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Parental Involvement in Adolescents' Learning and Academic Achievement: Cross-lagged Effect and Mediation of Academic Engagement

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Abstract

Parental involvement in adolescents' learning has been linked to high academic achievement, yet few studies have examined its reverse relationship at the same time and the potential mechanisms that underly these associations. To address this research gap, this study investigated the reciprocal relationship between parental involvement and academic achievement as well as the mediating role of adolescents' academic engagement among Chinese adolescents. In addition, the current study explored whether these relationships varied by gender. Using a longitudinal design, a total of 2381 secondary school students (48.8% girls, *Age* = 13.38 ± 0.59) participated in the study. The results found significant positive directional effects from academic achievement to parental involvement among total sample, but not vice versa. The cross-lagged effect from academic achievement to parental involvement only existed among adolescent girls. Bootstrap analyses in the total sample revealed that parental involvement was related to academic achievement through the indirect effects of adolescents' behavioral engagement. In terms of gender differences, behavioral engagement totally mediated the path from academic achievement to parental involvement for boys, while no significant mediation effect was found for girls. These results have provided empirical evidence of the evocative role of adolescents' academic characteristics on parenting behaviors and the double-edged effect of parental involvement on adolescents' academic performance, they also suggest that further research is needed to explore effective and appropriate ways for parents to get involved in adolescents' learning in order to promote their children's academic achievement.

Keywords Parental involvement · Academic achievement · Academic engagement · Gender differences

Introduction

Adolescents' academic achievement is generally considered to play a fundamental role in their future development and that of society at large (Hughes et al. 2008). In China especially, education and academic success are national obsessions (Wang and Cai 2017) because high academic achievement is a key pathway to top-rated universities and

sought-after jobs (Zhang et al. 2020). Psychologists and educational researchers have long considered identifying the factors that influence high academic achievement; parental involvement is an important factor in adolescents' learning (Boonk et al. 2018; Wilder 2014). However, most extant research has examined the directional path from parental involvement to academic outcomes (Cheung and Pomerantz 2011; Duan et al. 2018; Wang and Sheikh-Khalil 2014), with less emphasis on its potential reverse relationship from a child-directed development perspective (Nurmi and Silinskas 2014). Moreover, extant research knew very little about the underlying mechanisms in the bidirectional relationship between parental involvement and academic achievement. It is important to examine the underlying mechanisms in the relationship between parental involvement and academic achievement, as these may have implications for programs and policies aimed at improving adolescent academic development. Therefore, the current

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study aimed to examine the reciprocal relationships between parental involvement and academic achievement as well as the mediating role of academic engagement using longitudinal data. Given the significant gender differences in parental involvement, academic achievement, and academic engagement (Voyer and Voyer Susan 2014; Wang et al. 2011; Xu et al. 2020), the study also aimed to further explore the differences between boys and girls with regard to these associations.

Parental Involvement and Academic Achievement

Parents are essential in children's daily lives, and they play a significant role in their children's education. Parental involvement is a complex concept. Although the term has an intuitive meaning, consensus has not yet been reached on how to define this construct. Some researchers use the general definition of parental involvement as referring to parents dedicating resources to a child (Grolnick & Slowiaczek, 1994) or parents' or caregivers' investment in their children's education (LaRocque et al. 2011), while others focus on specific types of parental involvement (Boonk et al. 2018; Seginer 2006), such as home-based (e.g., helping with homework) and school-based (e.g., attending parent–teacher conferences). The relationship between parental involvement and academic achievement has been a primary research interest for years. However, empirical research has often produced competing findings about the relationship between parental involvement and educational outcomes due to the lack of clarity regarding the conceptualization of the former. For example, some research has demonstrated that parental involvement is positively associated with adolescents' academic outcomes (Brajša-Žganec et al. 2019; Otani 2020), but other research found that parental involvement is unrelated or even negatively related to achievement (Bronstein et al. 2005). Fortunately, a meta-synthesis of nine meta-analyses addressed this concern and indicated that parental involvement had a positive relationship with academic achievement, regardless of how the term "parental involvement" was defined (Wilder 2014).

In addition to examining the impact of parental involvement on academic achievement, researchers should also explore whether students' academic achievement levels affect parental involvement. The evocative effect, as Scarr and McCartney (1983) termed it, refers to the extent to which children's characteristics (e.g., their academic performance) influence their parents'/caregivers' behavior (Silinskas et al. 2015). It might be assumed, for example, that children's ongoing success or failure in academic work may facilitate or discourage parental practices with respect to children's learning. Children's academic performance has already been shown to activate parental involvement (e.g.,

Keith et al. 1998; Núñez et al. 2017; Silinskas et al. 2015; Silinskas and Kikas, 2019).

The above studies suggest that the relationship between parental involvement and academic achievement might be reciprocal. A bidirectional relationship between parental involvement and academic achievement could find support in theoretical evidence. According to transactional theory (Sameroff 2009), children's development results from dynamic interactions between individuals and their contexts. That is, parenting practices and family environments could help to shape children's behaviors, and children's characteristics and behaviors also influence the family context and process. The bulk of extant research has utilized cross-sectional data to examine the unidirectional relationship between parental involvement and children's academic achievement (Brajša-Žganec et al. 2019; Otani 2020); this approach was far from adequate in terms of revealing developmental processes.

