

# Parental Mathematics Homework Involvement of Low-Income Families with Middle School Students

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## Abstract

This study explores the relationships between methods of parental assistance (i.e., provision of structure, direct assistance, and autonomy support) with mathematics homework for high-achieving and low-achieving students and children's achievement in mathematics in low-income families and examines the impact of parental efficacy on these findings. Seventy-nine students from low-income families and their parents and mathematics teachers who were recruited from an urban junior high school participated in this study. The results indicate that provision of structure is the most prevalent method of involvement in mathematics homework among low-income parents, regardless of their child's achievement level. Parental provision of structure contributes significantly to children's grades in mathematics. Parental involvement in mathematics homework in the forms of direct assistance and autonomy support does not predict children's grades. Parental self-efficacy is associated with parental involvement in mathematics homework. Implications and limitations of the present study are discussed, including the importance to helping low-income parents realize they can help their children succeed in math even if they cannot provide direct assistance with their homework.

Key Words: mathematics achievement, parental involvement, homework, low-income family, families, urban, junior high school, self-efficacy

## Introduction

Strong positive effects of parental involvement on student academic outcomes (e.g., GPA, grades, standardized tests, self-regulated learning efficacy) across elementary and secondary school levels have been documented in the literature (e.g., Barnard, 2004; Cheung & Pomerantz, 2011; Epstein, 1992; Fan & Chen, 2001; Jaynes, 2007; Pomerantz, Grolnick, & Price, 2005; Seginer, 2006; Sheldon & Epstein, 2005). Moreover, different types of parent involvement such as parent–child communication (e.g., talking about children’s school activities), home supervision (e.g., limiting TV and monitoring homework), educational aspirations for children, school contact and participation (e.g., volunteering in school and attending school meetings), perceptions of parental efficacy, and homework assistance have been significantly linked to positive educational outcomes in children (e.g., Fan & Chen, 2001; Hong & Ho, 2005; Jaynes, 2007; Walker, Wilkins, Dallaire, Sandler, & Hoover-Dempsey, 2005).

According to the parental involvement model proposed by Hoover-Dempsey and colleagues (e.g., Green, Walker, Hoover-Dempsey, & Sandler, 2007; Hoover-Dempsey & Sandler, 1995; Walker et al., 2005), in attempt to explain why parents get involved, parental motivational beliefs regarding their involvement (e.g., parental self-efficacy in helping their child succeed in school) predicts parents’ school- and home-based involvement. Cai, Moyer, and Wang’s (1999) research suggests that parental roles as motivators and monitors significantly influence students’ mathematics achievement.

A widely studied area of parental involvement relates to homework. Although the advantages and disadvantages of homework have been discussed and debated among professionals in education and psychology, there is substantial and growing evidence to support the practice of homework as an effective supplement to in-school learning (e.g., Trautwein, 2007), particularly at the middle and secondary school levels (e.g., Bembenuddy, 2011; Cooper, Robinson, & Patall, 2006; Xu, 2010). According to Dettmers et al. (2011), homework is a complex issue that involves different actors (teachers, students, and parents), serves different purposes (e.g., enhances academic skills and self-regulation), and impacts the organization and experience of student learning.

With respect to homework, parental involvement activities may take different forms, from establishing structures for homework to teaching or guiding for understanding and developing student learning and problem-solving strategies (e.g., Hoover-Dempsey et al., 2005; Walker, Shenker, & Hoover-Dempsey, 2010). Pomerantz, Moorman, and Litwack (2007) argued that how parents are involved in children’s education, rather than just the extent, contributes to the effectiveness of their involvement, suggesting the importance of

examining different types of parental involvement. Specifically, Patall, Cooper, and Robinson (2008) suggested that different types of parental involvement in homework might have different relationships to student achievement. However, most studies in the literature have simply asked about general parental homework involvement, such as generally and vaguely defined provision of help with homework (e.g., Driessen, Smit, & Slegers, 2005), checking children's homework (e.g., Gutman & Midgley, 2000), proportion of time parents remind and/or insist that their children do their homework (e.g., Bronstein, Ginsburg, & Herrera, 2005), and time devoted to help their children with homework (e.g., Jodl, Michael, Malanchuk, Eccles, & Sameroff, 2001), rather than examining the approaches/methods used to support their children's learning, suggesting the need for further clarification.

