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Relations between Self-regulation and Behavioral Adjustment in Chinese American Immigrant Children during Early Elementary School Years

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Abstract

The present study examined associations between sociocultural factors and self-regulation (parent-report, teacher-report, laboratory tasks), and prospective relations between self-regulation and behavioral adjustment (parent-, teacher-, child-report) in a socioeconomically diverse sample of Chinese American children in immigrant families (N = 258, Wave 1 age = 6–9 years, Wave 2 age = 9–11 years, 52% boys, 57% low-income) in a longitudinal study (2007–2011) during early elementary school years. Family income uniquely related to self-regulation latent factor (β = 0.22), and parent-child Chinese orientation gaps were associated with parent-reported effortful control (β = 0.40). Self-regulation at W1 negatively predicted parent- and teacher-reported behavioral adjustment (βs = −0.22 and −0.48) at W2, controlling for cross-time stability of both constructs and covariates (child sex, parental education).

The early elementary school years (kindergarten to third grade) lay the foundation for later academic development and behavioral adjustment. Compared to children from non-immigrant families, children from immigrant families face additional sociocultural barriers during preschool and early school years, which can put them at higher risk for low academic achievement and behavioral maladjustment in subsequent schooling (Crosnoe & Ansari, 2016). Past research found longitudinal and bidirectional associations between self-regulation and academic skills across the early elementary school grades (e.g., Hernández et al., 2018; McClelland & Cameron, 2012). Some of these links have been replicated in children of Chinese American families (e.g., S. H. Chen et al., 2015; Mauer et al., 2021), the largest subgroup of Asians and a fast growing population in the U.S. (United States Census Bureau, 2021).

However, the links between self-regulation and behavioral adjustment in immigrant children in early school years remain understudied. Importantly, the development of self-regulation occurs within social contexts (McClelland & Cameron, 2012). For children in immigrant

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families, home and school represent distinct social contexts with contrasting norms, values, and expectations for behaviors. Thus, by examining the longitudinal associations of self-regulation to behavioral adjustment assessed by different reporters (e.g., parents and teachers) and methods (e.g., task-based and questionnaire measures), we can better understand how self-regulation supports immigrant children's behavioral adjustment in different contexts (e.g., home and school; De Los Reyes, 2011). Moreover, given cultural variations in socialization goals and practices for promoting self-regulation development (X. Chen & French, 2008; Trommsdorff, 2012), it is important to study the links of family sociocultural factors (e.g., cultural orientations, socioeconomic status, and generation) to immigrant children's self-regulation during early school years. This knowledge can inform the adaptation and dissemination of interventions to promote early academic development and behavioral adjustment for children of immigrants.

Concepts of Self-Regulation and its Development in Sociocultural Contexts

Although preschool age marks the first significant growth period for self-regulatory skills (Garon et al., 2008), self-regulation continues to develop throughout childhood and adolescence (Larsen & Luna, 2018). There are various conceptualizations of self-regulation, including effortful control, executive function, and behavioral regulation. Emerged from the temperament literature, effortful control refers to constitutionally based emotion regulation abilities underpinned by executive attention, such as planning, detecting errors, and inhibiting a dominant response in favor of a subdominant response (Eisenberg et al., 2005). Extensively studied in cognitive and clinical science literatures, executive function refers to the use of higher-order cognitive processes to engage, direct, or coordinate lower-order attention, cognition, and behavioral tendencies in goal-directed activities (Doebel, 2020). In contrast to the view of executive function as a unitary construct consisting of multiple interrelated components (e.g., working memory, inhibitory control, cognitive flexibility, Garon et al., 2008), Doebel (2020) viewed the development of executive function as the emergence of skills in using control to achieve specific goals.

Previous reviews suggested that effortful control and executive function share conceptual and measurement overlap (Eisenberg & Zhou, 2016). Indeed, empirical studies reported small to moderate correlations between measures of effortful control and executive function and support a single-factor model of self-regulation in preschool to early school age children (Kälin & Roebers, 2021; Lin et al., 2019). McClelland and colleagues used the term behavioral regulation to represent the deliberate process of applying attentional flexibility, working memory, and inhibitory control to overt actions (McClelland & Cameron, 2012). In this paper, we use the term *self-regulation* to encompass higher-order processes that enable an individual to govern emotions, cognitions, and behaviors in service of achieving a goal (Rothbart, 1989). A multi-method assessment approach has been recommended for studying self-regulation because different measures vary by the contexts (e.g., laboratory vs. real-world) and goals of executing control, as well as the types of regulatory processes involved (Doebel, 2020). Moreover, there are pros and cons of various assessment methods. While task-based measures are designed to tap specific neurocognitive mechanisms (e.g., inhibitory control, working memory), they are less sensitive at capturing individual differences in self-regulation that confer risks or protections for mental health (Pezzoli et al., 2023). In

contrast, while questionnaire measures are designed to capture stable, trait-level individual differences in self-regulation and typically outperform task-based measures in predicting mental health outcomes, they "are not designed – and hence are not able to – discern potentially different underlying cognitive mechanisms that may lead to similar behavioral profiles that may require different interventions" (Pezzoli et al., 2023, p. 6). Therefore, by incorporating multiple measures, researchers can address different research questions to maximize the contribution to both scientific theory and intervention development.

According to the sociocultural perspective, children's self-regulatory skills are shaped by socialization contexts (e.g., family, school, peer group) through social evaluations, responses, and scaffolding of behaviors (X. Chen & French, 2008). A child's cultural milieu can inform aspects of "agentic" (intentional) self-regulation, including the goals (self- vs. other-oriented) and functions (e.g., self-expression vs. preservation of group harmony) of specific regulatory behaviors, as well as how these behaviors are perceived and received by others (Trommsdorff, 2012). Western cultures tend to emphasize agency values of individualism, uniqueness, and self-expression. In contrast, Chinese cultures emphasize values of interpersonal harmony, filial piety, and face (dignity and reputation; Liew & Zhou, 2022). Thus, there are culturally salient expectations and rules for regulated behaviors in Chinese families (e.g., children are expected to show respect for elders and caring of younger siblings, be polite and show good manners, and resist open expressions of disruptive emotions). Children displaying well-regulated behaviors receive more positive social evaluations from family members, which in turn further reinforce such behaviors. Consistent with this view, cross-cultural studies showed that Chinese children developed regulatory skills such as compliance, executive function, and inhibition earlier than children in countries with more individualistic norms (X. Chen et al., 2003).

Importantly, Chinese American immigrants may simultaneously engage in host (American) and heritage (Chinese) cultures. Cultural orientation is defined as a bilinear construct reflecting the extent to which immigrants interact and engage with media, language, and social relationships in their heritage and host cultures (Tsai & Chentsova-Dutton, 2002). Very few studies have examined the relations between family cultural orientations and children's self-regulatory development in immigrant families. A previous study using cross-sectional data from the same sample as the present one found a direct positive link between parents' American orientation and parent-reported child effortful control during 1st to 2nd grades (S. H. Chen et al., 2015). It is important to replicate the finding using longitudinal data and other self-regulation measures (e.g., task-based measures). Researchers have also found immigrants' host and heritage cultural orientations are weakly associated with each other, and they relate differently to parenting practices (Chan et al., 2022), highlighting the need to simultaneously consider the roles of host and heritage cultural orientations.

Moreover, previous research suggested that parent-child gaps in cultural orientations can increase immigrant youth's risk for maladjustment by escalating parent-child conflict (Lui, 2015). In a study of early adolescents in Chinese-Italian families, low impulse control was related to greater externalizing behavior in families with larger gaps in parent-child heritage cultural orientation (Miconi et al., 2019). Thus, we will examine whether parent-child cultural orientation gaps predict children's self-regulatory skills longitudinally.

Because cultural orientations are often associated with other sociocultural factors in immigrant families, such as socioeconomic status (SES) and generation status, it is necessary to apply a multivariate approach to examine their unique relations to self-regulation. For example, SES has been positively linked to parent-reported and task-based self-regulatory skills in school-aged children, including those from ethnically diverse and low-income backgrounds (e.g., S. H. Chen et al., 2014). Although the relation between immigrant status and self-regulation has not been extensively investigated, one study of school-aged Latino children failed to find any generation-based differences in cognitive flexibility or teacher-reported effortful control (Greenfader, 2019). Additionally, gender differences in self-regulation have been commonly observed, with girls displaying higher behavioral self-regulation than boys from early to middle childhood (e.g., Matthews et al., 2009).

