance, a review by Helm et al. (2021) summarizes that parents tend to report fewer instances of teacher feedback than teachers or students. Thus, additional research efforts might be required to develop a measure of teaching quality that is valid for the specific context of remote schooling. With regard to the other possible associations between teacher support and parent involvement, the sizes of standardized coefficients imply that the lack of significant effects might partly be due to our small sample size. It seems plausible that with larger samples, further negative associations between parent-rated teacher support and parental schoolwork help and monitoring might have been revealed. This would imply that parents whose child received adequate teacher support might feel less obliged to help and monitor their child. However, coefficients estimating the contributions of teacher support to students' achievement were numerically small. One explanation might however be that during the emergency lockdown in spring 2020, teachers likely spent much time in direct interaction with their students than during regular classroom instruction (cf. Helm et al., 2021), which might diminish their influence on student performance.

Comparing findings for parent versus teacher effects, our finding of an influence of parental need-oriented support on students' development of academic skills might mirror the fact that remote schooling during the first lockdown in Germany often centered on completing assignments (Langmeyer et al., 2020). Thus, parents had to take the role of the primary person of contact that children could immediately address in case of questions and difficulties. Thus, promoting parents' ability to support their children in an adequate manner might be an important pathway to facilitating students' learning during a lockdown. This is particularly

important regarding the strains and difficulties families are facing during this time (Prime et al., 2020), which might make it more difficult for parents to be supportive.

Limitations

This study has several methodological limitations. Some of them were obvious even when we were planning the study but could not be avoided due to the specific situation. First, since participant recruitment was limited to participants of the ongoing longitudinal study who had undergone the academic skills assessment within a certain limited timeframe before the lockdown, it was not possible for us to do an a priori power analysis and recruit a sample with the resulting sample size. In consequence, our sample was quite small. The size of standardized coefficients (e.g., of parental monitoring and help regressed on teacher support) implies that there might be effects to be discovered in larger samples. Moreover, the fact that some effects—especially in the model for mathematical word problems—varied in their level of significance depending on whether analyses were performed on data files without imputation of missing values versus on imputed data shows that our small sample size limits the robustness of findings. Relatedly, we did not include many control variables in our models. Although preliminary analyses showed that children's gender and language status was not significantly related to any outcome variables, this might have been in part influenced by the sample size.

Second, given the relatively high educational level of the mothers and the relatively high rate of multilingual children, findings should be replicated in a more representative sample. In particular, although there were some significant associations between parental support and student achievement, it seems remarkable that there was not a more consistent influence of parental support given that the remote schooling situation might have augmented the importance of parents' support compared with traditional classroom teaching. Although the means and standard deviations of parental help and support in the present study were comparable to the values reported by Silinskas et al. (2013), parental schoolwork involvement and children's achievement after the lockdown might have been influenced by other variables not investigated in our study, such as children's emotional well-being and behavior problems, parental occupation, parental stress, or specific features of the organization of homeschooling. This is particularly relevant given that many of the significant effects in our models referred to associations of students' achievement before the lockdown and parental support. Factors that influence both child achievement and parental support might have confounded these associations. For instance, families might have differed in some culturally shaped beliefs with regard to school achievement or parent involvement. Also, child physiological or psychological health issues might have had

detrimental effects on achievement prior to the lockdown (e.g., by making it difficult for the child to concentrate, or resulting in longer periods of absence from school) but might also have caused a habit of stronger support by parents. On the other hand, factors that emerged only during the lockdown (e.g., parents' double burden by working their jobs and supporting their children in remote schooling) should not have affected the child's previous academic performance.

Third, students' academic skills before the lockdown had not been measured directly at the start of the lockdown, but a few months earlier. Thus, changes in students' academic skills between the two assessments have not entirely emerged during lockdown, but might partly be due to classroom teaching in winter 2019/2020. Fourth, we did not use validated instruments to assess teacher support during the lockdown. Since the remote teaching situation was a unique situation, we were not able to draw on existing measures. Our indices however build on existing frameworks of teaching quality. Relatedly, we had to use z -transformation of indices of teacher support, but also of academic achievement. Standardization of achievement within each time point prevented us from drawing conclusions on achievement gains. Especially for the mathematics assessment where we had to use different versions depending on children's age and standardized scores within each version, the data basis for standardization was quite small, limiting distributional assumptions. However, a repetition of our main analyses using unstandardized mathematics scores (proportion correct) did not reveal any substantial changes in the directions of effects. Finally, we did not control for possible effects of a nested data structure (students from different cities), resulting in a possible increased risk in Type 1 error (cf. Clarke, 2008).

Conclusions and Future Directions

In the present study, we studied associations between parental and teacher support and elementary students' academic skills during the first lockdown due to the COVID-19 pandemic in Germany. Findings highlight the importance of students' academic skills before the lockdown to elicit need-oriented support and help from their parents, as well as the potential role of parents' need-oriented support for children's further development of arithmetic skills. In our study, however, we were unable to compare the changes in students' academic skills across the lockdown period with a control group of students who received "business as usual" classroom teaching and experienced parental support merely with respect to afternoon homework. This was impossible because the school closure affected all elementary students in Germany. Future studies should undertake this comparison, possibly by recruiting a comparable sample after the pandemic. With regard to practical implications

for home schooling situations, future efforts by researchers and teachers to improve elementary students' learning conditions should focus on facilitating high-quality parental support as a potential facilitator of children's academic progress. From a practical perspective, it might be useful if teachers included guidelines for high-quality parental support in their plans for remote schooling. Future research during presence schooling should investigate whether such guidelines might also be helpful for parent involvement in regular homework.

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Open Practices

The data access and syntax files used to generate the results reported in this article can be found at <https://doi.org/10.3886/E155024V2>

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