Developmental Trajectories of Academic Achievement in Chinese Children: Contributions of Early Social-Behavioral Functioning

Rui Fu and Xinyin Chen
University of Pennsylvania

Li Wang
Peking University

Fan Yang
University of Pennsylvania

This study explored the developmental trajectories of academic achievement and the contributions of early social behaviors and problems to these trajectories in Chinese children. Data were collected each year in 5 consecutive years from a sample of elementary schoolchildren in China (initially $N = 1,146$, 609 boys, initial M age $= 8.33$ years). Four distinct academic achievement trajectories were identified: low-stable, high/moderate-decreasing, high-increasing, and high-stable. Children high on sociability and low on externalizing behaviors and girls were more likely to be classified in the higher academic achievement trajectories. Initial higher levels of social competence were associated with lower decreasing rates of academic achievement within the high/moderate-decreasing trajectory. Initial lower levels of shyness and fewer externalizing behaviors predicted higher growth rates within the high-increasing trajectory. In addition, within the low-stable trajectory, children initially low on shyness and high on social-behavioral problems remained poor in academic achievement over time. The results suggest the significance of social-behavioral functioning in predicting the distinctive trajectories of academic achievement in Chinese children.

Keywords: academic achievement, adjustment, developmental trajectories

The attainment of academic achievement is one of the most important tasks for school-age children in the Chinese society. It has been found that Chinese children outperform their counterparts in many other countries in academic areas throughout the elementary and high school years (e.g., Stevenson, Chen, & Lee, 1993; Zhou, Main, & Wang, 2010). Whereas academic success is a major source of pride for the family, the child's failure in academic achievement may bring disgrace and shame to parents and ancestors (Ho, 1986). The Confucian doctrine of filial piety, for example, stipulates that children have the obligation to maintain and enhance the status and reputation of the family. In childhood and adolescence, this obligation is reflected mostly in school performance (e.g., Fuligni, Tseng, & Lam, 1999). Although the Chinese society has changed substantially over the past decades, many of the traditional beliefs and values, including those concerning academic achievement, have been retained in contemporary China. Children in Chinese schools receive high pressure to perform optimally on academic work; those who perform well are often praised by teachers and parents and respected by peers, but those who fail to meet the standard are regarded as problematic (Phillipson & Phillipson, 2007) and are likely to be criticized by adults and rejected by peers (Chen, Rubin, & Li, 1997; Phillipson & Phillipson, 2007; Zhou et al., 2010).

Researchers have conducted a number of studies to examine the factors that contribute to academic success and failure in Chinese children (e.g., Chen, Huang, Chang, Wang, & Li, 2010; Liu, Bullock, & Coplan, 2014; Zhou et al., 2010). In general, the results indicate that socially competent and appropriate behaviors are associated with high academic achievement and that problem behaviors, such as disruptive and aggressive behaviors, are associated with academic difficulties. Children who display sociable and prosocial-cooperative behaviors are likely to receive assistance and support from others on schoolwork. In contrast, children who display aggressive-disruptive and other externalizing behaviors are likely to create an undesirable environment for learning (e.g., Chang, 2004; Wentzel, 2005).

Trajectories of Academic Achievement in Chinese Children

The existing studies have provided valuable information about factors that are correlated with academic achievement among Chinese children. However, the majority of these studies were cross-sectional, and the existing longitudinal studies (e.g., Liu et

al., 2014; Zhou et al., 2010) mostly included two-wave data, which did not allow for an examination of the growth patterns of individuals over time. The impact of social and behavioral factors on academic achievement are likely to be continuous and long-term. To examine the developmental pathways of academic achievement and effects of social and behavioral factors on academic growth, at least three assessment points are needed. Therefore, we conducted this five-wave longitudinal study in Chinese school-age children to explore the developmental trajectories of academic achievement and contributions of early social-behavioral functioning to the trajectories.

In the study of academic achievement, researchers have traditionally treated Chinese children as a single group. This type of design is based on the assumption that a common developmental process holds for all individuals in the population. However, there is growing evidence indicating that children exhibit multiple patterns of academic development in childhood and adolescence (e.g., Hao & Woo, 2012; Hodis, Meyer, McClure, Weir, & Walkey, 2011; Ladd & Dinella, 2009). Specifically, students typically vary on the initial level of academic achievement. Moreover, over time, academic performance may be stable among some students but increase or decrease among others. For example, Hodis and colleagues (2011) identified two achievement trajectories in a diverse sample of high school students in New Zealand: students with a high initial level and slightly declining achievement and students with a lower initial level and steeply declining achievement. In a sample of adolescent children of immigrants in the United States, Hao and Woo (2012) identified four academic trajectories: high-fast growing, high-moderate growing, low-fast growing, and low-stable.

Importantly, children in different academic achievement trajectories appear to be susceptible to the influence of different factors. For example, researchers found that increasing achievement was predicted by stronger cognitive abilities (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004) and better learning-related skills such as self-regulation (McClelland, Acock, & Morrison, 2006). In contrast, students who had decreasing academic performance tended to have poor attendance rates at school (Hao & Woo, 2012) and low perceived self-efficacy (Caprara et al., 2008). Moreover, the same factor may have different effects on children in different trajectories (e.g., Chen, Hughes, & Kwok, 2014; Hodis et al., 2011). A negative motivation orientation, for example, undermined academic performance particularly for students who initially fell behind their peers (Hodis et al., 2011). Taken together, these findings suggest that in order to fully understand the development of children's academic achievement, it is important to take developmental heterogeneity into account and examine distinct academic trajectories and their predicting factors.

Research on children's academic trajectories has been conducted mostly in Western societies. Little is known about the trajectories of academic achievement among children in other societies. It is possible that academic trajectories show a distinct pattern in Chinese children. For example, a commonly reported trajectory of academic achievement in studies conducted in the United States is a low-increasing trajectory in which children had initially low achievement but displayed a moderate or fast growth over time (e.g., Chen et al., 2014; Hao & Woo, 2012; McClelland et al., 2006). However, this may not be the case in Chinese children, due to the specific features of social and school contexts.