The relations between sociocultural factors and self-regulation in immigrant children may vary by how self-regulation is measured. Teachers' ratings of self-regulation may be more developmentally accurate due to comparison of behavior with age-matched peers (van der Ende et al., 2012), although teachers can be prone to ethnic and racial biases in ratings of students' behavioral tendencies (Chang & Demyan, 2007). Parental ratings of children's self-regulation may be influenced by their own mental health (Gagne et al., 2021) and cultural norms, beliefs, or expectations regarding regulated behaviors. By contrast, task-based measures of self-regulation may be less susceptible to cultural values and expectations compared to parent or teacher ratings.

Relations between Self-Regulation and Behavioral Adjustment during Early School Years

In early elementary school years, children face new contextual demands. Children are expected to adapt to new schools and new routines, engage in classroom learning, acquire higher-order academic skills, and develop positive relationships with new teachers and peers, all of which involve self-regulation skills (Savina, 2021). Not surprisingly, children with higher self-regulatory skills at school entry showed greater gains in academic achievement in early school grades in culturally diverse samples, including Chinese immigrant families (e.g., Mauer et al., 2021). Importantly, classroom behaviors (including classroom engagement, behavioral problems, and social behaviors) are thought to partly mediate the relations between self-regulation and academic achievement (e.g., Valiente et al., 2014). On the other hand, researchers also suggested that the relations between self-regulation and academic functioning are bidirectional such that behavior-related disruptions in schooling adversely affect the development of self-regulatory skills (Atherton et al., 2018).

A methodological issue in assessing children's behavioral adjustment is the degree of agreement across informants, which has typically ranged from low to moderate effect sizes (Robson et al., 2020). One possible explanation for informant discrepancy is the observer's context. Specifically, parents' ratings mainly capture children's behaviors at home and teachers' ratings capture children's behaviors in classrooms. Thus, the informant

discrepancy in parents' and teachers' ratings of behavioral adjustment might be related to differences in contextual demands on children's behaviors at home and in classroom settings (De Los Reyes, 2011). Because classroom learning places many demands on self-regulatory skills (Savina, 2021), including response inhibition (e.g., lowering one's voice), attention control (e.g., staying on task in the presence of environmental distractors), and working memory (e.g., holding and following rules and directions), children's self-regulation might be especially predictive of teacher-rated behavioral adjustment. On the other hand, parents have greater knowledge of their child's developmental history, and they observe children in family and extracurricular contexts where strengths or deficits in regulatory abilities could also be predictive of parents' perceived child adjustment (e.g., doing chores, behaving at the dinner table). Thus, while both teachers and parents are reliable and valid reporters of behavior (De Los Reyes, 2011), they provide distinct but equally valuable perspectives on children's behaviors across developmental settings.

The home-classroom difference in contextual demands on behaviors can be especially salient for children of immigrant families who attend school in the mainstream culture and live in homes with varying levels of heritage culture maintenance. Theoretically, children growing up in a household more oriented to a collectivistic culture may demonstrate especially strong positive associations between self-regulation and parent-rated behavioral adjustment. For example, while in a more individualistic (e.g., American) environment a child's disinhibition may be aligned with values of self-expression, a child who fails to regulate emotions and behaviors in a more collectivistic-oriented household (e.g., Chinese) may cause more parental distress or strains in parent-child relationships by clashing with traditional values of self-restraint and compliance (X. Chen & French, 2008). However, very few researchers examined cultural orientation as moderators in the relations between self-regulation and behavioral adjustment. One exception is a study showing that the links between infant temperament profiles and toddler behavioral and physiological regulation in Mexican American families varied by mothers' cultural orientations (Lin et al., 2021). Similar to Chinese families, Mexican families encourage and promote children's self-regulation through socialization practices rooted in cultural values such as *familism, respeto, and education* (Diaz & McClelland, 2017). Thus, the finding that infants' negative reactive and low regulated temperament predicted poorer physiological regulation in toddlerhood *only* among those families with high Mexican culture orientation is consistent with the hypothesis that misfits between one's temperament trait and cultural expectations confer risks for psychopathology (Lin et al., 2021). A similar pattern of moderation by culture was found in a cross-cultural study: the negative association between effortful control and teacher-rated externalizing problems was stronger in the Chinese sample than in the U.S. sample (Zhou et al., 2009), possibly reflecting Chinese teachers' higher expectations for students' self-regulation. However, Atherton et al. (2018) tested whether the co-development between effortful control and school problems from childhood to adolescence was moderated by Mexican-origin youths' cultural values and failed to find evidence of moderation. In sum, there is least some evidence in the literature that the association between self-regulation and behavioral adjustment is strengthened in cultural contexts that more highly value self-constraint and regulation. Thus, we will explore whether

cultural orientations moderate the longitudinal links between self-regulation and behavioral adjustment.

Although the present study focused on the predictive relations between prior self-regulation and later behavioral adjustment, it is important to consider that the regulation-adjustment relation might be bidirectional such that earlier behavioral problems can undermine later self-regulation development or exacerbate pre-existing emotion or behavior dysregulation (Atherton et al., 2018). For example, Eisenberg et al. (2015) found that externalizing problems at 30 and 42 months predicted lower effortful control a year later. Therefore, we will test whether behavioral adjustment predicts self-regulation.

The Present Study

Using two waves (Wave 1: 6–9 years of age; Wave 2: 9–11 years of age) of multi-method and multi-informant data from a socioeconomically diverse sample of children ($N = 258$) in Chinese American immigrant families, the present study examined the associations between self-regulation and behavioral adjustment during early elementary school. The study had three aims. First, we tested the prospective relations of family sociocultural factors (e.g., cultural orientations, SES, and child generation) to self-regulation. We hypothesized that parents' Chinese cultural orientation and SES (income and education) would be positively associated with the latent factor of self-regulation (confirmatory).

Second, we tested the prospective links between self-regulation and behavioral adjustment. We hypothesized that higher self-regulation in 1st to 3rd grade (6–9 years old) would predict higher behavioral adjustment in 2nd to 4th grade (confirmatory). We expected this association to be significant for both teacher- and parent-reported adjustment. We further explored whether behavioral maladjustment in 1st to 3rd grade would predict lower self-regulation in 2nd to 4th grade.

When testing Aim 1 and Aim 2, we used both the latent factor approach (structural equation modeling) and individual variable approach (multiple regression) for conceptual and statistical reasons. Conceptually, the two approaches addressed somewhat different questions. The latent factor approach examines the associations between children's overall levels of self-regulation and sociocultural factors or behavioral adjustment across contexts, whereas the individual variable approach allows us to explore: 1) whether sociocultural factors relate to different measures of self-regulation (e.g., task-based vs. adult reports); and 2) whether the relations between self-regulation and adjustment vary by assessment method and/or informant of regulation or adjustment. Statistically, there are pros and cons of both approaches. The latent factor approach tends to provide more accurate estimates of the relations among constructs but with less precision (especially with smaller sample sizes), whereas the individual variable approach can yield inaccurate estimates of the relations due to measurement errors, but with higher precision (Ledgerwood & Shrout, 2011).

The third aim was to test whether parents' and children's cultural orientations, as well as parent-child cultural orientation gaps, moderated the prospective relations between self-regulation and behavioral adjustment (exploratory). We hypothesized that the relation

between self-regulation and parent-reported behavioral adjustment would be stronger for children and parents with higher Chinese orientation because of the higher valuing and preference for self-regulatory behaviors in traditional Chinese culture, although this aim is exploratory due to limited prior research testing the moderation hypothesis.