Family characteristics, such as parental education and family income, have been well documented in the literature as robust predictors of children's achievement. Low-socioeconomic status (SES) children face significant inequalities in terms of their school resources and educational opportunities and may be more vulnerable to academic difficulties (Gutman & Midgley, 2000). Patall et al. (2008) suggested that limited financial resources and a single-parent family structure may negatively impact economically disadvantaged children and adolescents as their parents may have to work longer hours or multiple jobs to earn money for their families and have less time to spend on activities related to their children's schooling, including homework, than parents in higher SES families. However, the potentially positive and protective effects of parental involvement in children's learning, especially in mathematics, among economically disadvantaged families have not gained much attention in the literature. Although parents with lower incomes and educational levels and those from immigrant and minority backgrounds may be less likely to be involved in their child's education at the school level, some studies (e.g., Shumow, Lyutykh, & Schmidt, 2011; Strickland & Shumow, 2008) have suggested that parents from traditionally marginalized groups are involved at the home level as much as those parents who are White, native born, and are relatively more educated and affluent. This sheds light on the importance of strengthening home-based parental involvement (e.g., homework) for immigrant and minority families, as well as those from socially and economically disadvantaged groups.

Many policymakers, administrators, and practitioners in the field of education have serious concerns about the poor performance of American children on standardized mathematics tests, and experts continue to search for solutions to this problem. Studies in the literature have tried to identify (a) the most effective mathematics curricula, (b) the best instructional methods and guiding strategies for learning mathematics, (c) high quality mathematics teacher

training, (d) teacher–student interactions, and (e) the quality of homework assignments associated with mathematics learning in formal school settings (Hyde, Else-Quest, Alibali, Knuth, & Romberg, 2006). Though one study (Van Voorhis, 2011) demonstrated the positive effects of a highly interactive mathematics program of family involvement on students' achievement (e.g., higher scores on a standardized mathematics test) and attitudes and feelings toward mathematics learning, mathematics learning in the home environment has not received much attention in the current literature, and parents' roles and contributions to children's learning and achievement in mathematics remain unclear for improving children's mathematics performance.

The potential benefits of mathematics learning at home through homework, commonly assigned by teachers, may provide an opportunity for students to learn during nonschool hours and highlights the potentially important role of parents in homework. The present study expands the discussion regarding mathematics achievement by investigating parental involvement in mathematics homework in the home setting among low-SES families and its relationship to children's academic performance in mathematics. Further, results from Hyde et al. (2006) revealed that children may face inequities in the parental resources available to them for mathematics learning, as they found that parents with more mathematics preparation and self-confidence performed better in conveying mathematical content and in scaffolding the material and concepts for their children; we include parental self-efficacy in our study and investigate whether it is associated with different methods of parental homework assistance as well.

Finally, considerable research suggests that student achievement may help explain parental homework involvement (e.g., Gorges & Elliott, 1995; Hoover-Dempsey et al., 2005; Leone & Richards, 1989; Levin et al., 1997; Powell-Smith, Shinn, Stoner, & Good, 2000). Shumow and Miller (2001) found a negative association between parent's academic involvement at home and young adolescents' educational achievement in school. As it might be difficult for parents to watch their children struggle, parents of middle school students may react by getting more involved at home to help their struggling children with lower grades in an attempt to improve their academic performance. As a result, we further explore the effects of student achievement level on parental involvement in homework by examining the relative associations between three types of homework assistance (e.g., provision of structure, direct assistance, autonomy support) provided by parents of high- and low-achieving students and children's academic achievement in mathematics.

## The Present Study

Research on the influence of parental homework assistance on student achievement has yielded mixed findings (Hoover-Dempsey et al., 2001). While many studies (e.g., Cooper et al., 2006; Patall et al., 2008) have pointed out the positive effects of parental involvement in homework, a meta-analytic assessment of the strategies that prompt achievement in middle school conducted by Hill and Tyson (2009) suggested that parental help with homework is not related to student achievement. However, the methods of parental involvement and assistance with homework were not examined separately, and parental help with homework was treated as a general concept in Hill and Tyson's study. While recognizing the limited findings available in the literature regarding children's mathematics learning, especially in the home environment among low-income students, this study adds to the current literature by investigating the relationships between methods of parental assistance with mathematics homework for high-achieving and low-achieving students and children's achievement in mathematics in low-SES families and by examining the impact of parental efficacy on these findings. The findings of the present study may lead to developing potential interventions for helping low-income students succeed in school through effective parental involvement in mathematics homework.

Our first hypothesis (Hypothesis 1) stated that parental self-efficacy and methods of homework assistance would vary as a function of student's achievement level (high versus low). Second, it was hypothesized, based on Hoover-Dempsey and colleagues' parental involvement model (e.g., Green et al., 2007), that parental self-efficacy level would be positively related to all three methods of homework assistance (Hypothesis 2). Third, we predicted that higher parental self-efficacy would be related to better student performance in mathematics (Hypothesis 3). Lastly, grounded on Pomerantz et al.'s (2007) suggestion that the approaches and styles of parent involvement in their children's schooling matters in determining the effects of their involvement, we hypothesized that different methods of parental homework assistance would contribute to children's grades in mathematics differently (Hypothesis 4).