In Chinese schools, main subjects such as Chinese language and mathematics are taught from lower to higher grades in a progressive manner with increasing difficulty and minimum repetition. Doing well in these subjects requires persistent effort and thorough understanding of the material in lower grades. Falling behind in these subjects usually makes it very difficult to catch up later. In addition, in Chinese schools, students' academic achievement is often evaluated publicly, and those who underperform are sometimes criticized and even humiliated by teachers and peers. Conceivably, underachieving students face great pressure, which may foster their negative attitudes toward academic work. Given the emphasis on academic achievement, Chinese children with poor academic performance are often disliked by peers (e.g., Chen et al., 1997), preventing them from getting necessary support and assistance from others. These unfavorable school conditions for children with low academic achievement may make it particularly difficult for them to improve their performance over time. Thus, there may not be a low-increase academic trajectory evident among Chinese children as typically found among Western children. As such, it is important to conduct research to explore academic trajectories in Chinese children.

Social-Behavioral Functioning and Academic Trajectories in Chinese Children

Different aspects of social-behavioral functioning may have differential effects on the academic trajectories as well as within-trajectory growth among Chinese children. Researchers who are interested in children's social-behavioral functioning typically focus on socially competent (e.g., sociable-prosocial), externalizing (e.g., aggression, disruption), and internalizing (e.g., anxiety, social withdrawal) behaviors (e.g., Morison & Masten, 1991; Rubin, Chen, McDougall, Bowker, & McKinnon, 1995). Consistent with the literature (e.g., Caprara et al., 2008), it has been found that Chinese children who display sociable and prosocial behaviors tend to perform well academically (Chen, Rubin, & Li, 1995). Thus, we expected that socially competent children would be more likely than socially incompetent children to have high initial academic performance. Socially competent children may possess social skills to approach peers for academic assistance in an appropriate way, and their peers are likely to offer support to these children when they are in need (Jia et al., 2009). The positive reactions from peers help socially competent children maintain confidence to overcome obstacles, reduce academic stress, and develop positive attitudes toward schoolwork. Therefore, it is conceivable that socially competent children are also more likely than others to gain increasing academic achievement over time, and their improvement may be faster than that of socially incompetent children. Even among children who have a decreasing academic trajectory, those who are relatively more competent in social areas may show a less dramatic decline.

Recent research with Chinese children has indicated that early externalizing problem behaviors contributed significantly and negatively to subsequent academic failure and difficulties (Chen, Cen, Li, & He, 2005; Zhou et al., 2010). It is likely that externalizing behaviors create an environment that perpetuates low academic performance. Specifically, aggressive, disruptive and other externalizing behaviors are typically perceived as highly problematic in China (Chang, 2004; Chen et al., 2010). Furthermore, children

with externalizing behaviors tend to lack the ability to concentrate on work and regulatory skills to deal with frustration (e.g., Krueger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996), which may also inhibit academic progress. Therefore, externalizing behaviors may lead to low and decreasing academic performance. Among the children who have a decreasing academic trajectory, the display of externalizing behaviors may exacerbate their difficulties, leading to a steeper declining trend.

Similar to externalizing problems, internalizing problems have been found to have negative effects on academic achievement in Chinese children (e.g., Chen et al., 1995; Liu, Zhou, & Li, 2012). As the school year advances, academic tasks typically get more difficult. Children with internalizing problems are often highly sensitive and vulnerable to stress and distress, which makes them less able to cope with the increasing academic pressure. In addition, in the Chinese society, group orientation and connectedness are valued, and individuals are expected to display regulated emotions to maintain social affiliation. Children who show heightened anxiety, depression, and other internalizing symptoms may be perceived as "abnormal" and excluded from peer interactions. Therefore, it seems reasonable to expect that the academic achievement of children with higher levels of internalizing problems may be lower and may decrease at an accelerating rate over time. As a salient internalizing social behavior, social withdrawal has received particular attention in the study of academic achievement in childhood and adolescence (e.g., Chang et al., 2005; Morison & Masten, 1991). Shyness and unsociability are two main types of social withdrawal in Western and Chinese children (e.g., Chen, Wang, & Cao, 2011; Coplan & Armer, 2007); both may have significant implications for trajectories of academic achievement. Whereas shyness represents an anxious reactivity to challenging social situations, unsociability refers to the low tendency to participate in social interaction or a nonfearful preference for solitude. According to a conceptual model proposed by Asendorpf (1990), shyness is derived from a conflict between approach and avoidance motivations, indicating internal anxiety, fear, and lack of self-confidence. In contrast to shyness, unsociability is based on low levels of both approach and avoidance in social settings; unsociable children are characterized as lacking a strong desire to play with others although they may not actively avoid peer interaction (Coplan & Weeks, 2010). Traditionally, shyness was valued in the Chinese society and was linked with academic achievement (e.g., Chen et al., 1995; Chen, Rubin, & Sun, 1992). However, as the Chinese society has become a more competitive, market-oriented society since the early 1990s, shyness has been found to be associated with increased academic difficulties (Chang et al., 2005; Chen et al., 2005; Chen, Wang, & Wang, 2009). In comparison to shyness, unsociability is associated with more pervasive and negative social evaluations in the Chinese society, because it is directly incompatible with the emphasis on group orientation and interpersonal connectedness. In the present study, we were interested in how shyness and unsociability would predict decreasing academic trajectories and inhibit the growth rate of academic achievement over time.

Finally, research has consistently demonstrated negative effects of victimization on concurrent and later academic achievement (Liu et al., 2014; Schwartz, Gorman, Nakamoto, & Toblin, 2005). Compared to other peers, victimized children appear to be less capable of coping with school demands and concentrating on schoolwork, leading to poorer academic performance. Therefore, it is plausible that detrimental to children's academic performance, victimization may predict low and decreasing performance, as well as a slower growth rate or steeper decline rate within a trajectory.

Overview of the Present Study

The primary purpose of the present longitudinal study was to examine growth trajectories of academic achievement and the contributions of early social-behavioral functioning to these trajectories in Chinese children. We focused on the period from second grade to sixth grade, which represents an important period of development in Chinese children as they engage in extensive social interactions and experience increased pressure on social and school performance (e.g., Chen et al., 2010). We included peer-assessed sociability-leadership, aggression, shyness and unsociability in our study. To complement the peer ratings, we also asked the head teacher of each class to assess their students' school-related competence, including social competence, victimization experiences, as well as externalizing and internalizing problems. These measures have been found to adequately capture students' school-related behaviors and competence (e.g., Hightower et al., 1986) and have important relations with Chinese children's academic achievement (e.g., Chen et al., 1997, 2010; Liu et al., 2014).