Method

The present study used the first two waves of data from a longitudinal study on socioemotional and academic development of Chinese American children in immigrant families (see S.H. Chen et al., 2014, 2015). At Wave 1 (data were collected from December 2007 to July 2009), a total of 258 children (52% boys) and one participating parent (81.8% mothers) and teacher were recruited from schools and communities in the San Francisco Bay area. At Wave 1, most children were in first (48.8%) or second grade (50%), with the remaining (1.2%) in third grade (M_{age} = 7.4 years, SD = 0.7, range = 5.8–9.1). Around a quarter of the children (24%) were first-generation immigrants (born outside the U.S.), while most (76%) were second-generation (born inside the U.S. to at least one foreign-born parent). On average at Wave 1, first-generation children had lived in the U.S. for 4.0 years (SD = 1.7, range = 0.7 – 7.8). Most children were from two-parent households (92.5%) with the remaining from single-parent (including never married, divorced, or widowed) households. Most participating parents (75.7%) were born in mainland China, followed by Hong Kong (10%), Taiwan (3.3%), and other countries (11%). Parents reported living in the U.S. for an average of 11.8 years (range = 0.5–38.0, SD = 7.6). Parents' mean years of formal education ranged from 0 to 20 (M = 13.3, SD = 2.4). The average *per capita* income for families was \$11,607, ranging from \$625 to \$50,000 (SD = \$8,309). Based on household income, fifty-seven percent of children qualified for free or reduced-cost lunch programs. Fifty-seven percent of mothers and 76.7% of fathers had full-time jobs, 17% and 7.7% held part-time positions, and 12.9% and 6.8% reported being unemployed or stay-at-home parents, respectively.

At Wave 2 (about two years after Wave 1; M = 1.8 years, SD ± 0.2 years, range = 1.3–3.2 years), 239 children (92.6% of the original sample) were re-assessed, and the children were in third, fourth, or fifth grade (M_{age} = 8.7 years, SD = 0.8, range = 7–10 years). Attrition analyses comparing group characteristics of the children assessed at Wave 1 only (n = 19) and those assessed at both waves (n = 239) showed no differences with respect to Wave 1 demographic variables (i.e., child age, gender, generation, parent education, and income), self-regulation variables, or socioemotional outcomes.

Procedures

Participants were recruited in a large metropolitan area of northern California in neighborhoods and schools with large proportions of Chinese or Asian American populations. Recruitment strategies included tabling at community events (63.6%), flyer distribution at public and private schools (17.4%), and referrals by community organizations (19%). Families whose children received free or reduced-cost lunch at school were oversampled to meet the larger study's emphasis on examining the experiences of Chinese American families of low-income backgrounds. After providing their phone numbers,

interested families were screened by bilingual interviewers, with eligibility requirements being a) they had a child in first or second grade; b) the child lived with at least one biological parent; c) both biological parents were ethnically Chinese; d) the parent and child could understand and speak Chinese (Mandarin or Cantonese) or English; and e) the child had either first- or second-generation immigrant status. Of the original 380 families who expressed interest, 353 of them were screened, 291 met eligibility requirements, and 258 completed assessments.

All data collection procedures were approved by the Institutional Review Board of the authors' university. At each wave, after providing written consent, the child and the parent participated in a 2.5-hour lab assessment in which they completed structured interviews, questionnaires, and psychological testing (cognitive, behavioral, and academic achievement tasks). The child's mother was invited first to participate, and the father was contacted thereafter if the mother was unavailable. After the parent and child selected their preferred language for assessment, trained bilingual undergraduate students administered the assessments to them in two separate rooms. Parents can choose to complete their written materials in English (16.3%) or Chinese (83.7%). Most children performed the behavioral tasks in English at Wave 1 (86%) and all children performed tasks in English (100%) at Wave 2. There were no differences by language of administration at Wave 1 for any measures except the Go/No-Go response inhibition task, where a Wilcoxon-signed-rank test (Wilcoxon, 1945) revealed that children who were instructed in at least some Chinese committed more omission errors compared to those who were instructed in English only ($Z = 2.46$, $p = .014$). English literacy tests were administered in English only. Children received a small prize, and parents were given $50 as well as reimbursement for transportation expenses. With the parent's consent, the child's current teacher at the time was contacted to complete questionnaires by mail about the child's behavior at school. Teacher surveys were collected for 214 children (83%) at Wave 1 and 218 children (92%) at Wave 2. Teachers were paid $20 for completing the surveys for each student. Overall, rates of missingness on key study variables ranged from <0.01% to 25% (see Table 1).

Measures

Demographic Information—Demographic information was obtained by parent report on an adapted version of the Family Demographics and Migration History Questionnaire (Roosa et al., 2008).

Child Self-Regulation (Wave 1 and Wave 2)

Parent- and Teacher-Reported Effortful Control (CBQ).: At both waves, parents and teachers completed the Attention Focusing (12 items) and Inhibitory Control (11 items) subscales of the Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001). The items were rated using a 7-point scale from 1 (*extremely untrue*) to 7 (*extremely true*). One previous study found similar factor structures for the parent-report CBQ for American and Chinese school-aged children (Ahadi et al., 1993). Given the high correlations between composites of attention focusing and inhibitory control within each reporter (rs = .65–.71), the two subscales were combined to create one effortful control composite for parent- and teacher-report, a procedure used in prior studies (S. H. Chen et al., 2014). At Waves 1 and 2,

the alphas for parent-reported effortful control were .81 and .85, respectively, and the alphas for teacher-reported effortful control were .90 and .91, respectively. Composites for parent- and teacher-reported effortful control were created by averaging the item scores.

Behavioral Persistence Task (Puzzle Box).: In the puzzle box task, children were asked to assemble a puzzle that was blocked from their view and placed inside a wooden box (Eisenberg et al., 2005). Children reached through the back portion of the box, which was covered by a black cloth, using sleeves cut out of the cloth. The front of the box consisted of clear Plexiglas so that children's hand movements could be observed. Children were instructed to not lift the black cloth to "peek" at the puzzle, were told that they would receive a prize for finishing the puzzle and were given five minutes to complete the task. Children were left alone in the room to complete the puzzle and their responses were videotaped. Two trained research assistants coded the videos for the number of seconds the child persisted on the puzzle (inter-rater $r = 0.97$). An index of behavioral persistence was computed as the proportion of time (0–1) the child persisted on the task without cheating (Eisenberg et al., 2005). At Waves 1 and 2, respectively, 95.0% and 95.8% of children had data on this task.

Response Inhibition (Go/No-Go Task).: In a computerized, adapted version of the standard Go/No-Go task (Eriksen & Eriksen, 1974), children were asked to press a button to respond to a target stimulus, and refrain from pressing the button when presented with a non-target stimulus. The stimuli were images of cartoon characters from an animated children's film and were presented for 2 seconds each at consistent intervals. Prior to the testing phase, children were presented with 30 practice trials in which they were provided with correctional feedback if they made an error in responding. During the testing phase, children were presented with 200 target (Go) trials and 50 non-target (No-Go) trials. Omission error scores were calculated as the total number of times a child failed to press the button upon appearance of the target stimulus (0–200). Commission error scores were calculated as the total number of times a child pressed the button upon appearance of the non-target stimulus (0–50). A low rate of omission errors is thought to capture sustained attention, while a low rate of commission errors is thought to reflect inhibitory control (Barkley, 1991). At Waves 1 and 2, respectively, 95.3% and 100% of children completed the task.

Cognitive Control (Nemo Task).: In a computerized task, children were presented with a series of stimuli and asked to respond using left and right buttons to one of two visually presented rule cues ("Color" or "Direction"). The stimuli were images of cartoon characters from an animated children's film. The rule cue appeared for 2300ms, followed by the target stimulus for 1500ms on each trial. On incongruent trials, the Color and Direction rules required different responses (e.g., a right-facing stimulus in one color associated with a left button press), while on congruent trials, the Color and Direction rules led to the same button press response. Prior to the testing phase, children were presented with 32 practice trials in which they were provided with correctional feedback if they made an error in responding. During the testing phase, children were presented with 98 trials, and no feedback was provided. For the present study, the 24 trials in which the rule cue differed from the preceding trial ("Switch" trials) were used in analyses. The proportion of correct

responses (0–1) in the incongruent trials is used as the measure of cognitive control, because accurate performance on these trials requires the participant to switch rules flexibly while ignoring the stimulus dimension that was relevant on the immediately preceding trial (Baym et al., 2008). At Waves 1 and 2, respectively, 93.8% and 99.2% of children completed the task.