## Method

### Participants and Design

Seventy-nine students attending a junior school (7<sup>th</sup> and 8<sup>th</sup> grades) in a large, urban public school system and their parents and mathematics teachers participated in this study. Of participants, 48 students were in 7<sup>th</sup> grade,

and 31 students were in 8<sup>th</sup> grade. The majority of students enrolled in the participating school were either Hispanic (56%) or Asian (38%), with a small percentage of White (4%) and Black (2%) students represented in the student body. Ninety percent of students in the school were eligible for free lunch at school, and all the students in our sample were eligible for free lunch, meeting the criterion for low socioeconomic status for the present study.

In our sample, one third of the participating students ( $n = 26$ ) were male, and two thirds of them ( $n = 53$ ) were female. Half (52%) of the participating students were Asian, more than one third (38%) were Hispanic, 5% were White, and 5% chose “other” as their ethnicity. No African American students were represented in the sample, most likely due to the extremely low representation of African American students in the participating school. None of the participants were receiving any special education services. Forty-two students were recruited from four low-achieving classes, and 37 students were recruited from four high-achieving classes. The distribution of the students and their placements is presented in Table 1.

Table 1. Distribution of Student Placements and Grades in Mathematics

Achievement	Class/Teacher	# of Students	Mean of Grade (SD)	Group Mean (SD)
Low	L1	3	2.00 (1.00)	2.33 (0.79)
	L2	16	2.75 (0.68)	
	L3	4	2.25 (0.96)	
	L4	19	2.05 (0.71)	
High	H1	5	3.80 (0.45)	3.43 (0.73)
	H2	7	3.29 (0.95)	
	H3	10	3.30 (0.95)	
	H4	15	3.30 (0.95)	

Note. Score range: Grade = 1–4

### Measures

Parents completed a 27-item parent questionnaire that asked for their children’s demographic information (e.g., birth date, gender, ethnicity, eligibility for free lunch in school, etc.), their levels and degrees of homework assistance through different methods, and parental self-efficacy. Teachers of the children involved in this sample completed a short questionnaire that asked about the students’ grade levels (e.g., 7<sup>th</sup> or 8<sup>th</sup> grade) and grades in mathematics and

whether the students have been in their classes for at least three months at the time of completing the questionnaire.

### *Methods of Homework Assistance*

A 13-item scale was developed for this study to measure the degree to which parents engage in each of the three methods of homework assistance: provision of structure, direct assistance, and autonomy support. This scale was developed based on Cooper's eight-item Homework Process Inventory (Cooper, Lindsay, Nye, & Greathouse, 1998). Revisions were made on the basis of the results of a pilot study that indicated the need for increasing clarity in measuring provision of structure, direct involvement, and autonomy support in homework assistance. Five items from Cooper's Homework Process Inventory were retained because they achieved at least 80% agreement by a panel that included 10 practicing certified school psychologists. We created new items for this scale, and they were reviewed by a second panel of 10 school psychologists. Eight new items that achieved at least 80% agreement by the panel were obtained, resulting in a new scale of 13 items for this study to measure the methods of parental homework assistance. Four items were used to measure provision of structure, five items to measure direct homework assistance, and four items to measure autonomy support. Sample items for assessing provision of structure included: "How often do you make your child set aside quiet time for doing mathematics homework?" and "Do you provide incentives for your child to finish his/her mathematics homework?" Some items used to measure direct assistance of homework included: "How often do you demonstrate how to do a sample math problem for your child?" and "How often does your child's math homework require you to be involved?" Parental autonomy support was measured by items such as "How often do you discuss problem-solving strategies to use for different methods of math problems?" and "How often do you encourage your child to monitor his/her own level of understanding when working on mathematics homework assignments?" Parents were asked to rate the frequency of their assistance with homework on a 5-point Likert scale, ranging from 1 ("never") to 5 ("all the time," "every night," or "always or almost always"). A total score was obtained by summing up the item scores for each method of homework assistance, with higher scores reflecting higher levels of involvement.

Since only a few items were used to assess each of the homework assistance methods and because some scholars argue that Cronbach's alpha might be too sensitive to number of items when assessing internal consistency, we followed Briggs and Cheek's (1986) recommendation and adopted the raw mean interitem correlation as a marker of unidimensionality indicating whether the scale items assess a single underlying factor. Clark and Watson (1995) recommended that the average interitem correlation fall in the range of .15 to .50 in

order to show moderate level of homogeneity. The mean interitem correlations for the scales of provision of structure (.17), direct homework assistance (.54), and autonomy support (.58) in this study suggested acceptable to high levels of homogeneity.