Based on the discussion above, we first hypothesized that for students who start with high initial performance, there might be an increasing trajectory, a decreasing trajectory and a stable trajectory. For students with low initial performance, low or decreasing trajectories might be more likely to emerge than increasing trajectory. Second, we expected that children's early social-behavioral functioning, including social competence, peer victimization, social withdrawal, externalizing and internalizing problems would differentiate trajectories of academic performance. More specifically, high social competence, low social withdrawal, and few externalizing and internalizing problems would predict high-performance category and promote academic growth. In contrast, low social competence and high levels of problematic behaviors and maladjustment would predict low-performance category and predict decreasing achievement. To our knowledge, this was the first study assessing in the urban Chinese context the contributions of early social behaviors and adjustment to identifying distinctive academic trajectories as well as to predicting academic growth within trajectories. We believe that this study would help us better understand, in today's urban China, the significance of social behaviors and adjustment in predicting distinctive academic profiles.

Method

Participants

Participants were 1,146 second-grade children (609 boys) in ordinary elementary schools in Beijing (inside the 5th Ring Road), P. R. China. Unlike a few "key" schools, in which students were selected from different areas based on their school performance, students in ordinary schools came from the residential area in which the school is located. There were 30 classes, with approximately 40 students in each class. The initial mean age of children in this sample was 8 years 4 months ($SD = 8$ months). The core

curriculum, including Chinese, mathematics, and English, is stipulated by the Ministry of Education in China. The structure and organization of elementary schools are similar across schools. Students are encouraged to participate in a variety of extracurricular social and academic activities in school, which provides extensive opportunities for peer interactions. One teacher is designated to be in charge of a class. This head teacher often teaches one major course and takes care of the social and daily activities of the class. The schedule of courses and other activities is typically identical for students in the same class. Students spend roughly the same amount of time in the classroom.

Almost all of the children (98%) were from intact families, and 92% of them were only children whereas others had one or more siblings. The participants came from families with mostly low to middle socioeconomic status. Preliminary analyses indicated that family socioeconomic status and other demographic variables had nonsignificant effects on the variables or relations of interest in the study.

We collected follow-up data on academic achievement near the end of each school year (May and June) in the same schools for Grades 3 to 6. These data were collected for 92.8% of the students from the original sample and 160 additional students who did not participate in the initial study. There were no significant differences on the variables of interest between children who participated in all waves and those who did not.

Procedure

In Grade 2, we group administered to the children a peer assessment measure of social behaviors. Teachers were requested to rate each participant concerning his or her school-related social competence, externalizing and internalizing problems, and victimization. Data concerning children's academic achievement were obtained from school records for Grades 2 to 6.

The members of our research team carefully examined the items in the measures, using a variety of strategies (e.g., repeated discussion in the research group, interviews with children and teachers, psychometric analysis). The measures have proved valid and appropriate in Chinese as well as some other cultures (e.g., Chen et al., 2005). Extensive explanations of the procedure were provided during administration. No evidence was found that the children had difficulties understanding the procedure or the items in the measures. The administration of all measures was carried out by a group of psychology teachers and graduate students at Peking University. The first wave of data was collected in 2002. The participation rate was approximately 95% at each time. Written assent was obtained from all the children and written consent was obtained from all the parents.

Measures

Academic achievement. Children's academic achievement in Chinese, mathematics, and English was obtained through school records. The scores of the three subjects were based on objective examinations conducted by the school. The maximum score for each subject was 100, and a score of 60 is usually considered the cutoff between a pass and a failure in a course. Chinese, mathematics, and English were three major subjects taught in Chinese schools, and the aggregated score of the grades of these three subjects has been shown to be a valid measure of academic achievement in predicting relevant aspects of social, school, and psychological functioning (e.g., teacher-rated school competence and learning problems; self-perceptions of scholastic competence) in Chinese children (e.g., Chen et al., 1997, 2005, 2010). In the present study, scores on Chinese, mathematics, and English were significantly correlated (rs = .62–.85, ps < .001). Consistent with the approach used in previous studies (e.g., Chen et al., 2010), scores on the three subjects were averaged and standardized to form a single index of academic achievement in the present study. Internal reliabilities of the measure based on grades for the three subjects were .81 to .88 for Grades 2 to 6. One-year stabilities were .74 to .84 from Grade 2 to Grade 6.

Peer assessments of social behaviors. We administered to the students a peer assessment measure of social behaviors, adapted from the Revised Class Play (Masten, Morison, & Pellegrini, 1985). During administration, a research assistant read behavioral descriptors, and children were asked to nominate up to three classmates who could best play the role if they were to direct a class play. The total number of nominations each child received from all classmates was calculated and used to compute each item score for him or her. Children who received more nominations from the classmates for a role had higher scores on that item. Children who did not receive any nominations for an item received a score of zero. The item scores were standardized within the class ($M = 0$, $SD = 1$ for standardized scores) to adjust for differences in the number of nominators. The original Class Play measure consisted of items in broad areas of social functioning. The measure in the present study consisted of items concerning sociability-leadership (e.g., "makes new friends easily," "helps others when they need it"), aggression-disruption (e.g., "gets into a lot of fights," "picks on other kids"), shyness-sensitivity (e.g., "very shy," "feelings get hurt easily", and unsociability (e.g., "rather play alone than with others," "not interested in participating in activities with others"). Factor analysis indicated that the items represented the corresponding factors. Previous studies have shown that the measure is reliable and valid in Chinese children (see Chen et al., 2011). In the present study, internal reliabilities were .96 for sociability, .91 for aggression, .69 for shyness, and .67 for unsociability. One-year stabilities were .70 to .88 for sociability, .78 to .87 for aggression, .60 to .74 for shyness, and .62 to .82 for unsociability from Grade 2 to Grade 6.