Child Behavioral Adjustment (Wave 1 and Wave 2)

Parent-Reported Behavior Problems (CBCL) and Social Competence (HPSC).: At both waves, parents rated children's behavior problems in the past six months using the Internalizing Problems (31 items) and Externalizing Problems (33 items) subscales from the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). The items were rated using a three-point Likert scale (0 = *absent*, 1 = *occurs sometimes*, 2 = *occurs often*). Previous studies of Chinese and Chinese American children have demonstrated good internal consistency, test-retest reliability, and criterion validity for the CBCL (Leung et al., 2006). At Waves 1 and 2, the alphas for parent-reported Internalizing Problems were .85 and .98, respectively; the alphas for parent-reported Externalizing Problems were .85 and .99, respectively. Composites of parent-rated internalizing and externalizing problems were formed by summing the raw item scores (0–93 for Internalizing Problems and 0–99 for Externalizing Problems). Parents also rated children's socially appropriate behaviors using an adapted version of Harter's Perceived Competence Scale for Children (HPCSC; Harter, 1982). The items were rated using a 4-point Likert scale (from 1 = *really false* to 4 = *really true*). Previous research has demonstrated satisfactory internal consistencies among native Chinese school-aged children (Leung et al., 2006). In the present sample, the alphas for parent-reported Social Competence at Waves 1 and 2 were .69 and .71, respectively. A composite score was formed by averaging the item scores.

Teacher-Reported Behavior Problems (TRF) and Social Competence (HPCSC).: At both waves, teachers completed the Internalizing Problems (32 items) and Externalizing Problems (27 items) subscales from the Teacher Report Form (TRF; Achenbach & Rescorla, 2001). On this questionnaire, teachers are asked to rate items pertaining to children's problem behaviors at school over the past six months using a 3-point Likert scale (0 = *absent*, 1 = *occurs sometimes*, 2 = *occurs often*). While many items overlap with the parent-reported CBCL (e.g., "There is very little they enjoy", "Complains of loneliness"), 10 items are setting-specific (e.g., "Breaks school rules," "Disrupts class discipline"). Satisfactory psychometric properties have been documented in previous studies of Chinese school-aged youth (Leung et al., 2006). In the present sample, the alphas for teacher-reported Internalizing Problems were .82 and .85 for Wave 1 and Wave 2, respectively; the alphas for teacher-reported Externalizing Problems were .87 and .87, respectively. Composites of teacher-rated internalizing and externalizing problems were formed by summing the raw item scores (0–96 for Internalizing, 0–81 for Externalizing). Teachers also rated the extent of children's socially appropriate behaviors on a 4-point Likert scale (1 = *really false* to 4 = *really true*) using an adapted version of the HPCSC (Harter, 1982). In the present sample, the alphas for teacher-reported social competence were .86 and .83 at Waves 1 and 2, respectively. A composite score was formed by averaging the item scores.

Parent and Child Cultural Orientations (Wave 1)—Parents rated their own and children's Chinese and American cultural orientations using the Cultural and Social Acculturation Scale (CSAS; X. Chen & Lee, 1996). The CSAS is a bi-dimensional measure assessing an individual's Chinese and American cultural orientations in behavioral domains of language proficiency, media use, friendships, and celebration of cultural traditions and holidays. Parents completed two versions of the CSAS: parents' reports of their own cultural orientations, and parents' report of their children's cultural orientations. Previous studies of Chinese immigrant families have demonstrated satisfactory internal reliabilities of the CSAS for assessing both parents' and children's heritage and host cultural orientations (X. Chen & Tse, 2010; Ren et al., 2020). CSAS has also been adapted and validated to assess orientations to urban and rural cultures in school-age rural migrant children in China (X. Chen et al., 2021). In the present study, the alphas were 0.73 (12 items) and 0.87 (14 items) for parents' Chinese and American orientations, and 0.77 (12 items) and 0.82 (14 items) for children's Chinese and American orientations, respectively. To create composite scores of cultural orientations, the corresponding item scores were standardized and averaged.

Analytic Procedure

First, we computed descriptive statistics of study variables and screened variables for univariate normality. Second, pairwise correlations among study variables and hypothesized covariates were computed. Third, measurement models for the latent factors of self-regulation and behavioral adjustment were tested using confirmatory factor analysis (CFA) in Mplus 8.6 (Muthén & Muthén, 2017). For all models, missing data were handled using the full information maximum likelihood method. Model fit was evaluated using the following criteria: CFI > .95, SRMR < .08, RMSEA < .06 (Hu & Bentler, 1999). Fourth, the relations between sociocultural characteristics and self-regulation were tested using longitudinal structural equation modeling (SEM). Fifth, cross-lagged panel models were tested to examine the hypothesized relations among a latent factor of self-regulation and behavioral adjustment, as well as relations between individual indicators of self-regulation and behavioral adjustment. Finally, the latent moderated structural (LMS) equations approach was used to test whether parent and child cultural orientations (American and Chinese cultural orientations), as well as gaps between the two, moderated the link between children's self-regulation and behavioral adjustment.

Results

Preliminary Analyses: Descriptive Statistics and Correlations

Descriptive statistics for the sample are displayed in Table 1. Based on the cut-offs of 2 and 7 for skew and kurtosis, respectively (West et al., 1995), Go/No-go task omission errors at both waves displayed positive skewness and high kurtosis, meaning scores clustered in the lower range and sample variability was limited. Wave 1 behavioral persistence was negatively skewed and had high kurtosis, and Wave 2 teacher-reported child externalizing behavior was positively skewed. Due to the presence of nonnormally distributed variables, subsequent regression and SEM analyses were conducted using the Maximum Likelihood Robust estimator (Muthén & Muthén, 2017) to adjust for correction of standard errors.

Pairwise correlations for study variables and covariates are reported in Supplementary Tables 1 and 2. To identify covariates that might confound the relations between self-regulation and adjustment, we also ran pairwise correlations between study variables at Wave 1 and sociocultural characteristics. Among the self-regulation variables, boys demonstrated lower teacher-reported effortful control, $r(192) = -.22$, $p = <. 01$, behavioral persistence $r(243) = -.14$, $p = .025$, and cognitive control $r(240) = -.17$, $p < .01$, as well as higher commission errors compared to girls $r(244) = .14$, $p = .03$. Among the adjustment variables, boys had lower parent- ($r(248) = -.15$, $p = .02$) and teacher-reported ($r(206) = -.30$, $p < .001$) social competence, and higher teacher-reported externalizing compared to girls, $r(212) = .18$, $p < .01$. Additionally, parental education was positively correlated with parent-reported effortful control ($r(222) = .14$, $p = .04$) and child social competence ($r(240) = .17$, $p < .01$). Thus, both child sex and parental education were included as covariates in longitudinal analyses between self-regulation and adjustment.

Preliminary Analyses: Measurement Models of Self-Regulation and Maladjustment

For self-regulation, we tested a two-factor CFA model with two latent factors: Wave 1 self-regulation and Wave 2 self-regulation, each indicated by the six observed self-regulation measures (behavioral persistence, Go/No-go omission errors, Go/No-Go commission errors, cognitive control, and parent- and teacher-reported effortful control). However, the Go/No-Go commission errors score was dropped from the models used in the main analyses due to lower loadings at Waves 1 ($\beta = -0.31$) and 2 ($\beta = -0.23$). Given the problems associated with post hoc model modification (Brown, 2015), we correlated error terms a priori that were theoretically meaningful in each model. Specifically, we correlated error terms of indicators that were derived from the same instrument and completed by the same reporter. The fit for the final model was acceptable: $\chi2(27, N = 258) = 33.89$, $p = 0.169$, CFI = 0.98, TLI = 0.97, SRMR = .042, RMSEA = .031, demonstrating configural invariance across waves. We also estimated simultaneous CFA models with the factor loadings for the same reporter constrained to be equal across waves. A Satorra-Bentler scaled chi-square difference test (Satorra & Bentler, 1994) showed no significant difference in loadings between the two models, demonstrating metric invariance. All the model estimated loadings for both Wave 1 and Wave 2 self-regulation were significant and in the expected direction (the absolute values of standardized loadings ranged from 0.33 to 0.59; see Supplementary Materials for the full measurement model). Therefore, there was support for a single-factor model of self-regulation at both waves.