Only a few longitudinal studies have investigated the reciprocal relationship between parental involvement and academic achievement (Dumont et al. 2014; Hong et al. 2010), and those studies' findings have indicated the existence of a significant reciprocal relationship. However, the longitudinal evidence came almost entirely from research conducted against a Western cultural background, and relevant studies in China are limited. Due to their cultural orientation toward independence, European and American parents believe that it is critical to learning to cultivate a sense of autonomy in children (Markus and Kitayama 1991). However, in China, where Confucian philosophies are predominant, children's academic achievement extends beyond personal values (Zhang et al. 2020); rather, it is regarded as a collective effort that represents family honor, and it reflects parents' worth (Huntsinger and Jose 2009; Ng et al. 2014). Hence, Chinese parents tend to be more involved than their Western counterparts (Ng, Pomerantz, & Lam, 2007), and their involvement style exercises more control over their children's learning (Cheung and Pomerantz 2011). It follows that the relationship between parental involvement and Chinese children's academic outcomes might be a special one in light of Chinese cultural values. Therefore, more longitudinal studies are needed to evaluate the reciprocal relationship between parental involvement and students' academic achievement among Chinese students. Moreover, exploring this reciprocal relationship among early adolescents is of great value because adolescence is a life stage at which youth often start to experience steady declines in academic achievement (Dotterer et al. 2014). As children age, the relationship between parental involvement and achievement may be influenced by the characteristics of early adolescent development, family dynamics, and the middle school context (for more details, see Hill and Tyson 2009).

Mediation of Academic Engagement

Academic engagement is a motivational outcome that refers to students' involvement in initiating and executing learning activities; it is expressed in both behavioral and emotional components (Gonida et al. 2009). Specifically, behavioral engagement includes students' effort, attention, and persistence during the initiation and execution of learning activities, whereas emotional engagement focuses on states that are germane to students' emotional involvement during learning activities, such as enthusiasm, interest, and enjoyment (Meyer and Turner 2002; Skinner et al. 2008). As an example of a psychological characteristic that is susceptible to contextual influences and predictive of academic performance (Lam et al. 2012), academic engagement could explain the reciprocal relationship between parental involvement and academic achievement. The benefits of examining mediating processes are reflected in the fact that specific recommendations can be formulated and provided regarding precisely how parental behaviors and children's school achievement contribute to each other.

On the one hand, the effects of parental behaviors on children's academic success are usually indirect, operating through the child's individual characteristics (e.g., academic engagement), which are more proximal to the child's success in school (Brajša-Žganec et al. 2019). Proposed by Hoover-Dempsey and Sandler (1995), modeling theory states that parental involvement influences educational outcomes when parents model children's school-related behaviors and attitudes. In other words, children emulate their parents' positive behaviors in their learning process and behaviorally and emotionally engage with school work, which results in good academic performance. Furthermore, based on self-system theory (Skinner et al. 2009), parental involvement that fulfills adolescents' psychological needs of competence, autonomy, and relatedness increase school engagement, which, in turn, promotes positive adolescent outcomes (Wang and Sheikh-Khalil 2014). Some empirical evidence has also revealed that parental involvement predicted adolescent academic success via academic engagement, but the role of the specific type of academic engagement was mixed (Chen 2005; Dotterer and Wehrspann 2016; Wang and Sheikh-Khalil 2014). For example, one study investigated whether parental involvement influenced adolescent academic outcomes by increasing their academic engagement in school, and while their findings showed that behavioral engagement mediated the links between parental involvement in education and academic achievement, emotional engagement did not play a mediating role (Dotterer and Wehrspann 2016). While another study found that parental involvement predicted adolescent academic success indirectly through both behavioral and emotional engagement (Wang and Sheikh-Khalil 2014).

On the other hand, reverse effects from students' academic achievement to their parents' involvement directly or indirectly via academic engagement may also occur. As important feedback for students, academic achievement could influence their engagement in school activities. Superior academic achievement could encourage students to invest time, effort, and enthusiasm, while, by contrast, failures in school performance may trigger avoidance and negative feelings about learning activities, thus limiting students' academic engagement. Researchers have confirmed the positive predictive effect of academic achievement on adolescent emotional and behavioral engagement: higher grades predicted increased emotional and behavioral engagement, while lower grades predicted lower emotional and behavioral engagement over time (Poorthuis et al. 2015). Furthermore, the level of adolescent academic engagement may elicit certain parenting behaviors with regard to children's schoolwork. For example, one study found that the more time parents dedicated to their children's school work and the more homework they completed, the stronger students' reports of their parents' involvement in terms of both control and homework support (Núñez et al. 2017). To date, however, no research has examined whether behavioral and emotional engagement could mediate the association between academic achievement and parental involvement.

Gender Differences

When studying the relationship between parental involvement and academic achievement, as well as the processes or pathways of these effects, it is also important to consider possible gender differences. Previous research has suggested that parents' involvement may vary systematically on the basis of the child's gender (Muller 1998; Xu et al. 2020). For example, in a survey of American children, female students were found to have experienced a greater level of parental involvement than males (Carter and Wojtkiewicz 2000). With respect to academic performance, studies have consistently shown that compared to adolescent boys, adolescent girls typically obtain higher grades (e.g., Duckworth and Seligman 2006; Matthews et al. 2009; Voyer and Voyer Susan 2014). Moreover, gender differences in academic engagement have been documented in studies with middle-school students. Generally, throughout schooling, girls report higher levels of both behavioral and emotional engagement than boys (e.g., Wang et al. 2011).