Teacher ratings. The head teacher in each class was requested to complete the Teacher–Child Rating Scale (adapted from Hightower et al., 1986 and Schwartz, Chang, & Farver, 2001). Teachers were asked to rate, on a 5-point scale, ranging from 1 (*not true at all*) to 5 (*very true*), how well each item described the child. This measure includes several subscales tapping school-related competence and problems, including social competence (e.g., "participates in class discussion," "comfortable as a leader"), externalizing problems (e.g., "overly aggressive to peers [fights]," "disruptive in class"), internalizing problems (e.g., "nervous, frightened, tense," "anxious, worried"), and victimization (e.g., "other children pick on this child," "other children hit or push this child"). Factor analysis indicated four factors with the items loaded on the corresponding factor. The total scores on each subscale were computed and standardized within the class to adjust for teacher response styles and to allow for appropriate comparisons. The variables of externalizing and internalizing problems were

labeled as "acting out or aggression/acting-out" and "shy-anxious" in Hightower et al. (1986) and some other studies (e.g., Chen et al., 2010). The items for these variables tapped broader constructs than aggression and shyness in peer assessments. To avoid potential confusion, we used the terms of externalizing and internalizing problems in this study, which was consistent with the approach in previous studies (e.g., Chen, Yang, & Wang, 2013; Rubin et al., 1995). The Teacher–Child Rating Scale has proved to be reliable and valid in Chinese children (e.g., Chen et al., 1997). In the present study, internal reliabilities were .94 for competence, .81 for externalizing problems, .78 for internalizing problems, and .77 for victimization. One-year stabilities were .46 to .54 for competence, .44 to .55 for externalizing problems, .30 to .36 for internalizing problems, and .30 to .43 for victimization.

Results

Descriptive Data

A full-information maximum likelihood estimation was used to handle the missing data for students who had incomplete data on the variables (e.g., Graham, 2009). Little's missing-completely-at-random test indicated that all variables in this study were missing completely at random, $\chi^2(395) = 373.78$, $p > .05$. A multivariate analysis of variance (MANOVA) was conducted to examine the overall effect of gender on all the variables. Significant effects of gender were found in all variables except for teacher-rated internalizing problems, Wilks' $\lambda = .78$, $F(13, 1132) = 25.21$, $p < .01$. Follow-up univariate analyses revealed that girls had better academic performance than boys in Grades 2 to 6 (η^2 ranging from .02 to .05, $p < .01$). In addition, girls had higher scores on peer- and teacher-assessed sociability, peer-assessed shyness and unsociability than boys in Grade 2 (η^2 ranging from .03 to .07, $p < .01$). Boys had higher scores on peer-assessed aggression, teacher-assessed victimization and externalizing problems (η^2 ranging from .04 to .14, $p < .01$). Gender was included as a predictor in the subsequent growth mixture modeling (GMM).

Following our research questions, the results are presented in three parts. First, we described different developmental trajectories of academic achievement, after the optimal number of latent classes was determined. Second, we examined the effects of peer-assessed and teacher-rated social-behavioral variables in Grade 2 in predicting latent class membership. Third, we tested these variables as predictors of the initial status and growth rate of academic achievement within each trajectory.

Trajectories of Academic Achievement

Based on the linear growth model, a series of GMMs from one to six classes was tested and the fit indexes of each model were compared (see Table 1). Because GMMs with different classes were not nested, model fit comparisons were obtained from information indexes including the Bayesian information criterion (BIC), sample-size-adjusted BIC, and Akaike information criterion, which take into account the model log-likelihood while penalizing for model complexity (see Nylund, Asparouhov, & Muthén, 2007). Lower scores on these information indexes indicate a better fitting model. The Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT), Lo-Mendell-Rubin LRT, and bootstrapped LRT (BLRT) generally apply a corrected likelihood-ratio distribution to compare models with c and $c - 1$ unobserved groups (Muthén, 2004; Nylund et al., 2007). A statistically significant p value suggests the $c - 1$ class model should be rejected in favor of the current c class model (Feldman, Masyn, & Conger, 2009). Another indicator, entropy, indicates a summary of classification accuracy with which all cases are classified into extracted latent classes (Lubke & Muthén, 2007; Muthén, 2004). The value of entropy ranges from 0 to 1, with high values closer to 1 indicating higher classification accuracy. However, the optimal number of different classes should be determined by a combination of factors including acceptable fit indexes and tests, successful convergence, no less than 1% of total count in each class, and high posterior probabilities (Jung & Wickrama, 2008). Recent studies have shown that among all the fit indexes and tests, the BLRT performs the best, followed by BIC in determining the optimal number of classes in a growth mixture model (e.g., Nylund et al., 2007). As shown in Table 1, compared to the model with three and five classes, a significant value of BLRT and a smaller value of BIC suggested that the GMM with four classes should be chosen, as it best balanced goodness-of-fit, model parsimony, and interpretability.

After the optimal number of latent classes was determined, the four-class GMM model was estimated with covariates of interest (i.e., peer-reported and teacher-rated social behaviors and adjustment) to further test the predicting effects of covariates on class membership probabilities and on the initial status and growth rate within each trajectory. Because an unconditional model (i.e., without covariates) may lead to distorted results analogous to a misspecified regression model, it is crucial to include covariates to offer auxiliary information needed for a more precise classification. Therefore, a conditional GMM predicts an individual's estimated probability of class membership and this individual's growth trend, relative to the mean trajectory in each class (e.g.,

Table 1
Fit Statistics for Growth Mixture Models

Class	Log-likelihood	BIC	aBIC	AIC	VLMR-LRT	LMR-LRT	BLRT	Entropy
1	−3,921.66	7,911.89	7,880.13	7,863.31	N/A	N/A	N/A	N/A
2	−2,858.66	5,854.47	5,790.95	5,757.32	<.001	<.001	<.001	.82
3	−2,658.66	5,488.75	5,409.35	5,367.31	<.001	<.001	<.001	.84
4	−2,523.71	5,266.86	5,165.23	5,111.42	<.001	<.001	<.001	.79
5	−2,393.15	5,074.32	4,940.93	4,870.30	<.001	<.001	>.05	.73
6	−2,318.55	4,993.69	4,828.54	4,741.09	>.05	>.05	>.05	.71

Note. BIC = Bayesian information criterion; aBIC = sample-size adjusted BIC; AIC = Akaike information criterion; VLMR-LRT = Vuong-Lo-Mendell-Rubin likelihood ratio test; LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; BLRT = Bootstrap likelihood ratio test.