We also tested a CFA model for behavioral maladjustment measures with four latent factors: parent-reported behavioral maladjustment at Wave 1 and Wave 2 (indicated by parent-report of child internalizing and externalizing symptoms and social competence), and teacher-reported behavioral maladjustment at Wave 1 and Wave 2 (indicated by teacher-report of child internalizing and externalizing symptoms and social competence). Teacher-reported internalizing behaviors were dropped from the models of teacher-reported behavioral adjustment used in the main analyses due to low loadings (Wave 1: $\beta = 0.23$; Wave 2: $\beta = 0.26$). We correlated error terms a priori of indicators that were derived from the same questionnaire completed by the same reporter (e.g., teacher-reported internalizing with teacher-reported externalizing problems). To test for longitudinal invariance, we first

estimated CFA models for behavioral maladjustment at both waves simultaneously and assessed overall model fit (*configural invariance*). The fit for the model was acceptable, $\chi 2(20, N = 258) = 17.789$, $p = 0.601$, CFI = 1.00, SRMR = .023, RMSEA = .00 (see full measurement model in Supplementary Materials). We next estimated simultaneous CFA models with the factor loadings for the same reporter constrained to be equal across waves (*metric invariance*). The fit for this model was acceptable: $\chi 2(23, N = 258) = 17.702$, $p = 0.774$, CFI = 1.00, SRMR = .025, RMSEA = .00. For both models, all parameter estimates were significant and in the expected directions (the absolute values of standardized loadings ranged from 0.43 to 0.95). A Satorra-Bentler scaled chi-square difference test (Satorra & Bentler, 1994) showed no significant difference in model fit between the models with or without the loadings constrained to be invariant across waves. Therefore, there was support for informant-grouped measurement model of maladjustment at both waves and measurement equivalence in loadings across waves.

Analyses for Aim 1: Longitudinal Relations of Sociocultural Variables to Self-Regulation

Sociocultural Variables Predicting Latent Factor of Child Self-Regulation

—Using structural equation modeling, we tested parent American orientation, parent Chinese orientation, child American orientation, child Chinese orientation, child sex, child generation, parent income, parental education, and parent years in the U.S. as simultaneous predictors of the latent factor of child self-regulation at Wave 2. This model controlled for the latent factor of Wave 1 self-regulation and the loadings were constrained to be invariant across waves. The fit for this model was adequate: $\chi 2(122, N = 258) = 162.79$, $p = .008$, CFI = 0.90, TLI = 0.89, SRMR = .073, RMSEA = .040. In this model, per capita income showed a unique, positive relation to Wave 2 self-regulation ($\beta = 0.22$, $p = .024$). Moreover, child sex was a significant predictor such that boys had lower W2 self-regulation than girls ($\beta = -0.18$, $p = .038$).

Sociocultural Variables Predicting Individual Indicators of Child Self-Regulation

—We also tested a series of multiple regression models to examine the simultaneous relations of Wave 1 sociocultural variables to individual indicators of Wave 2 self-regulation controlling for its corresponding Wave 1 indicator (Table 2). The cultural orientation variables were all mean-centered prior to computation of the interaction terms representing cultural orientation gaps. The regression models were tested in Mplus 8.6 using maximum likelihood estimation with robust standard errors (due to nonnormally distributed variables) and full information maximum likelihood (FIML) estimation for missing data. As reported in Table 2, child sex—specifically, being a boy—was associated with lower parent-reported effortful control ($\beta = -0.15$, $p = .006$), lower teacher-reported effortful control ($\beta = -0.33$, $p < .001$), and lower behavioral persistence ($\beta = -0.14$, $p = .045$) at Wave 2. Greater parent years in the U.S. was associated with lower parent-reported effortful control ($\beta = -0.17$, $p = .030$), and greater family per capita income was associated with greater parent-reported effortful control ($\beta = 0.19$, $p = .037$). Parent-child Chinese orientation gap— as indicated by the interaction term of parent Chinese orientation × child Chinese orientation —was significantly associated with parent-reported effortful control ($\beta = 0.40$, $p < .001$). As shown in Figure 1, simple slopes analyses (Aiken & West, 1991) indicated that at the low level of child Chinese orientation (1 *SD* below the mean), higher parent Chinese orientation

was associated with lower parent-reported effortful control ($\beta = -0.32$, $p = 0.01$), but there was no relation between parent Chinese orientation and parent-reported effortful control at mean ($\beta = -0.07$, $p = 0.49$) or high levels (1 SD above the mean, $\beta = 0.18$, $p = 0.18$) of child Chinese orientation.

Analyses for Aim 2: Longitudinal Relations between Self-Regulation and Maladjustment

To test for the hypothesized longitudinal relation between self-regulation and behavioral maladjustment, two cross-lagged panel models (CLPM) were tested in Mplus 8.6 with 20 sets of random start values (see Figure 2). Despite recent criticisms about the use of CLPM for testing prospective relations (e.g., Usami et al., 2019), we selected CLPM because: a) most alternative methods to CLPM (e.g., random-intercept CLPM, latent growth curve model) require at least three waves of data, and we only have two waves of data; b) we were interested in modeling the between-person (rather than within-person) prospective relations (e.g., Are children with low self-regulation more likely to show poor adjustment compared to children with high self-regulation?), which conceptually fit well with the CLPM approach (Orth et al., 2020). To reduce the number of parameter estimates, the loadings of latent factors of self-regulation and maladjustment were constrained to be invariant across time, and the latent factors of parent and teacher-reported maladjustment were tested in separate models. To control for the rank-order stability in self-regulation and maladjustment over time, the auto-regressive paths predicting the Wave 2 construct from its Wave 1 counterpart were included. The main hypotheses were represented by the cross-time and cross-construct paths from Wave 1 self-regulation to Wave 2 maladjustment. We also tested potential bidirectional effects by adding the cross-lagged paths from Wave 1 maladjustment to Wave 2 self-regulation. In these models, the paths from covariates (child sex and parent education) to maladjustment at Wave 2 were controlled for. The error variances of indicators measured by the same reporter or from the same task (e.g., parent-reported internalizing and parent-reported social competence) were allowed to be correlated if doing so improved the overall model fit. Based on the criteria recommended by Hu and Bentler (1999), the models predicting teacher-reported and parent-reported behavioral maladjustment fit the data adequately: $\chi^2(90, N = 250) = 118.89$, $p = .02$, CFI = .97, TLI = 0.96, RMSEA = .036, SRMR = .056 for the teacher-reported model, $\chi^2(109, N = 250) = 149.30$, $p = .006$, CFI = .96, TLI = 0.94, RMSEA = .038, SRMR = .072 for the parent-reported model. In these models, the model-estimated loadings for latent factors of self-regulation and maladjustment were all significant ($p < .05$) and in the expected directions.

Regarding the auto-regressive paths (reflecting rank-order stability across time), Wave 1 self-regulation was positively associated with self-regulation at Wave 2 in both models ($\beta = 0.93$ to 1.01, all ps $< .001$). The paths from Wave 1 maladjustment to Wave 2 maladjustment were significant in the positive direction for both parent report ($\beta = 0.43$, $p < .001$, see Figure 2, Model A) and teacher report ($\beta = 0.27$, $p = .001$, see Figure 2, Model B). For all models, we further tested whether the continuous variable of time interval between Wave 1 and Wave 2 moderated the cross-lagged paths, and no evidence of moderation was found.

Regarding the hypothesized cross-lagged paths, Wave 1 self-regulation negatively predicted both Wave 2 parent-reported maladjustment ($\beta = -0.22$, $p < .05$) and Wave 2 teacher-reported maladjustment ($\beta = -0.49$, $p = <.001$). The paths from Wave 1 maladjustment to Wave 2 self-regulation were not significant in any of the models. Among the covariates, parental education uniquely positively predicted teacher-reported behavioral maladjustment at Wave 2 ($\beta = 0.14$, $p < .05$).

We replicated the analyses testing longitudinal relations between Wave 1 self-regulation and Wave 2 maladjustment (Figure 2) using individual indicators of self-regulation (reported in Supplementary Tables 3 and 4). For predicting Wave 2 parent-reported child maladjustment, parent-reported effortful control was the only significant predictor ($\beta = -0.34$, $p < .05$). For predicting Wave 2 teacher-reported maladjustment, both parent-reported effortful control and behavioral persistence were significant predictors ($\beta = -0.14$, $p < .05$). Different from models predicting self-regulation as a latent factor, two significant reverse paths (Wave 1 maladjustment $\rightarrow$ W2 self-regulation) emerged in models predicting individual self-regulation indicators: W1 parent-reported maladjustment and W1 teacher-reported maladjustment both negatively predicted W2 teacher-reported effortful control (βs $= -0.18$ and -0.35, $p < .05$).