Despite consistent mean-level gender differences, the existing studies on process-level gender differences have yielded mixed findings, indicating a need for further research. Regarding the effect of parental involvement on academic achievement, one study examined 8- to 12-year-olds and found that parental involvement predicted

academic achievement positively among girls, but no direct significant associations were found for boys (Jung and Zhang 2016). In contrast, another study indicated that the effect of parental involvement on grades was indistinguishable for boys and girls (Keith et al. 1998). The possible gender differences in the reverse relationship—from children to parents—have not yet been tested. In China, parents place a high premium on sons' education and academic success, and are more likely to be actively involved in boys' learning. Thus, the relationship between parental involvement and academic achievement may exhibit special gender differences among Chinese adolescents. Despite the existing gender differences in the study variables, when exploring the mediation of behavioral and emotional engagement in the association between parental involvement and academic achievement, the relevant research only included gender as a control variable, rather than considering possible gender differences (Dotterer and Wehrspann 2016; Wang and Sheikh-Khalil 2014). Thus, the present study will examine potential gender differences in reciprocal relationships and possible indirect paths among parental involvement, academic engagement, and academic achievement.

Current Study

To better understand the developmental process and underlying mechanisms in the association between parental involvement and academic achievement for adolescent boys and girls, this study examined the reciprocal relationship between parental involvement and academic achievement, the mediating role of academic engagement, and potential gender differences among Chinese middle school students, using a longitudinal design (Fig. 1). First, based on transactional theory (Sameroff 2009), it is expected that parental involvement in learning will predict higher academic achievement and that higher academic achievement will, in turn, predict more parental involvement. Second, according to relevant theory and existing evidence (Hoover-Dempsey

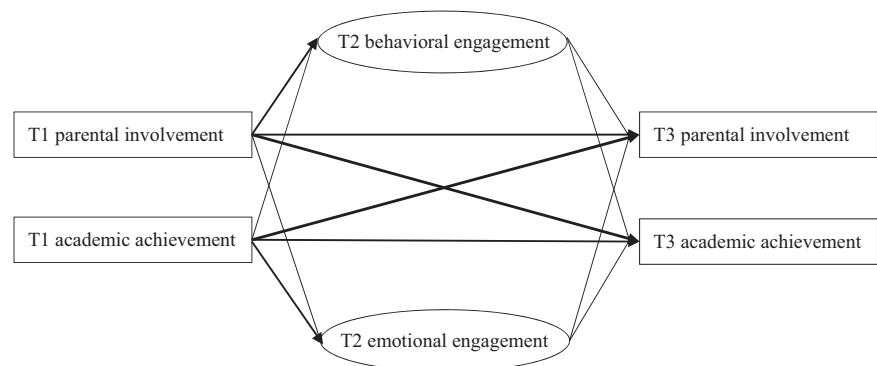
and Sandler 1995; Skinner et al. 2009; Wang and Sheikh-Khalil 2014), parental involvement is expected to have an indirect effect on academic achievement via behavioral and emotional engagement, and academic achievement will also have an indirect effect on parental involvement via behavioral and emotional engagement. Finally, given the aforementioned mixed results on gender differences, the role of gender will be tested in an exploratory analysis.

Methods

Participants and Procedures

Data were collected from seven secondary schools in Zhengzhou City, which is located in the middle of China's Henan province. The city's annual gross domestic product of 1158.97 billion China Yuan in 2019 ranked it 15th out of the 336 cities in China. Three surveys were administered as part of the longitudinal study, at an interval of 6 months, starting at the end of the second semester of Grade 7 in June 2015 and continuing until the end of the second semester in Grade 8 in June 2016. Students reported on their parents' involvement at Times 1 and 3 (T1, T3), and on their academic engagement at Time 2 (T2). At T1, data were collected from 2608 students. There was very low attrition in subsequent waves of data collection (T2 = 116, T3 = 111) because participants were either absent from school at the time of data collection or they chose not to participate. Thus, 2381 adolescents [1218 (51.2%) boys; 1163 (48.8%) girls] participated in all three waves of the study over 12 months. The participants' mean age was 13.38 years ($SD = 0.59$), with the mean age of boys and girls being 13.42 years ($SD = 0.60$) and 13.34 years ($SD = 0.58$), respectively. Adolescents' subjective socioeconomic status (SES) was slightly lower than the mid-point ($M = 2.72$, $SD = 0.73$, actual range = 1–5). The majority of participants (95.6%) belonged to the Han nationality, a dominant nationality in China. Regarding the parents, a high proportion had a low educational level, with 1860 (78.1%)

Fig. 1 Proposed analytic model including cross-lagged path (bold lines) and academic engagement as proposed mediator



mothers and 1807 (75.9%) fathers possessing a junior secondary education or lower.

Before the survey was administered, approval from the Institutional Review Board of Beijing Normal University and the participants' written informed consent at each wave were obtained. All parents and legal caregivers also provided corresponding written informed consent for their charges' participation in the study. The research assistants (i.e., trained undergraduate and postgraduate students) read the instructions aloud and made sure that each participant understood them. Throughout the procedure, the children were reminded to keep their responses confidential. Students were assessed collectively, i.e., by taking the class as a group, and they completed all the questionnaires in their classroom during school hours.