Feldman et al., 2009; Muthén, 2004; Reinecke & Seddig, 2011). When peer- and teacher-assessed covariates were included in the current study and allowed to have varying influence in different classes, the four-class solution remained stable (e.g., significantly lower values of BIC and log-likelihood; entropy > .7; changes in the classification proportions are less than 1%; e.g., Muthén, 2004; Reinecke & Seddig, 2011).

Four distinct trajectories of academic achievement were identified and the corresponding model-estimated mean trajectories are depicted in Figure 1. The trajectories included (a) a low-stable trajectory (224 children, 24% of the sample, initial $M = -.52$, approximately 65 on the 0–100 scale): This trajectory started low in Grade 2 and remained at the lowest level throughout the 5-year period; (b) a high/moderate-decreasing trajectory (251 children, 26% of the sample, initial $M = .32$, 79 on the 0–100 scale): Children in this trajectory showed a moderately high level of academic achievement in Grade 2 but decreased thereafter throughout the 5-year period; (c) a high-increasing trajectory (343 children, 36% of the sample, initial $M = .38$, 81 on the 0–100 scale): Their academic achievement was high in Grade 2 (i.e., higher than the decreasing class but lower than the high-stable class) and exhibited subsequent growth; and (d) a high-stable trajectory (133 children, 14% of the sample, initial $M = .46$, 82 on the 0–100 scale): This trajectory started the highest in Grade 2 and remained stable throughout the 5-year period. The latent means and standard errors of covariates are presented in Figure 2.

The Effects of Early Social-Behavioral Variables on Latent Class Membership

The effects of covariates of social behaviors and adjustment on latent class membership are estimated by a multinomial logit model and the results are shown in Table 2. First, with the current four-class solution, the low-stable class was designated as a reference group. The log odds of being in the high/moderate-decreasing, high-increasing, and high-stable classes and the extent to which each covariate distinguishes class membership were compared with this reference group. Results showed that peer-assessed sociability differentiated the low-

stable class from the other three classes. Children with a higher initial level of sociability in Grade 2 were less likely to be in the low-stable class than in the other three classes (estimates = 1.14, 1.38, and 1.48, SEs = .38, .33, and .34, odds ratios [ORs] = 3.12, 3.97, and 4.40). In contrast, children who exhibited more externalizing behavior problems were more likely to be classified in the low-stable class than any other trajectory (estimates = $-.35$, $-.33$, and $-.43$, SEs = .17, .15, and .21, ORs = .83, .72, and .65). In addition, children with higher teacher-rated social competence in Grade 2 were more likely to be in the high-increasing class than in the low-stable class (estimates = .51, SEs = .16, ORs = 1.66). Second, the high-increasing class was chosen as the reference group. Teacher-rated social competence differentiated this group from other classes. Finally, using the high/moderate-decreasing class as the reference group, gender differentiated the high-stable class from this reference class. Compared to boys, girls had a greater likelihood of being in the high-stable class than in the high/moderate-decreasing class.

The Effects of Early Social-Behavioral Variables on the Initial Status and Growth Rate Within Trajectories

As GMMs essentially assume that the population of interest consists of heterogeneous subpopulations with varying parameters, covariates can be used to predict individual differences of the initial status and growth rates within each class. In the present model, the intercept and slope of academic achievement within the trajectory were regressed on peer-assessed and teacher-rated social behaviors and adjustment. As shown in Table 3, all the covariates except for peer-assessed aggression in Grade 2 were significant predictors to within-class intercepts or slopes.

Among children classified in the high/moderate-decreasing trajectory, those with higher teacher-rated social competence had a higher initial level of academic achievement. Their academic achievement also decreased to a lesser extent than others in this class, suggesting that social competence may serve as a protective factor for preventing decrease in academic success. For children in the high-increasing trajectory of academic achievement, higher
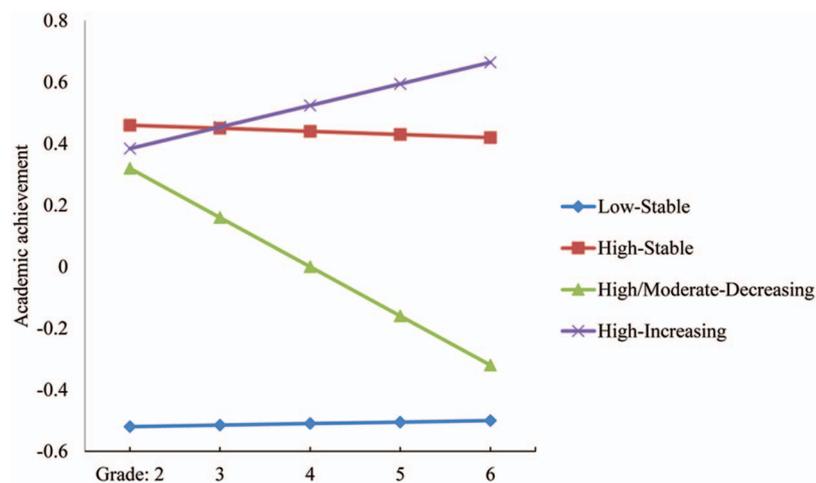