Analyses for Aim 3: Testing Moderation by Cultural Orientations and Cultural Gaps

We re-ran the models predicting Wave 2 behavioral maladjustment from Wave 1 self-regulation controlling for autoregressive effects (Figure 2), as well as models predicting Wave 2 self-regulation from Wave 1 behavioral adjustment. For each model, we tested whether parent and child American or Chinese orientation moderated the path from the latent factor of self-regulation to the latent factors of parent-reported or teacher-reported behavioral maladjustment (and vice versus) using the LMS (latent moderated structural equations) approach (Klein & Moosbrugger, 2000). A total of 16 LMS models were estimated —2 (parent/child) $\times$ 2 (American/Chinese cultural orientation) $\times$ 2 (parent-reported/teacher-reported maladjustment) $\times$ 2 (directionality). We evaluated model fit using the same criteria as previous models: CFA > .95, SRMR < .08, RMSEA < .06 (Hu & Bentler, 1999). No significant moderation by parent or child cultural orientations was found. Finally, we computed difference scores between parents' and children's Chinese or American orientations (Telzer, 2010), and tested whether cultural orientation gaps (as difference scores) moderated the relations between W1 self-regulation and W2 maladjustment. No evidence of moderation by cultural orientation gaps (as difference scores) in the links between self-regulation and maladjustment was found.

Discussion

Using a multi-method and multi-informant battery, we examined the prospective relations among sociocultural factors, self-regulation, and behavioral maladjustment during early elementary school years in a socioeconomically diverse sample of Chinese American children in immigrant families. Regarding associations with sociocultural factors, when analyzed as a latent factor, self-regulation was only predicted by family income, with children from higher-income families displaying higher self-regulation over time than those

from lower-income families. When individual measures of self-regulation were analyzed, sociocultural factors were primarily associated with parent-reported effortful control. Regarding the relation between self-regulation and behavioral adjustment, self-regulation analyzed as a latent factor predicted both teacher- and parent-reported lower behavioral maladjustment over time. Further analyses indicated that parent-reported effortful control and behavioral persistence were the primary measures driving the association between self-regulation and adjustment. In addition, behavioral maladjustment negatively predicted teacher-reported effortful control over time. We found no evidence of moderation by parents' cultural orientations, children's cultural orientations, or cultural orientation gaps in the relations between self-regulation and adjustment.

Prospective Relations between Sociocultural Factors and Self-Regulation

It is interesting that different patterns were found when testing self-regulation as a latent factor versus individual measures. The positive relation between family income and latent factor of self-regulation is consistent with previous findings on SES-related variations in self-regulatory skills among ethnically and socioeconomically diverse samples (e.g., Lonigan et al., 2017). However, when analyzed as individual measures, we found that sociocultural factors had differential relations to different measures of self-regulation. First, sex differences were found for parent- and teacher-reported effortful control and behavioral persistence (with boys scoring lower than girls), but not on computerized measures of sustained attention, inhibitory control, and cognitive flexibility. This suggests that compared to girls, boys might have a slower developmental growth in self-regulatory skills in complex social contexts and/or on tasks that involve the integration of multiple regulatory processes (Matthews et al., 2009). It is also possible that parent- and teacher-reported effortful control are more susceptible to the impact of gender role stereotypes (Muntoni & Retelsdorf, 2019) than objective behavioral or cognitive measures. Second, we found acculturation-related factors (parents' time living in the U.S. and cultural orientations) were primarily associated parent-reported effortful control. Specifically, in families where parents lived in the U.S. longer or there was a greater parent-child gap in Chinese orientation, parents rated their children as lower on self-regulation. Most parents in our sample were foreign-born (97.7%) and immigrated to the U.S. after adolescence (79.8%), meaning that their own childhood and schooling experience were in a different country and sociocultural context than those of their children. It is possible that the longer the parents lived in the U.S., the more they became aware of the cultural differences in expectations and norms for self-regulation. Consequently, they may perceive their children as unable to meet the stringent expectations of behavioral self-regulation at home typical of Chinese cultures (X. Chen & French, 2008). Similarly, in families with larger parent-child differences in Chinese orientation, parents may perceive their child as less regulated. Moreover, parent-child conflict could arise from parent-child gaps in cultural orientation (Lui, 2015), and parent-child conflict can undermine children's self-regulation development (Overbeek et al., 2007). Importantly, the fact that no relations were found between acculturation-related factors and task-based or teacher-reported self-regulation measures suggest that acculturation influences on self-regulation development in middle childhood are more salient in home than school or laboratory contexts.

Longitudinal Links between Self-Regulation and Behavioral Maladjustment

Consistent with the larger literature emphasizing the critical roles of self-regulatory skills in children's academic development in early elementary school grades (e.g., Hernández et al., 2018; Savina, 2021), we found that self-regulation at 1st to 2nd grade predicted Chinese American children's better behavioral adjustment at 3rd to 4th grade. Higher self-regulatory skills in early elementary school may serve as a foundation for an upward spiral of social, cognitive, and academic benefits in children (Lonigan et al., 2017), who can be then on the path to future academic and socioemotional success at school. Because children from low-income immigrant families tend to have lower school readiness and experience more challenges during early elementary school related to the sociocultural disadvantages (Crosnoe & Ansari, 2016), supporting self-regulatory skill development during early school years can be a target for interventions.

The longitudinal association between self-regulation (analyzed as a latent factor) and socioemotional adjustment was significant for both teacher- and parent-reported adjustment. Our study is consistent with the robust literature implicating child self-regulation in adaptive functioning in home as well as structured school settings (Lonigan et al., 2017). This difference in effect size – whereby the association between self-regulation and adjustment is stronger for teacher-reported adjustment – may reflect differences in the contextual demands of the observational setting (school vs. home). Additionally, because teacher-reported internalizing problems was dropped as an indicator of the latent teacher-reported adjustment factor, the differences in effect size might be also attributed to the different indicators between the two latent factors. Compared to parents, teachers may observe the child's behavior in a more demanding setting with higher expectations for regulated behaviors. Teachers also have experience with many same-aged children who can serve as the reference group, potentially reducing measurement error. The difference in effect size may also reflect the longitudinal stability of parent-report of adjustment, as has been observed in other longitudinal studies (Robson et al., 2020). Although the same parent rated children's adjustment at both timepoints in this study, the reporting teachers were different at Wave 1 and Wave 2, resulting in lower cross-time rank-order stability in teacher-ratings of behavioral adjustment. It is also important to note that individual- and cultural-level response tendencies on Likert scales can shape behavioral ratings of children. For example, individuals from cultures favoring self-reliance tend to engage more in extreme response styles as opposed to middle response styles (Smith et al., 2016).

Additional analyses treating self-regulation as individual predictors revealed that the prospective relations from self-regulation to behavioral adjustment were primarily driven by parent-reported effortful control and behavioral persistence. Parent-reported effortful control demonstrated its predictive validity of behavioral adjustment across both home and school contexts, whereas behavioral persistence during a frustration task demonstrated its predictive validity in the school context. Because parents interact with children daily, across a variety of contexts, and across developmental history, parent report is a reliable, convenient, and effective tool of assessing children's overall self-regulatory skills in immigrant populations. In contrast, task-based computerized measures of self-regulation had limited value of predicting children's behavioral adjustment in home and school contexts

in the present study, although our previous studies from the same sample showed validity of computerized self-regulation measures for predicting children's academic achievement (S.H. Chen et al, 2015). The lack of prospective relation from teacher-reported effortful control to maladjustment might be because children have different teachers in different grades and teachers usually have limited knowledge on children's developmental history. Thus, teachers' observations of children's self-regulation might be more predictive of children's concurrent classroom behaviors than future behaviors. In sum, when selecting self-regulation measures, researchers and clinicians should carefully consider the goals and contexts of their research and assessment questions.

Although the reversed relation from behavioral maladjustment to self-regulation was not significant when using latent factors of self-regulation, supplementary analyses using individual variables of self-regulation found some evidence of reversed relations. Specifically, parent-reported and teacher-reported maladjustment negatively predicted teacher-reported effortful control over time. These results are consistent with Eisenberg et al. (2015), which reported a negative relation between externalizing problems and later effortful control in early childhood. Because children with behavioral difficulties experience more disruptions in schooling or are less likely to engage in academic tasks (Atherton et al., 2018), they might miss the opportunities to practice self-regulatory skills through academic engagement (Peng & Kievit, 2020).