### *Parental Self-Efficacy*

The 6-item measure used to assess parental efficacy in assisting their child's mathematics homework was primarily adapted from Hoover-Dempsey and Sandler's (1995) 4-item parental self-efficacy scale. For the purpose of this study, two additional items were developed and added, resulting in a new 6-item measure of parental self-efficacy. Parents were asked to rate their beliefs in their capability to act in ways that would produce positive influences in their children's school performance in mathematics on a 5-point Likert scale, ranging from 1 ("never or almost never") to 5 ("always or almost always"). A total score was obtained by summing up the six items, with higher scores representing high levels of parental self-efficacy. Sample items include: "I know how to help my child with his/her mathematics homework" and "I believe that when I help my child with his/her mathematics homework, he/she understands mathematical concepts better." The original 4-item scale has demonstrated adequate reliability in past research (Bareno, 1997), and the 6-item scale developed for this study yielded good reliability in the current sample ( $\alpha = .91$ ).

### *Children's Achievement in Mathematics*

Children's academic achievement in mathematics was assessed by a teacher report on a scale indicating children's grades are "4 (or a numerical average of 90–100)," "3 (or 80–89)," "2 (or 70–79)," or "1 (or below 70)." This scale is similar to the parent rating scale used in a study by Fehrmann, Keith, and Reimers (1987) to indicate children's academic achievement.

### **Procedure**

The first author contacted the principals from eight junior high schools within a region of a large, urban school district that met the criterion for low socioeconomic status based on percentages of free lunch eligibility (i.e., a minimum of 70% of the student body had to be eligible for free lunch) and asked for permission and assistance to recruit research participants in their schools. Four principals responded, but only one agreed to participate in this study, resulting in one participating school. Membership in the high and low achievement level groups in the participating school was based on preexisting tracking systems within the school. Specifically, the mathematics classes were formed on the basis of previous achievement level. The advanced/honors mathematics classes (high achievement level) and the lower level/remedial mathematics

classes (low achievement level) were invited to participate in this study. For the purpose of this study, the mid-level mathematics classes were not invited to participate in this study. The first author met with the 7<sup>th</sup> and 8<sup>th</sup> grade mathematics teachers in those classes and invited them to participate in this study, and eight teachers and classes agreed to participate. Parents ( $n = 290$ ) of students in the identified classes were invited to participate in this study, and 30% ( $n = 87$ ) of them agreed to participate in this study and completed their questionnaire. However, seven parental responses were not included in the sample because they reported that their children received special education services. Furthermore, one student was excluded from the data analyses because the student's teacher did not report his math grade, resulting in a total of 79 student–parent–teacher trios as the sample for this study.

Of the eight teachers who participated in this study, seven of them were female, and one was male. No information regarding the ethnicity of the teachers was collected. All of the teachers had known the participating students for at least three months prior to completing the teacher questionnaires. The teachers were offered a \$25 gift card as compensation for their time and involvement in the study.

## Results

### Preliminary Data Analyses

We first examined assumptions of normality for general linear model analyses for all continuous variables by inspecting their skewness and kurtosis. All variables met the assumptions of normality (skewness ranging from  $-.37$  to  $1.17$ ; kurtosis ranging from  $-.87$  to  $.71$ ).

We tested whether grade level (7<sup>th</sup> versus 8<sup>th</sup>) had any effects on the main variables of this present study by conducting a MANOVA test (see Table 2) prior to one-way ANOVA tests to protect against potential false positives as a result of multiple one-way ANOVAs. Parental self-efficacy, methods of homework assistance, and student math grade did not vary as a function of student grade level in this study. As a result, we conducted the following data analyses combining the 7<sup>th</sup> and 8<sup>th</sup> grade students in our sample as a whole.

Table 2. MANOVA Table of the Effect of Student’s Grade Level on Parental Self-Efficacy, Method of Homework Assistance, and Math Grade

Variables	Type III Sum of Squares	<i>Df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
Parental Self-Efficacy	20.06	1	20.06	.451	.504
Provision of Structure	15.57	1	15.57	1.213	.274
Direct Assistance	3.47	1	3.47	.142	.708
Autonomy Support	1.44	1	1.44	.071	.791
Math Grade	.73	1	.73	.834	.364

We also decided to test whether the classification of high-achieving versus low-achieving students in our sample was accurate. We conducted a hierarchical regression to test the effects of preexisting achievement level on children’s grades based on teacher report on the 4-point scale of student achievement while controlling for the possible effects stemming from being placed in different classes and rated by different teachers (see Table 3). After controlling for teacher/class variable, classified high achieving students performed better than classified low-achieving students ( $\beta = .66, p < .001$ ). The results provided support for the meaningful classification of two (low versus high) achieving groups in the study.