Measures

Parental involvement in adolescents' learning

Parental academic involvement was measured using a revised 10-item self-report scale (Cheung and Pomerantz 2015) that has been shown to be reliable and valid among Chinese adolescents (Zhang, Chen, Yang, Ren, Liu, 2021). The items address a variety of practices, reflecting parents' commitment of resources to their children in the academic arena. Ten items included "My parents try to get to know the teachers at my school", "My parents talk to me about things related to what I am studying in school", "My parents know how I am doing in school", "My parents help me with my homework when I ask", "My parents go to parent-teacher conferences", "My parents tell me that a certain newspaper or magazine article or TV show is related to the content of homework", "My parents spend time with me on things related to my schoolwork", "My parents make sure the surroundings are quiet while I am doing homework", "My parents check my homework when I ask", and "My parents purchase extra workbooks or outside materials related to school for me". Respondents indicated the extent to which each of the statements was true (1 = *not at all true*, 5 = *very true*). The mean of the items was taken, with higher numbers reflecting greater parental involvement ($\alpha = 0.84$ at T1; $\alpha = 0.85$ at T3).

Adolescent academic achievement

Values for adolescent academic achievement in Chinese, mathematics, and English were obtained from the participants' school records. Scores for the three subjects were based on the same objective examinations that are conducted at all schools. Chinese, mathematics, and English are three major subjects taught in Chinese schools, and the aggregated score of the grades for these subjects has been shown to be a

reliable and valid measure of academic achievement in Chinese children (e.g., Fu et al. 2016, Zhang et al. 2019). In the present study, scores for Chinese, mathematics, and English were significantly correlated ($r_s = 0.63$ – 0.83 , $p_s < 0.001$). Scores for the three subjects were standardized and summed to form a single index of academic achievement.

Adolescent academic engagement

Adolescents reported on their own academic engagement in the classroom using a measure developed to tap their behavioral and emotional participation in classroom learning activities (Skinner et al. 2008). Behavioral engagement was assessed using five items that tapped students' effort, attention, and persistence while initiating and participating in learning activities ($\alpha = 0.91$ at T2). Sample items are "I try hard to do well in school" and "I participate in class discussions". Emotional engagement was measured using five items that tapped emotions indicative of students' motivation to participate in learning activities ($\alpha = 0.88$ at T2). Sample items are "When I'm in class, I feel good" and "I enjoy learning new things in class". Responses to all items were given on a 5-point Likert-type scale ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Demographic variables

Adolescents reported their age, sex, their parents' highest education level, and their subjective SES (i.e., "What is your family's current economic situation in the local area?"), responses ranged from 1 (*relatively high*) to 5 (*relatively low*) at T1.

Data Analysis

Statistical analyses were performed using SPSS version 20.0 and Mplus version 8.3. First, a series of *t*-tests and bivariate correlations among study variables were conducted. Second, the present study built a cross-lagged model to examine the relationships between parental involvement and academic achievement. Third, the indirect effect model was tested using the maximum likelihood estimation (ML) with bootstrapping (1000 replicates and a 95% confidence interval; Preacher and Hayes 2008). Finally, a multi-group analysis was performed to determine the differences in the cross-lagged and indirect effect model between adolescent boys and girls. The Wald chi-square test was used to identify whether the specific paths (i.e., the paths that both significant among boys and girls) were different for adolescent boys and girls (Wang and Wang 2012). A nonsignificant Wald chi-square test of difference suggests that the path is invariant for two groups, whereas a significant test indicates that the path is variant.

The proportions of missing data for the main study variables ranged from 1.0 to 2.3%. This study employed full-information maximum likelihood (FIML) estimation, which has been found to be very efficient for incomplete data (Schafer and Olsen 1998). For each model, the overall chi-square test (χ^2) was reported, which is ideally nonsignificant; however, this statistic is sensitive to sample size and is not generally used as a stand-alone indicator of model fit (Brown 2015). Following Hu and Bentler’s (1998) recommendations, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) were also reported, using $CFI \geq 0.95$, $RMSEA \leq 0.06$, and $SRMR \leq 0.08$ as cutoff values to indicate a reasonable fit of the data to the specified model. In all models, students’ age, subjective SES, and parental education were included as control variables.

Parental involvement, academic achievement, and behavioral engagement showed significant gender differences. Compared with girls, boys had higher scores on parental involvement at both T1 ($t = 3.82, p < 0.001$) and T3 ($t = 3.51, p < 0.001$). Conversely, girls had higher scores on academic achievement at both waves ($t = -12.47, p < 0.001$ at T1, $t = -14.04, p < 0.001$ at T3) and behavioral engagement ($t = -3.77, p < 0.001$) than boys. Table 3 contains the correlations between the variables involved in the present study. As expected, parental involvement was associated positively with academic achievement and academic engagement for adolescent boys and girls ($rs = 0.15-0.31, ps < 0.001$). Also consistent with expectation, positive associations were found between academic achievement and academic engagement for two groups ($rs = 0.19-0.28, ps < 0.001$).

Results

Preliminary Analyses

Means and standard deviations of the primary variables are presented in Tables 1 and 2, for girls and boys separately.