Moderation by Cultural Orientations and Parent-Child Cultural Orientation Gaps

We hypothesized that the prospective relations between self-regulation and adjustment would be stronger for children whose parents were higher in Chinese orientation, given the higher emphasis on and expectation for self-regulation in Chinese culture compared to American culture (Liew & Zhou, 2022). However, no evidence of moderation was found. We tested moderation by self-regulation using the latent moderated structural equation model approach, which may have masked meaningful interactions between cultural orientations and individual self-regulation measures. For example, cultural orientations may moderate the association between parent-reported effortful control and parent-reported adjustment due to the consistency in reporters and, by extension, cultural expectations surrounding behavior, which is supported in our finding that parent-child Chinese orientation gaps were predictive only of parent-reported effortful control. In addition, our measurements of cultural orientation assessed only social relationships, household language use, and media exposure (e.g., TV, printed materials; X. Chen & Lee, 1996). In line with cross-cultural research suggesting Chinese American children may receive more self-regulation instructions than U.S. children (Lan et al., 2011), using a cultural orientation measure that directly assesses beliefs and parenting practices related to self-regulation may be more sensitive to detect differences between self-regulation and adjustment by cultural orientation. On the other hand, Atherton et al. (2018) tested whether Mexican-origin youths' Mexican cultural values moderated the associations between self-regulation and behavioral adjustment and did not find evidence of moderation (like our result). Thus, there is some evidence suggesting that the developmental processes underlying the interplay of self-regulation and behavioral adjustment in school-age children are generalizable across cultures.

Limitations, Future Directions, and Conclusions

The present study has several limitations. First, although we interpreted the discrepancies in associations between sociocultural factors and different self-regulation measures as reflecting contextual differences in behavioral expectations, we did not directly measure cultural, contextual, and reporter expectations for self-regulatory behaviors. Second, though most children at Wave 1 and all children at Wave 2 completed the task-based measures of self-regulation in English, evaluating the measurement equivalence by language for self-regulation measures will be important for future studies. Third, our sample size had limited statistical power for testing moderation hypotheses, and only two-way moderations were tested. Future studies with a larger sample size can test more complex moderations (e.g., parent Chinese × child Chinese × self-regulation), which can address questions such as whether parent-child cultural orientation gaps moderate the relation between self-regulation and adjustment. Fourth, because the data were collected in 2007–2011, the sociocultural contexts of Chinese Americans families may differ now. For example, Chinese American families have experienced more discrimination since the outbreak of COVID-19 in March 2022 (Cheah et al., 2020). It is possible that both the adaptive functions of self-regulatory abilities and the dynamic interactions and transactions between self-regulatory development and sociocultural contexts have shifted over time (Syed & Juang, 2018).

In summary, the study provided support for the critical roles of self-regulation in Chinese American children's behavioral adjustment during early school grades. We found self-regulatory skills among children of immigrant families are associated with multiple sociocultural factors including socioeconomic status and parent and child cultural orientations. The findings suggest that self-regulation can be a target for family- and school-based interventions for promoting early academic and socioemotional success among children of immigrant families. Doebel (2020) suggested that interventions for improving self-regulation should consider the goals and values of executive control in specific contexts. Our findings on sociocultural correlates of self-regulation suggest that family-based interventions for promoting children's self-regulation in immigrant families should consider home-school differences in cultural values. For example, educating families about cultural variations in expectations and norms for self-regulation and promoting open communications and positive relationships between parents and children can support self-regulation development in the home context. Moreover, our findings on links between self-regulation and teacher-reported behavioral adjustment suggest that promoting self-regulatory skills in school settings (e.g., by incorporating self-regulatory skill training into teaching curriculums of academic subjects and classroom behavioral management) can be effective pathways to facilitate children's early schooling experiences.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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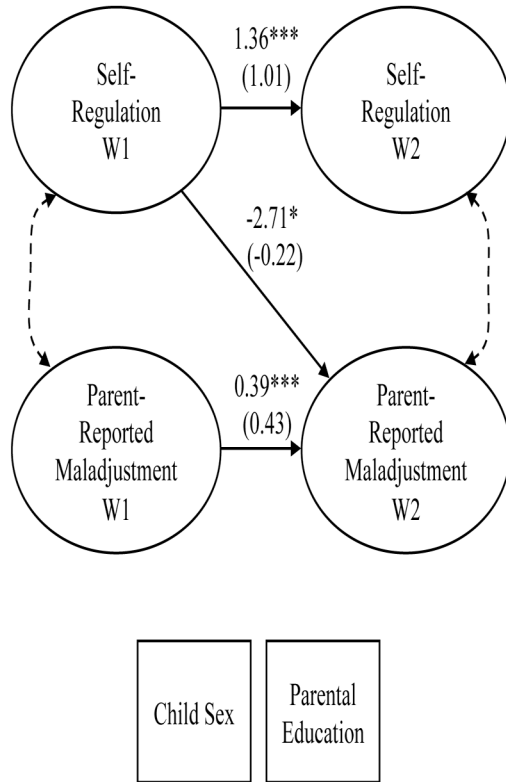
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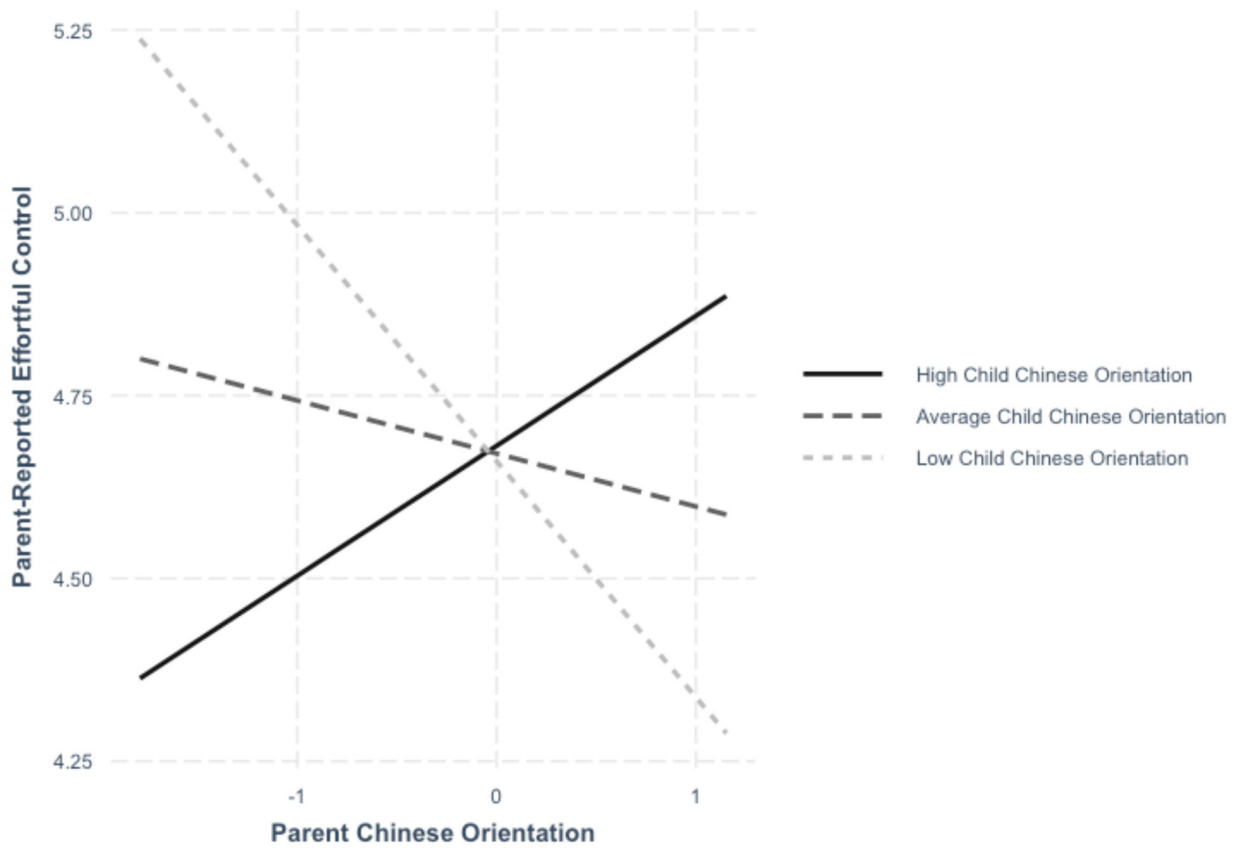
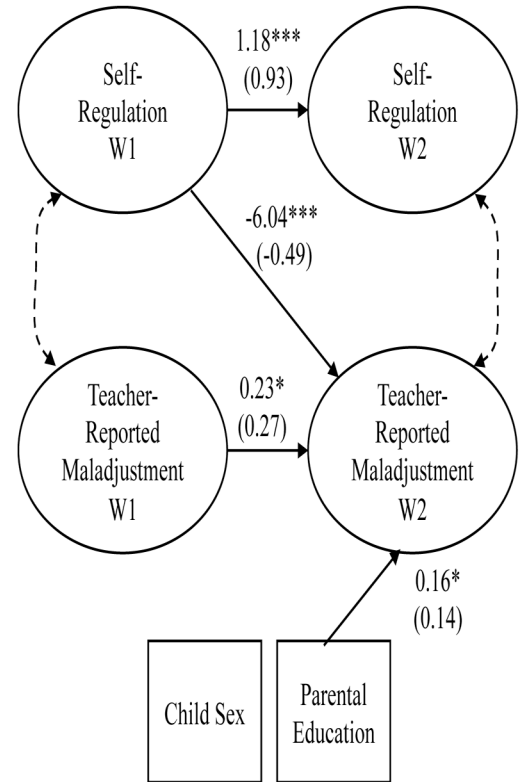**Figure 1.**
Simple Effects for the Interaction of Parent Chinese Orientation × Child Chinese
Orientations Predicting Parent-Reported Effortful Control
Note. "High" = 1 *SD* above the mean; "Low" = 1 *SD* below the mean.