Table 3. Regression of Preexisting Achievement Level on Math Grade After Controlling Class/Teacher Variable

<i>Predictors</i>	$\beta$	<i>t</i>	$\Delta R^2$	<i>p</i>
Model 1:			.01	
Class/Teacher	.11	1.01		.316
Cumulative $R^2 = .00$				
Final $F(1, 70) = .12$				
Model 2:			.35***	
Achievement level	.66***	6.55		.000
Cumulative $R^2 = .35$ ***				
Final $F(2, 69) = 18.27$				

Note.  $\beta$  = standardized beta coefficient; achieving level = 1 (low) or 2 (high).

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

*Student Achievement Level and Main Variables of the Study*

Table 4 presents the mean ratings of methods of parental homework assistance and parental self-efficacy for both high-achieving and low-achieving students. A MANOVA test (see Table 5) was conducted to examine whether student’s achievement level was associated with parental self-efficacy and three different methods of homework assistance (i.e., provision of structure, direct assistance, and autonomy support). The results indicated that neither parent’s self-efficacy nor any of the homework assistance methods varied as a result of the student’s classified preexisting achievement level. As a result, no future one-way ANOVAs were tested. Our first hypothesis (Hypothesis 1) was not supported by the results as parents in our sample appeared to provide similar homework assistance to their children regardless of their achievement levels.

Table 4. Mean Ratings of Methods of Parental Homework Assistance and Parental Self-Efficacy as a Function of Student Achievement Level (with Standard Deviations in Parentheses)

Achieving Level	Methods of Parental Homework Assistance			Parental Self-Efficacy
	Provision of Structure	Direct Assistance	Autonomy Support	
High	13.08 (3.59)	10.33 (4.91)	9.79 (4.48)	19.81 (6.98)
Low	12.88 (3.85)	9.76 (4.65)	9.15 (4.51)	19.15 (6.39)

Note. Score range: Provision of structure = 4–20; direct assistance = 5–25; autonomy support = 4–20; parental self-efficacy = 6–30

Since parental self-efficacy and homework assistance methods did not function as a result of student’s achievement level, we conducted the following data analyses using our sample as a whole without dividing them into two separate student achieving groups.

Table 5. MANOVA Table of the Effect of Student’s Achievement Level on Parental Self-Efficacy and Method of Homework Assistance

Variables	Type III Sum of Squares	Df	Mean Square	F	Sig.
Parental Self-Efficacy	.51	1	.51	.012	.914
Provision of Structure	.03	1	.03	.002	.961
Direct Assistance	10.79	1	10.79	.430	.514
Autonomy Support	13.00	1	13.00	.691	.409

### Descriptive Statistics and Relations Between Main Variables

We calculated the quartiles and medians (i.e., 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> percentiles) of the mean item scores for each method of homework assistance to describe the participants’ average responses on the items measuring provision of structure, direct assistance, and autonomy support methods. The mean item scores were obtained by dividing the total score for each method by the number of items included. The quartiles and medians indicated the scores of the lowest 25% and 50% of responses as well as the highest 25% of responses on subscales of provision of structure, direct assistance, and autonomy support (see Table 6).

Table 6. Quartiles and Medians of Parental Homework Assistance Methods

	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile
Provision of Structure	2.75	3.25	3.75
Direct Assistance	1.40	1.80	2.25
Autonomy Support	1.22	2.40	3.25

*Note.* Score range: 1 (never) to 5 (all the time or every night)

The correlations between parental self-efficacy, methods of mathematics homework assistance, and children’s grades are presented in Table 7.

Table 7. Correlations Between Parental Self-Efficacy, Methods of Homework Assistance, and Student’s Grades

	1	2	3	4	5	<i>M</i>	<i>SD</i>
Parental Self-Efficacy	-	.32**	.43***	.56***	.07	19.47	6.64
Methods of Homework Assistance:							
Provision of Structure		-	.44***	.47***	.24*	13.08	3.59
Direct Assistance			-	.71**	.07	10.33	4.92
Autonomy Support				-	.19	9.79	4.48
Child’s Grade					-	2.85	0.93

*Note.* *M* = mean; *SD* = standard deviation

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

#### *Methods of Homework Assistance*

The 25<sup>th</sup> percentile score for provision of structure (PR25 = 2.75) indicated that less than 25% of the responses were equal to or less than 2 on a 5-point Likert scale (see Table 6). In other words, the majority (more than 75%) of parents surveyed in our study indicated that they structured the home environment for their children’s homework at least once a week.

The median score for autonomy support ( $M = 2.40$ ) indicated that about half of the parents in our sample reported that they never (“1”) provided autonomy support for their children’s mathematics homework or only did so less than once a week (“2”; see Table 6). It also suggested that approximately 50% of parents reported that they provided autonomy support to assist their children with math homework once a week or more frequently.