Reciprocal Relationship and Gender Differences

Path analysis was used to test the reciprocal relations between parental involvement and academic achievement among the total sample (Fig. 2). The model obtained acceptable fit indices, $\chi^2(8) = 176.68, p = 0.00, RMSEA = 0.10, CFI = 0.96, SRMR = 0.08$. Accounting for stability of

Table 1 Means and standard deviations of the primary variables in the study

Variables	Boys		Girls		t test	Cohen's d
	M	SD	M	SD		
T1 parental involvement	3.36	0.75	3.24	0.76	3.82***	0.16
T3 parental involvement	3.28	0.77	3.17	0.74	3.51***	0.15
T1 academic achievement	-0.22	0.95	0.23	0.79	-12.47***	0.52
T3 academic achievement	-0.24	0.92	0.25	0.79	-14.04***	0.57
T2 behavioral engagement	3.87	0.85	4.00	0.77	-3.77***	0.16
T2 emotional engagement	3.68	0.87	3.72	0.84	-1.12	0.05

*** $p < 0.001$

Table 2 Correlations of the primary variables in the study for adolescent girls and boys

	1	2	3	4	5	6	7	8	9	10
1. T1 parental involvement	–	0.60***	0.16***	0.16***	0.31***	0.26***	-0.13***	0.04	0.14***	0.11***
2. T3 parental involvement	0.50***	–	0.15***	0.16***	0.25***	0.25***	-0.10**	0.06*	0.15***	0.10**
3. T1 academic achievement	0.20***	0.18***	–	0.91***	0.24***	0.19***	-0.14***	-0.06*	0.12***	0.18***
4. T3 academic achievement	0.18***	0.18***	0.89***	–	0.27***	0.23***	-0.16***	-0.06*	0.15***	0.16***
5. T2 behavioral engagement	0.29**	0.31***	0.24***	0.28***	–	0.76***	-0.06*	-0.01	0.04	0.05
6. T2 emotional engagement	0.27***	0.29***	0.20***	0.24***	0.80***	–	-0.02	-0.01	0.01	0.00
7. age	-0.15***	-0.11***	-0.15***	-0.17***	-0.08**	-0.10**	–	-0.01	-0.14***	-0.20***
8. subjective SES	0.03	0.04	-0.09**	-0.09**	-0.07*	-0.04	0.03	–	0.12***	0.12***
9. paternal education	0.13***	0.12***	0.13***	0.14***	0.08**	0.05	-0.10**	0.18***	–	0.48***
10. maternal education	0.13***	0.11***	0.12***	0.11***	0.04	0.04	-0.18***	0.18***	0.50***	–

Boys’ correlations appear below the diagonal and girls’ correlations above the diagonal

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Indirect effects and 95% confidence intervals for mediation model

Mediation paths	Total sample		Boys		Girls	
	Estimated	95% CI	Estimated	95% CI	Estimated	95% CI
T1PI → T2BE → T3AA	0.026	[0.007, 0.049]	0.024	[-0.012, 0.068]	0.021	[-0.003, 0.047]
T1PI → T2EE → T3AA	-0.005	[-0.022, 0.011]	-0.002	[-0.037, 0.030]	-0.001	[-0.022, 0.021]
T1AA → T2BE → T3PI	0.013	[-0.016, 0.041]	0.040	[0.002, 0.086]	-0.012	[-0.045, 0.022]
T1AA → T2EE → T3PI	0.012	[-0.006, 0.034]	-0.007	[-0.045, 0.027]	0.022	[0.000, 0.053]

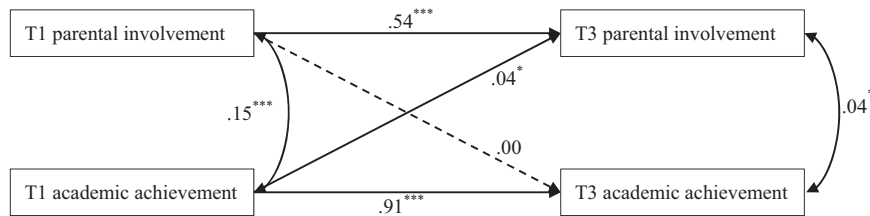
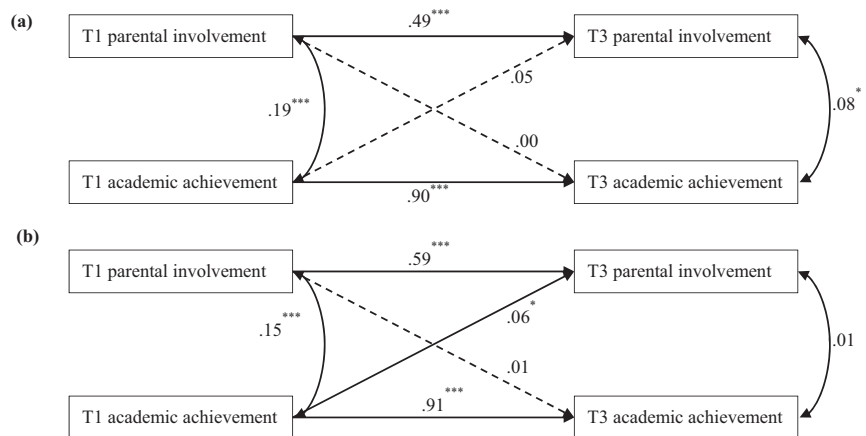


Fig. 2 Reciprocal relationship between parental involvement and academic achievement in total sample. Standardized coefficients are reported. The solid line represents significant, the dashed line

represents not significant. Paths for control variables are not depicted. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fig. 3 Reciprocal relationship between parental involvement and academic achievement for (a) boys and (b) girls. Standardized coefficients are reported. The solid line represents significant, the dashed line represents not significant. Paths for control variables are not depicted. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