Figure 1. Developmental trajectories of academic achievement estimated from the four-class growth mixture model. See the online article for the color version of this figure.
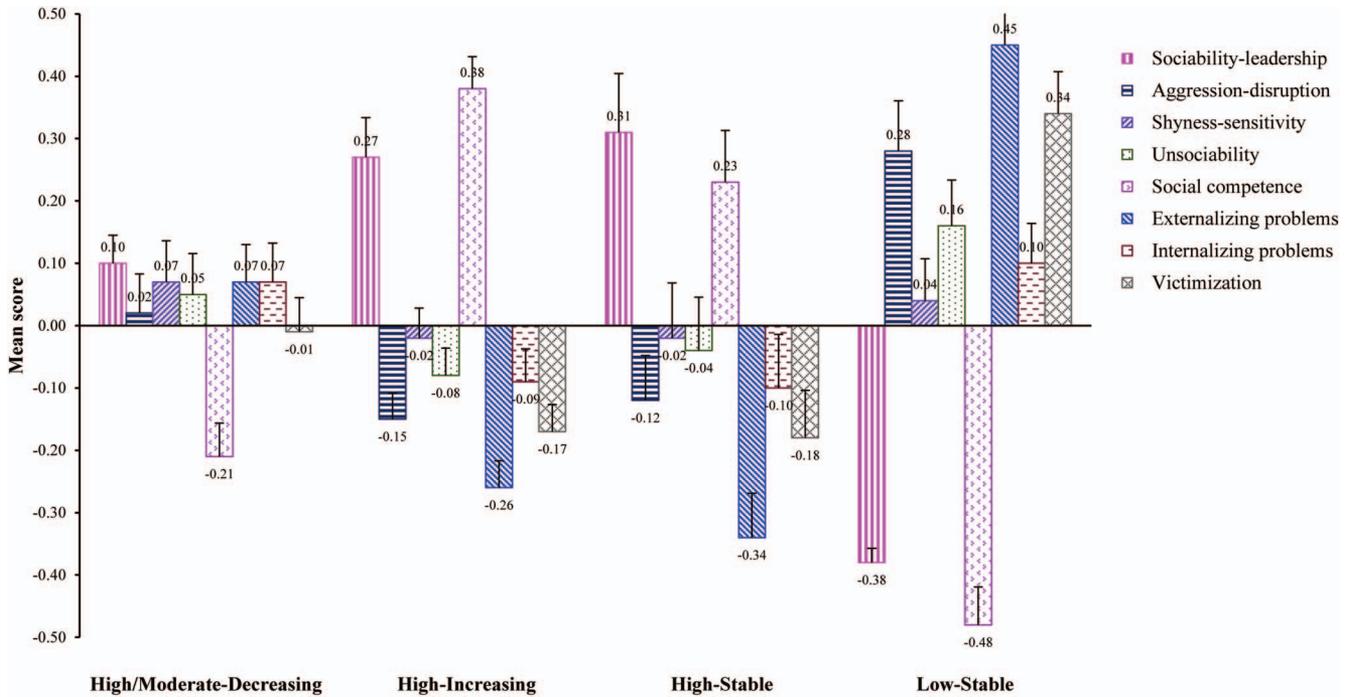
Figure 2. Means and standard errors (error bars) of covariates of four trajectories. See the online article for the color version of this figure.

peer-assessed sociability and shyness and teacher-rated social competence and lower unsociability were associated with a higher initial status of academic achievement. Throughout the 5-year period, children who displayed higher shyness and more externalizing problems tended to have a lower increase rate in academic growth. For children in the low-stable class, where individual academic achievement trajectory started and remained at the lowest level over time, higher peer-assessed shyness and teacher-rated social competence predicted relatively higher initial achievement in academic subjects. On the contrary, higher unsociability, more

internalizing problems and more victimization experiences predicted lower initial status of academic achievement within this category. For children in the high-stable class, only teacher-rated victimization was marginally significant in predicting the initial status of academic achievement.

Discussion

In this five-wave longitudinal study, we investigated academic trajectories and their social-behavioral predictors among Chinese

Table 2

The Association Between Trajectory Class Membership and Social-Behavioral Variables

Covariates	High/moderate-decreasing (vs. low-stable)			High-increasing (vs. low-stable)			High-stable (vs. low-stable)			High/moderate-decreasing (vs. high-increasing)			High-stable (vs. high-increasing)			High-stable (vs. high/mod-decreasing)		
	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE
Sex	1.14	.13	.32	1.61	.57*	.27	2.74	1.01*	.43	.71	−.63*	.30	1.71	.54	.44	2.40	.87*	.37
Peer assessments																		
Sociability	3.12	1.14**	.38	3.97	1.38**	.33	4.40	1.48**	.34	.79	−.24	.21	1.10	.10	.18	1.41	.34	.31
Aggression	.92	−.09	.14	.83	−.19	.17	.92	−.08	.25	1.10	.10	.20	1.11	.11	.24	1.00	.00	.29
Shyness	1.18	.16	.31	.98	−.01	.27	.79	−.24	.33	1.18	.16	.32	.99	−.01	.33	.67	−.39	.40
Unsociability	.81	−.21	.32	.80	−.23	.28	.97	−.03	.33	1.02	.01	.35	1.21	.19	.37	.84	−.18	.56
Teacher assessments																		
Social comp.	1.01	.01	.18	1.66	.51**	.16	1.40	.34	.26	.60	−.52**	.16	.85	−.35*	.17	1.42	.35	.25
Ext. prob.	.83	−.35*	.17	.72	−.33*	.15	.65	−.43*	.21	1.16	.15	.20	.91	−.09	.26	.79	−.24	.21
Int. prob.	1.02	.02	.13	.91	−.10	.14	.89	−.11	.19	1.12	.11	.15	.98	−.02	.17	.88	−.13	.22
Victimization	.88	−.13	.14	.98	−.02	.17	.95	−.05	.39	.86	−.16	.16	1.02	.02	.36	.85	−.17	.42

Note. OR = odds ratio; comp. = competence; Ext. = externalizing; prob. = problems; Int. = internalizing.
* *p* < .05.   ** *p* < .01.