With respect to direct assistance, its 75<sup>th</sup> percentile score (PR75 = 2.25) indicated that less than 25% of the responses were equal to or greater than 3 (about once a week) on a 5-point Likert scale (see Table 6), suggesting that only a small percentage (less than 25%) of parents in this study provided direct assistance to their children’s mathematics homework once a week.

We further conducted paired-sample *t*-tests to compare the frequency of parental homework assistance in provision of structure, direct assistance, and autonomy support methods (see Table 8). There were significant differences in the scores for provision of structure ( $M = 3.27, SD = .90$ ), direct assistance ( $M = 2.07, SD = .98$ ), and autonomy support ( $M = 2.45, SD = 1.12$ ) methods. Parent-reported frequencies for provision of structure were significantly higher than those for direct assistance;  $t(75) = 10.40, p < .001$ . Scores for provision of structure were significantly higher than those for autonomy support;  $t(74) = 7.21, p < .001$ . There was also a significant difference in the frequencies for direct assistance and autonomy support methods;  $t(76) = -3.89, p < .001$ . These results suggested that parents in our sample tended to provide structure for homework more frequently, followed by autonomy support, and then direct assistance for their children’s mathematics homework.

Table 8. Paired Samples *t*-tests for Homework Assistance Models

	<i>Mean</i>	<i>SD</i>	<i>t</i>	<i>Df</i>	<i>Sig.</i>
Pair 1: Provision of Structure— Direct Assistance	1.20	1.00	10.40	75	.000***
Pair 2: Provision of Structure— Autonomy Support	.86	1.03	7.21	74	.000***
Pair 3: Direct Assistance— Autonomy Support	-.36	0.81	-3.89	76	.000***

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Moreover, as shown in Table 7, the three methods of homework assistance were positively correlated with each other, suggesting that parents who provided structure more frequently also provided more autonomy support ( $r = .44, p < .001$ ) and direct assistance ( $r = .47, p < .001$ ).

*Parental Efficacy and Its Relationship With Mathematics Homework Assistance and Children's Grades in Mathematics*

We also calculated correlations to examine the relationships between parental feelings of efficacy and different methods of assistance they used to help with their children's mathematics homework (Hypothesis 2), as well as the relationship between parental efficacy and children's grades in mathematics (Hypothesis 3).

Parental self-efficacy was positively correlated with all three methods of homework assistance. As shown in Table 7, higher parental self-efficacy was related to more frequent provision of structure ( $r = .32, p = .007$ ), direct assistance ( $r = .43, p < .001$ ), and autonomy support ( $r = .56, p < .001$ ). The correlations in this section ranged from .32 to .56, indicating medium to large effect sizes (Cohen, 1992). Parental self-efficacy was not correlated with children's mathematics grades in this study ( $r = .07, p = .526$ ; see Table 7).

**Different Methods of Parental Homework Assistance and Children's Math Grades**

To test Hypothesis 4, we performed a regression analysis to examine the effects of different homework assistance methods on children's grades in mathematics while controlling for class/teacher variable, student's prior achievement level, and parental self-efficacy. The model including the homework assistance was significant,  $F(6, 65) = 7.39, p < .001$  (see Table 9). However, only the parental provision of structure contributed significantly to children's grades in mathematics ( $\beta = .22, p = .047$ ). Parental homework assistance in the forms of direct assistance and autonomy support did not predict children's grades.

Table 9. Regression of Variables on Mathematics Grade

Predictors	$\beta$	$t$	$\Delta R^2$	$p$
Model 1:				
Control Variables				
Model 2:			.06	
Homework Assistance				
Provision of Structure	.22*	2.03		.047
Direct Assistance	-.22	-1.62		.111
Autonomy Support	.15	1.03		.305
Cumulative $R^2 = .41$ ***				
Final $F(6, 65) = 7.39$				

Note. Control variables include class/teacher variable, preexisting achievement level, and parental self-efficacy.  $\beta$  = standardized beta coefficient.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Although parental provision of structure had a positive association with children's grades in mathematics, its impact was relatively small compared to student's prior achievement level. As shown in Table 3, the standardized coefficient for provision of structure was smaller than that for student's prior achievement level. In other words, student's previous academic success tended to matter more to children's grades in mathematics than the impact of parental provision of structure for mathematics homework.