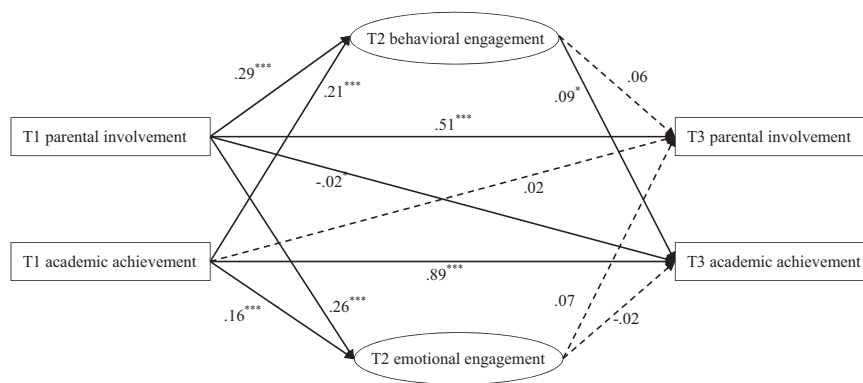
the variables across time and within time-point associations, T1 academic achievement significantly contributed to T3 parental involvement ($\beta = 0.04$, $p < 0.05$), but T1 parental involvement were not significantly related to T3 academic achievement ($\beta = 0.00$, $p > 0.05$). Multi-group analysis was performed to examine whether the cross-lagged paths differed on the basis of adolescent gender. Prior to multi-group analysis, the cross-lagged model was tested for boys and girls separately, and both had acceptable fit indices (boys: $\chi^2(8) = 88.06$, $p = 0.00$, RMSEA = 0.10, CFI = 0.96, SRMR = 0.08; girls: $\chi^2(8) = 95.47$, $p = 0.00$, RMSEA = 0.10, CFI = 0.96, SRMR = 0.09). As shown in Fig. 3, T1 parental involvement were not significantly related to T3 academic achievement for boys and girls ($\beta = 0.00$, $p > 0.05$; $\beta = 0.01$, $p > 0.05$, respectively), but T1 academic

achievement significantly contributed to T3 parental involvement only among girls ($\beta = 0.06$, $p < 0.05$) but not boys ($\beta = 0.05$, $p > 0.05$). This result indicated a significant gender difference in the cross-lagged path from academic achievement to parental involvement.

Mediating Effects of Academic Engagement and Gender Differences

The mediation analyses examined the extent to which behavioral and emotional engagement mediated the associations between parental involvement and academic achievement in the total sample (Fig. 4). The tested indirect effect model obtained acceptable fit indices, $\chi^2(110) = 874.56$, $p = 0.00$, RMSEA = 0.06, CFI = 0.97,

Fig. 4 The mediating role of academic engagement in total sample. Standardized coefficients are reported. The solid line represents significant, the dashed line represents not significant. Paths for control variables are not depicted. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



SRMR = 0.04. T1 parental involvement and academic achievement were positively associated with T2 behavioral engagement ($\beta = 0.29$, $p < 0.001$; $\beta = 0.21$, $p < 0.001$) and emotional engagement ($\beta = 0.26$, $p < 0.001$; $\beta = 0.16$, $p < 0.001$). T2 behavioral engagement was positively associated with T3 academic achievement ($\beta = 0.09$, $p < 0.05$). Table 3 presents the results of the academic engagement mediating effect test. The association between T1 parental involvement and T3 achievement was mediated by behavioral engagement (indirect effect = 0.026, 95% CI [0.007, 0.049]). Notably, T1 parental involvement was negatively linked with adolescent academic achievement ($\beta = -0.02$, $p < 0.05$) in the mediation model, thereby indicating that this mediation model was an inconsistent mediation model given the opposite signs of the mediating effect and the direct effect (MacKinnon 2008).

Then, multi-group analysis was performed to examine whether the indirect effect model differed on the basis of adolescent gender. Prior to multi-group analysis, the indirect effect model was tested among boys and girls, and both had acceptable fit indices (boys: $\chi^2(110) = 532.86$, $p = 0.00$, RMSEA = 0.06, CFI = 0.96, SRMR = 0.05; girls: $\chi^2(110) = 497.80$, $p = 0.00$, RMSEA = 0.06, CFI = 0.97, SRMR = 0.04). As shown in Fig. 5, T1 parental involvement was positively associated with T2 behavioral engagement and emotional engagement of boys and girls ($\beta = 0.30$, $p < 0.001$, $\beta = 0.26$, $p < 0.001$; $\beta = 0.30$, $p < 0.001$, $\beta = 0.25$, $p < 0.001$, respectively), and T1 academic achievement was positively associated with T2 behavioral engagement and emotional engagement of boys and girls ($\beta = 0.18$, $p < 0.001$, $\beta = 0.16$, $p < 0.001$; $\beta = 0.20$, $p < 0.001$, $\beta = 0.16$, $p < 0.001$, respectively). The Wald chi-square test showed that the above paths had no significant difference (Wald $\chi^2 = 0.48$ –1.88, $ps > 0.05$). For boys, T2 behavioral engagement was positively associated with T3 parental involvement ($\beta = 0.23$, $p < 0.01$). The association between T1 academic achievement and T3 parental involvement was fully mediated by behavioral engagement (indirect effect = 0.040, 95% CI [0.002, 0.086]). For girls, no significant mediation effect was found.