Table 3
Parameter Estimates for the Four-Class GMM With Social-Behavioral Variables

Parameter	High/moderate-decreasing	High-increasing	High-stable	Low-stable
Predicting intercept/initial status				
Sex	−.01 (.03)	.00 (.03)	−.02 (.02)	−.04 (.15)
Peer assessments				
Sociability	−.02 (.02)	.04 (.02)*	.01 (.01)	.31 (.20)
Aggression	−.02 (.02)	.01 (.03)	.01 (.01)	.05 (.08)
Shyness	−.01 (.03)	.08 (.03)*	−.03 (.02)	.25 (.12)*
Unsociability	.01 (.04)	−.08 (.04)*	.02 (.02)	−.42 (.12)**
Teacher assessments				
Social comp.	.07 (.03)*	.05 (.02)*	.01 (.01)	.34 (.08)***
Ext. prob.	.02 (.02)	.01 (.02)	.01 (.02)	.05 (.05)
Int. prob.	−.01 (.03)	.01 (.02)	.00 (.01)	−.15 (.07)*
Victimization	.01 (.02)	−.07 (.04)	−.02 (.01)†	−.20 (.06)**
Predicting slope/growth rate				
Sex	−.01 (.03)	−.01 (.01)	.01 (.01)	.14 (.05)*
Peer assessments				
Sociability	−.01 (.02)	.01 (.01)	.01 (.01)	−.02 (.09)
Aggression	.01 (.02)	.01 (.01)	−.01 (.01)	.02 (.03)
Shyness	−.01 (.03)	−.02 (.01)*	.02 (.02)	−.01 (.05)
Unsociability	.01 (.03)	.01 (.01)	−.02 (.02)	.02 (.05)
Teacher assessments				
Social comp.	.05 (.02)*	.01 (.01)	.01 (.01)	−.05 (.03)
Ext. prob.	−.02 (.02)	−.02 (.01)*	−.01 (.01)	−.01 (.03)
Int. prob.	.02 (.02)	.01 (.01)	.01 (.01)	.03 (.02)
Victimization	−.02 (.03)	.01 (.01)	.01 (.01)	.03 (.03)

Note. GMM = growth mixture modeling; comp. = competence; Ext. = externalizing; prob. = problems; Int. = internalizing. *SE*s are in parentheses after estimates.
† $p < .1$.   * $p < .05$.   ** $p < .01$.   *** $p < .001$.

children. Four academic trajectories emerged: low-stable, high/moderate-decreasing, high-increasing, and high-stable, differentiated mainly by early social competence and externalizing behaviors. In addition, social competence, externalizing behaviors, internalizing behaviors, social withdrawal, and victimization experiences differentially predicted the initial status and growth within trajectories. These findings revealed the heterogeneous patterns of development of academic achievement and the role of early social-behavioral functioning in predicting different academic trajectories in Chinese children.

Distinct Academic Trajectories Among Chinese Children

Four trajectories were identified in the study: high-stable, high-increasing, high/moderate-decreasing, and low-stable. We did not find a low-increasing class, which was different from the results typically found in Western samples (e.g., Hao & Woo, 2012; Ladd & Dinella, 2009). As indicated earlier, in the Chinese school systems, children with low academic performance may face seriously unfavorable conditions, such as increasing difficulty in core curriculum, heightened academic pressure, and lack of social support and assistance. These factors make it very difficult for low-achieving children to substantially improve their academic performance over time. It should be noted that the lack of a low-increasing class may not be the only difference between Chinese and Western children in their academic development. It will be important to conduct further research in Chinese and Western children in order to achieve a more complete understanding of academic trajectories of children in different societies.

Our results showed that gender differentiated the trajectories of academic achievement. Compared to boys, girls were more likely to display high-achieving developmental patterns (i.e., high-increasing and high-stable trajectories). These results were consistent with existing findings that girls tend to perform better than boys academically (e.g., Chen et al., 2013; Lam et al., 2012). Among the social-behavioral predictors, peer-assessed sociability, teacher-rated social competence, and externalizing problems predicted distinct academic trajectories. Children who exhibited high sociability and social competence in the early years were more likely to be in the high-increasing and high-stable trajectories than in the high/moderate-decreasing and low-stable trajectories. Socially competent children are more likely than others to gain emotional and social resources that are conducive to learning and academic achievement. Thus, socially competent behaviors help these children maintain or promote their high academic achievement over time.

In contrast, externalizing problem behaviors particularly characterized a stabilized pattern of the low-achieving group. Research has indicated that aggressive, disruptive, and other externalizing behaviors are related with significant academic deficiencies in Chinese children (Chen et al., 2010; Zhou et al., 2010). Aggressive and externalizing behaviors are perceived as highly problematic and children who display these behaviors are often rejected by peers, which may prevent them from getting academic support. Thus, it is not surprising that children with early externalizing problems were likely to be in the low-stable trajectory. Taken together, our results suggested that early social competence and behavioral problems play signifi-

cant roles in distinguishing and defining academic trajectories among Chinese children.

We focused on the academic achievement trajectories during the elementary school years and these trajectories may impact academic performance in the later years. Children identified in the four trajectories are likely to continue to develop in the same growth patterns. For example, it is argued that desirable conditions may serve to potentiate personal capacities and enhance adaptive development, whereas adverse conditions may suppress or inhibit adaptive development (Kupersmidt, Griesler, DeRosier, Patterson, & Davis, 1995). Thus, high and increasing patterns of academic achievement in elementary schools are beneficial to the acquisition of support from others, which may promote high-achievers' confidence and participation in academic learning in the later years. In contrast, low and decreasing patterns of academic achievement in elementary schools are likely to undermine individual learning and involvement in academic activities, leading to continuous academic difficulties in high schools. Moreover, given the current findings on the contributions of early social-behavioral functioning to academic trajectories in middle to late childhood, it will be interesting to examine how early social behaviors and problems predict academic development in adolescence.

Social-Behavioral Predictors of the Initial Status and Growth Rate Within Trajectories

Our results also revealed that social-behavioral variables have differential effects on the initial status and growth rate of academic achievement within different trajectories. Specifically, early teacher-rated social competence was positively associated with relatively higher initial levels of academic achievement for children in the high/moderate-decreasing, high-increasing, and low-stable trajectories. Teacher-rated social competence also predicted a lower rate of academic decline for children in the high/moderate-decreasing trajectory, suggesting that early social competence serves as a protective factor in the decline of academic achievement. This protective function of social competence is likely to involve both interpersonal and intrapersonal processes. Socially competent children are skilled at forming and maintaining positive classroom interactions that lead to instrumental support, which in turn helps them handle their learning problems (e.g., Chen et al., 2013). Moreover, the favorable social evaluations that socially competent children receive may help them maintain a positive school attitude and enhance their confidence in coping with academic frustration and failures (Jia et al., 2009).