## **Discussion**

This study supports and extends existing research on parental homework involvement by examining the variables using a low-SES population. The results of this study showed that the most prevalent method of involvement in homework among parents in this low-SES sample, regardless of their child's achievement level, was provision of structure, followed by autonomy support and direct assistance, indicating that parents in this study tended to arrange for a set of circumstances conducive to homework completion more frequently than becoming directly involved with the homework process. The findings appeared to be consistent with the results reported by Cooper, Lindsay, and Nye (2000) in which they found a significant correlation between family SES and the provision of autonomy support with homework, with parents who had more financial and educational resources providing more autonomy support to their children. The low-SES parents in our sample might place greater emphasis on structure, rather than providing autonomy support or direct assistance with their children's mathematics homework, or feel more comfortable structuring the homework environment, rather than working more directly with the academic content of the homework assignments. They might also feel less comfortable encouraging their children's independent problem solving and participation in decision-making. This may be due to low-SES parents' lack of perceived academic efficacy in mathematics content to scaffold the material and concepts for their children (Hyde et al., 2006).

### **Methods of Homework Assistance and Student Achievement in Mathematics**

Although the impact of parental involvement in mathematics homework seemed weak, the results of our study do support the hypothesis that having parents get involved in their child's mathematics homework in the home setting, especially by providing structure for doing homework, may be beneficial for students' mathematics learning among low-SES families. Hoover-Dempsey et al. (2001) argued that parents' involvement in homework might affect

student success in school through supporting student attributes related to achievement, such as attitudes about homework, perception of competency, and self-regulatory skills. Nonetheless, the results of the current study differ from those reported by Cooper et al. (1998, 2000) and Cooper, Jackson, Nye, and Lindsay (2001), as this study found that provision of structure, rather than autonomy support, was significantly associated with positive mathematics outcomes in a low-SES sample.

These results revealing the importance of parental provision of structure in homework involvement resonate with a meta-analytic study conducted by Patallo et al. (2008) that showed a strong link between parental rule-setting and student achievement. Several studies (e.g., Bronstein et al., 2005; Lamborn, Mounts, Steinberg, & Dornbusch, 1991) suggested that lack of parental guidance and supervision—such as setting few behavioral guidelines and neither teaching nor modeling purposeful, goal-oriented behavior—may be associated with poorer learning outcomes in students as they are less likely to develop appropriate internal controls, academic self-efficacy, determination, and positive orientation toward school. According to Grolnick and Ryan (1989), the powerful impact of structure on academic outcomes may be explained by parenting styles, and they argued that structure plays an important role in children's control perceptions. Specifically, children whose parents provide a highly structured environment tend to believe that they know the causes for academic outcomes in school. In this way, parental provision of structure may help children believe that they can exert a positive influence on their grades and other academic outcomes.

The different findings of this study compared to those of Cooper et al. (2000) regarding the relationships between various methods of homework involvement and achievement in mathematics may have to do with the general environment embedded in the different samples. The middle-class sample in Cooper et al.'s (2000) study showed no significant relationship between grades or standardized scores and provision of structure through rules, guidelines, and elimination of distractions, while the parental provision of structure was correlated to children's grades in mathematics in our low-SES sample. Perhaps children from middle school families are already accustomed to a structured environment, and they are not as affected by the additional rules and routines associated with homework. Conversely, there may be less structure overall in a family of lower SES due to job and time constraints as well as other financial obligations. Therefore, when parents of low-SES students introduce a consistent routine and structured rules regarding mathematics homework, there may be a significant impact on their children's achievement.

The same reason may be used to explain why, unlike many studies (e.g., Hoover-Dempsey et al., 2005; Powell-Smith et al., 2000) that suggested that student achievement may help explain parental homework involvement, the results of the current study using a sample of low-SES families revealed that methods of parental homework involvement did not vary as a function of student achievement level. Regardless of children's achievement levels, the low-SES parents in our sample were involved in their child's mathematics homework by providing structure more frequently than providing direct assistance and autonomy support, perhaps due to limited time and effort available or lack of knowledge and ability to provide more direct and advanced levels of homework assistance.

### **Parental Efficacy**

Consistent with the results of previous research studies (e.g., Deslandes & Bertrand, 2005; Shumow & Lomax, 2002), the results from this study suggested that parents who feel confident that they can help their children to succeed with math homework and feel competent doing so provide more frequent assistance with their children's homework. Specifically, in our sample, parents who felt more efficacious about helping with mathematics and believed that their involvement was beneficial to their children's learning were more likely to construct a structured environment, provide direct assistance/instruction, and to engage in activities that supported their children's autonomy to complete math homework when compared to parents who did not feel that their assistance would make a significant difference in their children's math performance.