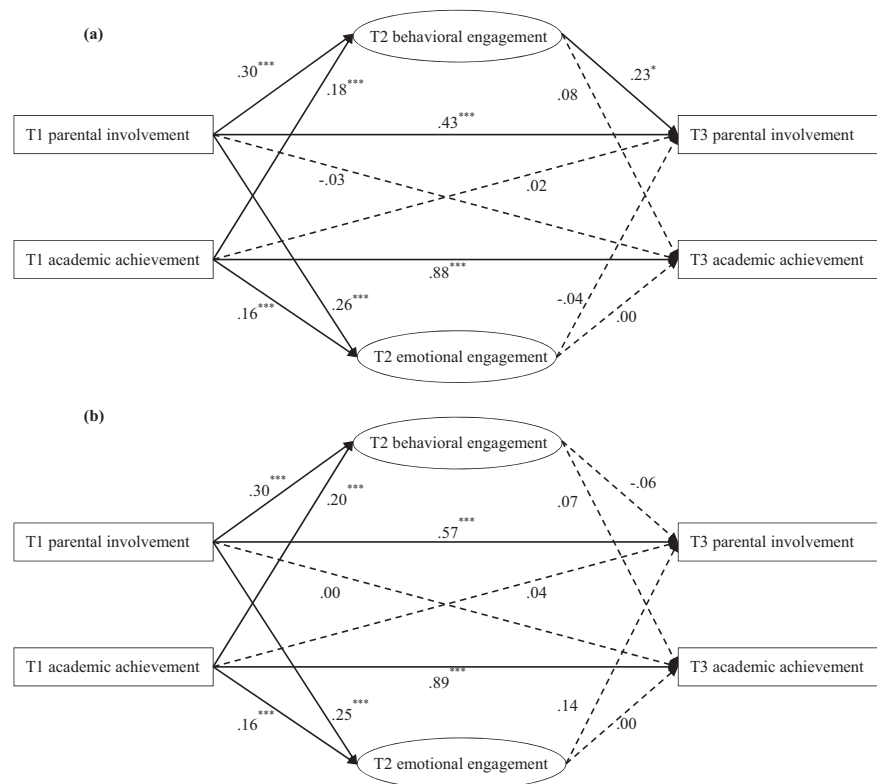
Discussion

Previous studies have paid a lot of attention to the impact of parental involvement on children's academic performance (Brajša-Žganec et al. 2019; Otani 2020). However, the reciprocal relationship between parental involvement and academic achievement as well as the underlying mechanisms in the developmental process are still poorly understood, particularly among Chinese adolescents. It is important to address this research gap, as the topic has valuable practical implications for intervention efforts. The current study used longitudinal data to investigate the directionality of the relationship between parental involvement and academic achievement and the mediating effect of academic engagement in the context of the Chinese education system. Moreover, to facilitate precise intervention, this study clarified whether gender differences were present in these relationships.

Parental Involvement and Academic Achievement

Against the backdrop of transactional theory (Sameroff 2009), which has stressed that children's development is a result of the interplay between children and their environment, the present study used a longitudinal design to investigate whether there are reciprocal relationships between parental involvement and academic achievement. Inconsistent with the hypothesis, results of the cross-lagged model indicated an asymmetrical pattern of the reciprocal influences of parental involvement and academic achievement: adolescents' academic achievement was positively related to subsequent parental involvement in learning, yet parental involvement was unrelated to subsequent academic achievement. This finding supports the notion of the evocative effect; in other words, children's characteristics (i.e., academic achievement) influence their parents' reactions, in this case, in the form of parental involvement in adolescent education. Even though the present study confirmed adolescents' role in the family process, the relationship between academic achievement and parental involvement is

Fig. 5 The mediating role of academic engagement for (a) boys and (b) girls. Standardized coefficients are reported. The solid line represents significant, the dashed line represents not significant. Paths for control variables are not depicted. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



inconsistent with previous literature (Silinskas et al. 2015; Silinskas et al. 2013). For example, Silinskas et al. (2015) showed the negative effect of academic performance on parental involvement; that is, the poorer second-graders' academic performance as reflected in their grades, the more their mothers monitored their work and tried to help. The present study found the opposite results: parents of poor performers were less likely to get involved in their children's learning, whereas parents of good performers were more willing to get involved. This difference may reflect the unique synchronous effect of adolescents on their parents in the context of Chinese culture. In terms of the gender differences, the findings indicated that the cross-lagged path from academic achievement to parental involvement was different based on adolescent gender. Specially, academic achievement was positively related to parental involvement among girls, whereas this cross-lagged effect was non-significant among boys. The gender-linked effect revealed that parents may be more sensitive to girls' academic performance, which is contrary to expectations, as Chinese parents tended to get more involved in boys' learning activities (Guo et al. 2018).

Parental involvement is generally considered an important factor to promote children's good academic performance (Otani 2020; Wilder 2014); however, no significant effect of parental involvement was found in the cross-lagged model. One possible explanation of the current finding is that adolescents' academic achievement is highly

stable, such that variance in subsequent achievement is primarily accounted for by the prior level of achievement. Meeus (2016) also proposed that when a developmental process has high stability over time (i.e., when it is close to time-invariant), the stable process will impact and drive related processes, whereas, due to its stable nature, it cannot be driven by these processes. Thus, academic achievement (i.e., the highly stable process, since the standardized auto-regression coefficient was 0.91), drove parental involvement (i.e., the less stable process, since the standardized auto-regression coefficient was 0.54). Another possible explanation is that the sample of the present study is in early adolescence. Typically, the nature of family relationships is in flux during adolescence, and parents tend to decrease the degree to which they are involved in their children's lives (Masche 2010). Furthermore, as children get older, they may develop a growing desire for autonomy (Noom et al. 2001) and gradually acquire the skills that are necessary to manage their schoolwork independently (Pomerantz et al. 2007). Therefore, at this developmental stage, parents' involvement may become less necessary and may not directly relate to children's academic performance.