Our results indicated that in contrast to social competence, social-behavioral problems predicted lower initial levels or lower growth rates of academic achievement. For example, externalizing behaviors predicted less academic growth for children in the high-increasing trajectory. That is, although children in this group initially performed well on academic tasks, those who displayed externalizing behaviors had relatively less growth in the later years. It should be noted that, on average, children in this group displayed fewer externalizing problems, especially compared to children in the high/moderate-decreasing and low-stable trajectories. The externalizing behaviors displayed by children in this group might be relatively less severe and extensive, which might not result in major learning problems but still inhibit academic growth. To become academically stronger, children need to con-

tinue to discuss, cooperate, and learn from other competent peers. Even moderate levels of aggressive and disruptive behavior might adversely affect these activities, which might be particularly the case in China where group harmony is highly valued (Chen & French, 2008). In addition, to make continuous academic progress, children need to deal with academic difficulties effectively. Externalizing behaviors may prevent them from concentrating on the schoolwork and regulating their emotional distress to overcome academic obstacles (Zhou et al., 2010). Therefore, although children in the high-increasing group generally perform well, externalizing behaviors serve to attenuate their academic growth.

Unsociability predicted lower initial achievement among children in both high-increasing and low-stable trajectories. The results were consistent with the literature indicating the negative effect of unsociability on academic achievement among Chinese children (e.g., Chen et al., 2011; Liu, Coplan et al., 2014). Interestingly, shyness was associated with better initial academic achievement for children in these two trajectories, which seems to support the view that unsociability and shyness are distinct types of social-withdrawal that have different functional meanings (Chen et al., 2011). The early positive association between shyness and academic achievement does not imply that shyness necessarily facilitates academic growth. In fact, a higher level of shyness predicted lower achievement growth rate, particularly among children in the high-increasing trajectory. These results need to be understood in the Chinese context. In Chinese schools, children who are high achievers initially benefit from opportunities and resources to make academic progress in the later years. For example, these children are likely to be elected by peers and teachers as class or school leaders, encouraged to participate in academic competitions, and invited to share their ideas in class, which are important for them to further enhance their achievement. However, these opportunities often involve group-level interactions and possibly evoke feelings of anxiety for shy children. Shy children tend to display constrained and vigilant behaviors in social-evaluative settings, which may lower the benefits of opportunities to enhance academic achievement (Asendorpf, 2010). As shyness is no longer viewed positively in today's urban China (e.g., Chen et al., 2009), shy children appear to have increasing difficulties getting peer support and social resources. Therefore, although children in the high-increasing category have a generally growing trend in academic achievement, those who are relatively shy do not enjoy as much growth as their nonshy peers.

Finally, we found that internalizing problems and victimization experiences were significant predictors of low initial academic achievement for children who were in the low-stable class. The psychological distress that children with internalizing problems experience may make them unable to effectively cope with their academic difficulties. Moreover, the symptoms they display may be viewed as deviant, which may impede their social affiliation and connectedness. As a result, these children are less likely than others to have supportive peer networks to help them with school tasks when needed. The experience of victimization may also function as an external stressor that reduces children's abilities to cope with school demands and leads to negative attitudes toward school (e.g., Schwartz et al., 2005). Taken together, children who have internalizing problems and who are victimized appear to be in a particularly adverse condition that makes their academic performance worse, even compared to other underachieving students without such problems.

Our results showed that early social behaviors and problems predicted the initial status of academic performance in the low-stable class more evidently and consistently than in other classes. The results indicated the exacerbating effects of initially poor social-behavioral functioning on the academic performance of children in the low-stable class. Poor social-behavioral functioning may create an unfavorable social context, such as peer rejection and lack of support and assistance on academic work, which is likely to have a salient adverse impact on the academic performance of underachieving children. The high vulnerability of children in the low-stable class to the effects of social-behavioral problems may also be related to their emotional reactions such as frustration resulting from frequent experiences of academic difficulties (e.g., Chen et al., 1997, 2013).

Limitations and Conclusions

Several weaknesses and limitations in this study should be noted. First, this study focused on the contributions of social behaviors and problems to academic trajectories in Chinese children. Considering the emphasis on academic achievement in China, it will be important to examine whether academic achievement is associated with heterogeneity and individual differences in the development of social behaviors (e.g., Booth-LaForce & Oxford, 2008; Oh et al., 2008). For example, it has been found that academic achievement protects shy Chinese children from developing psychological difficulties (Chen et al., 2013). It will be interesting to investigate whether and how academic achievement contributes to different developmental patterns of shyness and other social behaviors in Chinese children.

Second, we examined the relations between indexes of early social-behavioral functioning and academic trajectories mainly to understand the role of children's social behaviors and problems in identifying distinctive academic trajectories and in predicting academic growth patterns within the trajectories. However, these data were correlational in nature so one should be careful in interpreting the results in terms of causality. It is possible, for example, that social-behavioral problems in Grade 2 resulted from poor academic performance in kindergarten and Grade 1. Researchers should investigate causal directions between social-behavioral functioning and academic achievement using different approaches (e.g., experimental designs, longitudinal cross-lagged panel analyses).

Third, the present study focused on social behaviors as predictors of distinctive academic trajectories. The contributions of social behaviors to academic performance likely occur in broader social contexts such as families, peers, and schools. It will be important in future research to explore how social contexts play a role in shaping the relations between social-behavioral functioning and academic trajectories in Chinese children.

Despite the limitations, the present study made several major contributions to our understanding of children's academic achievement. First, the study revealed the developmental heterogeneity of academic achievement in the Chinese cultural context. Previous research on academic achievement among Chinese children has treated them as a uniform group. Our findings indicate that multiple developmental patterns exist and that the distinct trajectories emerged may be related to the influence of Chinese sociocultural circumstances. Second, our results indicated the significant role of early social-behavioral functioning in differentiating the academic trajectories among Chinese

children. The results have implications for identifying children at risk for low academic performance and for designing programs to help these children through promoting their social-behavioral functioning. For example, researchers, professionals, and educators may consider an integrative approach to incorporate the enhancement of social-behavioral competencies into prevention and intervention programs for children who have academic difficulties. Third, the multiwave data in this study allowed us to examine the effects of social-behavioral factors on the initial status and growth rate within each academic trajectory, which were rarely conducted in previous studies. The results suggest that the link between social-behavioral functioning and academic performance needs to be understood for children in specific academic trajectories.

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