These findings suggest the importance of increasing parental efficacy in helping their children succeed in school. Bandura (1997) indicated that there are several ways in which feelings of efficacy are cultivated. First, the experience of success contributes to feelings of efficacy. When parents see their efforts are related to positive outcomes for their children, feelings of efficacy rise. Another means of increasing parental self-efficacy is through social persuasion (Bandura, 1997). Parents persuaded to believe in themselves have been shown to make greater efforts subsequently increasing chances of success. Third, the use of social modeling also increases feelings of self-efficacy. Watching similar people engage in tasks and succeed helps increase feelings of efficacy regarding the same tasks. Additionally, Bandura suggested that reducing stress may help increase feelings of efficacy. Based on our findings that revealed the significant association between parental provision of structure for homework and children's achievement in mathematics, we believe it is important to help parents of low-SES status understand and recognize the value and benefit of their involvement in their child's mathematics learning by providing structure and

guidelines for homework completion and practice at home to improve student mathematics performance in school. It is equally important to help low-SES parents realize that they can still help their children get good grades in mathematics and succeed in school even if they do not know how to provide direct assistance with their child's mathematics homework assignments or guide them in problem solving strategies for mathematics due to lack of knowledge or confidence in mathematics or due to limited time and resources available to them.

Jeynes (2012) suggested that school guidance in parental involvement is important because many parents may not realize how powerful and effective their involvement can be in promoting positive outcomes in their children's achievement. Critical components of parent engagement, such as setting high expectations, fostering parent-child communication, and adopting parenting styles that are associated with positive student outcomes (e.g., Jeynes, 2010, 2012; Sy, Gottfried, & Gottfried, 2013), should be communicated with parents. A parent training workshop may be provided by schools to help low-SES parents learn how to create and implement structure, rule-setting, and guidelines for children's homework completion and practice, given that school-based guidance appears to increase the efficacy of those behaviors in parents (Jeynes, 2012). Parents should be advised to constantly monitor their ability to provide effective structure for their child's learning at home and student learning attitudes and academic performance in school. Teachers may provide feedback to the parents about their children's progress periodically, allowing the parents to examine the effectiveness of their homework involvement and increase their self-efficacy in helping their children succeed in school.

### **Limitations of the Current Study**

There are several limitations associated with this study. First, the demographics and characteristics of the participating school place an inevitable limitation on the implications of the study. Due to difficulty with recruiting schools to participate in this study, only one school was involved in this current study, raising some questions about selection bias in this study's design. Particularly, the majority of students enrolled in the participating school, as well as those who participated in our study, were primarily Asian American or Hispanic, with few Black and White students represented in the student body. As a result, it is unclear whether the results of this current study can be applied to Black or White low-income families. Second, free lunch in school was the only criterion to identify families' low-SES status, and family income was not directly measured in this study. Future research may use more sophisticated measures to assess a family's socioeconomic status, and parental educational level and family income and their relations to parental homework

involvement may need to be examined individually. Third, the low response rate for parents may affect the representativeness of the sample in this current study. Unfortunately, we were unable to identify the characteristics of nonparticipating parents for this study; therefore, the generalizability of the results derived from this study may be compromised. Fourth, we acknowledge that this study only measured limited aspects of homework assistance. More sophisticated and standardized measures of homework assistance may be needed in future studies to further examine the relationship between parental homework assistance and children's mathematics achievement. Fifth, it is possible that the results of the study might be affected by a biased presentation among the parents. Participating parents may have felt that it is considered desirable to be involved and may have reported that they were involved in their child's homework more frequently than they actually were. Future research may ask qualitative questions about when and why parents choose to become involved in the mathematics homework process for their child or why they refrain from doing so. Children's views on parental homework involvement may be added to provide another perspective of parental involvement. Moreover, a teacher-reported mathematics grade was the only achievement outcome measured in this study. Also, making ordinal data (1 to 4) of mathematics grades that are generally continuous data may also have reduced the statistical power, possibly explaining partially why some of our primary investigations did not yield statistically significant results in this study. More educational outcomes, such as standardized scores and attitudes toward mathematics learning, may need to be analyzed in future research. More studies are needed to further examine the differences in parental involvement between mathematics homework and homework in other subjects, such as science or English language and literature. A longitudinal study that involves providing intervention or training for parents to increase their levels of parental self-efficacy and abilities to provide appropriate homework involvement is required to determine the causal effects of different methods of improving parental homework involvement on children's performance in mathematics.

## Conclusion

While acknowledging the limitations of the study presented here, we believe the results of the current study contribute to the literature by shedding light on the potential effects of parental involvement in mathematics homework on student achievement in mathematics for low-income families. Our preliminary findings based on a sample of low-SES families in an urban school suggested that low-income parents may facilitate their children's mathematics

learning and increase their mathematics achievement in school, regardless of their preexisting achievement levels, by providing more structure for mathematics homework completion and practice at home. The implications with regard to intervention suggest that parents of low-SES students should be educated that they could make a difference in their children's achievement in mathematics by being involved in their schooling through strategies and methods that are direct and easy to implement at home (e.g., providing structure for homework learning), even if they feel they have limited knowledge in mathematics and the family has limited financial and social resources.

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