(a) Parent-Reported Socioemotional Maladjustment   (b) Teacher-Reported Socioemotional Maladjustment

Figure 2.
Structural Equation Models Testing Longitudinal Associations Between Child Self-Regulation and Socioemotional Maladjustment

Note. Only the significant paths are shown with unstandardized path coefficients and standardized path coefficients in parentheses. All models controlled for the effects of covariates (child sex and parental education). Curved, dotted lines indicate that self-regulation and socioemotional maladjustment were allowed to intercorrelate within each time point. *p<.05, **p<.01, ***p<.001

Table 1

Descriptive Statistics of Self-Regulation, Behavioral Adjustment, and Cultural Orientation Variables

Variables	N	Min	Max	Mean	SD	Skewness	Kurtosis
W1 Effortful Control (P)	230	2.73	6.18	4.66	0.68	−0.13	−0.25
W1 Effortful Control (T)	194	1.82	6.86	5.05	0.97	−0.66	0.19
W1 Behavioral persistence (%)	245	0.05	1.00	0.82	0.22	−1.46	1.36
W1 Omission errors (Go/No-Go task)	246	0.00	62.00	5.68	8.75	3.41	13.82
W1 Commission errors (Go/No-Go task)	246	0.00	46.00	9.61	6.48	1.33	3.57
W1 Cognitive control (Nemo task)	242	0.43	0.97	0.74	0.14	−0.29	−0.74
W1 Child externalizing (P)	253	0.00	21.00	4.82	5.09	1.19	0.54
W1 Child internalizing (P)	253	0.00	26.00	3.97	4.61	1.81	3.84
W1 Child social competence (P)	250	2	4.00	3.18	0.51	−0.15	−0.68
W1 Child externalizing (T)	214	0.00	23.00	2.54	4.29	2.45	6.08
W1 Child internalizing (T)	214	0.00	25.00	3.69	4.30	1.68	3.25
W1 Child social competence (T)	208	1.00	4.00	3.37	0.68	−1.24	1.19
W1 Parent American orientation (P)	247	−1.16	2.09	.004	.61	.54	.01
W1 Parent Chinese orientation (P)	254	−1.98	1.15	.002	.50	−.89	2.44
W1 Child American orientation (P)	253	−1.49	1.55	.001	.55	.42	−.01
W1 Child Chinese orientation (P)	254	−1.14	1.41	.000	.53	.08	−.14
W2 Effortful Control (P)	213	2.77	6.59	4.74	0.75	0.18	−0.36
W2 Effortful Control (T)	193	2.91	6.95	5.25	0.92	−0.54	−0.41
W2 Behavioral persistence (%)	229	0.09	1.00	0.94	0.15	−3.66	14.45
W2 Omission errors (Go/No-Go task)	239	0.00	20.00	1.94	3.09	2.72	9.13
W2 Commission errors (Go/No-Go task)	239	0.00	38.00	9.37	5.64	1.47	4.08
W2 Cognitive control (Nemo task)	237	0.50	1.00	0.82	0.13	−0.61	−0.35
W2 Child externalizing (P)	243	0.00	24.00	4.50	5.00	1.57	2.36
W2 Child internalizing (P)	243	0.00	22.00	3.68	4.20	1.67	3.21
W2 Child social competence (P)	233	1.00	4.00	3.35	0.50	−0.90	1.35
W2 Child externalizing (T)	218	0.00	19.00	1.93	3.67	2.48	6.12
W2 Child internalizing (T)	218	0.00	20.00	3.37	4.48	1.92	3.51
W2 Child social competence (T)	209	1.00	4.00	3.48	0.61	−1.50	2.16

Note. SD = standard deviation; W1 = Wave 1; W2 = Wave 2; P = parent report; T = teacher report.

Table 2

Multiple Regression Models Predicting W2 Self-Regulation Indicators from W1 Sociocultural Factors and W1 Self-Regulation

Sociocultural Predictors	Self-Regulation Indicators					
	DV: W2 Effortful Control (P)	DV: W2 Effortful Control (T)	DV: W2 Behavioral Persistence	DV: W2 Omission Errors	DV: W2 Commission Errors	DV: W2 Cognitive Control
W1 Self-regulation variable	0.71 (0.06)***	0.47 (0.08)***	0.35 (0.05)**	0.50 (0.11)***	0.33 (0.06)***	0.41 (0.06)***
Parent American cultural orientation	−0.04 (0.12)	−0.17 (0.17)	0.10 (0.03)	−0.10 (0.48)	0.04 (1.01)	0.14 (0.07)
Parent Chinese cultural orientation	−0.04 (0.10)	0.10 (0.17)	−0.10 (0.03)	−0.09 (0.47)	−0.08 (1.00)	0.06 (0.02)
Child American cultural orientation	−0.11 (0.11)	−0.02 (0.17)	0.00 (0.02)	0.10 (0.47)	−0.04 (0.99)	−0.16 (0.02)†
Child Chinese cultural orientation	0.01 (0.10)	0.08 (0.17)	0.03 (0.02)	0.04 (0.44)	−0.02 (0.92)	0.06 (0.02)
Parent × child American orientations	0.13 (0.24)	0.00 (0.18)	−0.03 (0.03)	0.72 (0.61)	0.68 (0.11)	0.01 (0.03)
Parent × child Chinese orientations	0.41 (0.15)***	0.01 (0.21)	−0.13 (0.03)	−0.05 (0.72)	0.08 (0.07)	−0.10 (0.03)
Child sex (0 = female, 1 = male)	−0.15 (0.08)**	−0.33 (0.14)***	−0.14 (0.02)*	0.01 (0.37)	−0.03 (0.79)	−0.05 (0.02)
Child generation (1=1st, 2=2nd)	−0.03 (0.12)	−0.04 (0.21)	0.10 (0.03)	0.07 (0.46)	0.12 (1.23)	0.02 (0.02)
Per capita income ($)	0.19 (0.00)*	0.19 (0.00)†	−0.11 (0.00)	0.06 (0.01)	−0.06 (0.02)	0.13 (0.00)
Parental education (years)	0.02 (0.00)	0.00 (0.04)	−0.05 (0.01)	0.16 (0.11)	0.05 (0.23)	−0.04 (0.01)
Parent years in the U.S.	−0.17 (0.08)*	0.10 (0.01)	−0.05 (0.00)	−0.08 (0.03)	0.03 (0.07)	0.01 (0.00)

Note. DV = dependent variable. Each indicator was tested in a separate model. Standardized betas with standard errors in parentheses are shown. (P) = parent report; (T) = teacher report;

† $p < .10$;

* $p < .05$;

** $p < .01$;

*** $p < .001$.