The Mediating Role of Academic Engagement and Gender Differences

Although the present study did not find the parents-to-children effect in the cross-lagged analysis, parental

involvement exerted an indirect effect on academic achievement, partially through behavioral engagement. Consistent with theoretical perspectives and related empirical evidence (Dotterer and Wehrspann 2016; Hoover-Dempsey and Sandler 1995; Skinner et al. 2009), the results revealed that parental involvement was associated with high levels of behavioral engagement, thereby ultimately predicting a high level of academic achievement. However, the directional predicting effect of parental involvement on academic achievement was negative. Given the opposite signs of the mediating effect and the direct effect, this finding suggested parental involvement had a double-edged effect on Chinese adolescents' academic achievement. In other words, only those parental practice that promote adolescent engage behaviorally in their academic work at school can lead to higher achievement, while others can hinder adolescent academic development. Notably, although a meta-synthesis demonstrated that parental involvement played a positive role in academic achievement regardless of how parental involvement was defined (Wilder 2014), the current finding suggested that distinguishing different aspects of parental involvement is necessary.

Considering the relevant research examining the mediation of academic engagement only included gender as a control variable (Dotterer and Wehrspann 2016; Wang and Sheikh-Khalil 2014), the current study further analyzed the possible gender differences. For boys, the association between academic achievement and parental involvement was totally explained by behavioral engagement, which to some extent supported the results of past research (Núñez et al. 2017). That is, boys with higher grades reported more willingness to invest energy in and behave appropriately with regard to school activities, such as engaging with course materials, devoting time to school tasks, and asking questions. These behaviors, in turn, predicted more parental involvement in boys' learning. For girls, however, no mediation effect of behavioral and emotional engagement was found in the current research. One possible explanation is that girls typically exhibited higher behavioral and emotional engagement in school activities (Wang et al. 2011). The results also indicated that in the future, more studies should consider gender difference when examining possible mediators of the parental involvement–achievement link.

Limitations and Future Directions

Some limitations of the current study should be noted. First, the present research did not distinguish different aspects of parental involvement; instead, children were asked to report on their parents' involvement practices as a whole. Meta-analysis, however, suggested differential effects for the different types of parental educational involvement (Hill and Tyson 2009). Another limitation was that parental involvement was not

measured separately for mothers and fathers. Gender intensification theory posits that adolescents may be more receptive to their same-gender parent's socialization efforts (Camacho-Thompson et al. 2019). Further research that includes different kinds of parental involvement as well as maternal and paternal involvement would provide an enhanced understanding of the distinct parental involvement roles with regard to children's achievement. Moreover, except for grades, children served as the sole data sources. This study only relied on students' self-reports of parental involvement and academic engagement, rather than parents' reports of their own involvement, potentially raising concerns about the influence of reporter bias and the social desirability effect. Thus, future studies should use multiple information sources and methodologies to gain a more comprehensive perspective of parental involvement and academic engagement. Finally, even though a cross-lagged panel design is superior to a cross-sectional design in terms of understanding the directional relationships between variables, parental involvement and academic achievement were only measured twice at T1 and T3 in the current study. Thus, the relationships do not imply causality and should not be interpreted as such. Further studies should analyze longitudinal data measured at three or more time points to fully delineate the causal relationship between parental involvement and academic achievement. Furthermore, measures of behavioral and emotional engagement were not available at T1, and thus it was not possible to control for baseline engagement in mediation analysis. Future studies can better assess the causality of these pathways by measuring mediators at the first and second time points.

Conclusion

Parental involvement is a promising factor that promotes high academic achievement among adolescents. However, most extant research has only examined the unidirectional relationship from parental involvement to children's academic achievement using cross-sectional data, while neglecting the potential reverse relationship. Moreover, only a few studies have been conducted to explore the underlying mechanisms in the association between parental involvement and academic achievement. To address this research gap, the present study used longitudinal data to examine the reciprocal relationship between parental involvement and academic achievement as well as the mediating role of academic engagement. The study also used multi-group analysis to determine if the proposed relationships operated similarly across gender. The findings have shown that higher academic achievement predicted higher subsequent parental involvement, but parental involvement was not significantly related to subsequent academic achievement. The positive cross-lagged effect of

academic achievement on parental involvement only existed among adolescent girls. Mediation analysis revealed that the link from parental involvement to academic achievement was partially mediated by adolescents' behavioral engagement, and parental involvement had a double-edged effect on adolescents' academic achievement. Moreover, behavioral engagement entirely mediated the association between academic achievement and parental involvement only among boys. The findings of this study suggest that educators and parents should understand that adolescents' academic characteristics have an evocative effect on their parents' reactions and that the effects of parental involvement on children's academic performance seem to be double-edged. These results do not suggest that parental involvement in learning activities should be neglected. Rather, future research should focus on how parents can appropriately and effectively adjust their parenting behaviors with respect to children's academic performance, so as to promote high academic achievement.

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Data Sharing and Declaration The datasets generated and analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval All procedures performed in the present study were in accordance with the recommendations of the Research Ethics Committee of the Beijing Normal University and with the Declaration of Helsinki. Written informed consent was obtained from both adolescents and their caregivers included in the study.

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