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Emotion Knowledge and Psychosocial Adjustment in Middle Childhood: A Cross-cultural

Longitudinal Investigation

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Abstract

The study is the first to examine the developmental trajectory of emotion knowledge (EK) as it relates to psychosocial adjustment in a cross-cultural context. European American (EA) and Chinese immigrant (CI) children in the U.S. ($n=130$, 59 boys) and their mothers participated. Children's EK was assessed, and their psychosocial adjustment was reported by mothers at three time points when children were 6.5, 7, and 8 years of age. Although EA children had greater EK at Time 1, CI children's EK grew faster over the following 1.5 years to catch up. EK was a protective factor for psychosocial adjustment for both cultural groups, but particularly helpful for children to cope with issues that they are most vulnerable in their respective cultural context.

Key words: emotion knowledge, psychosocial adjustment, culture

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Understanding one's own or other's emotions plays a critical role in children's socio-emotional development, affecting their stress coping, peer relationship, and psychosocial adjustment (Denham, 1986; Trentacosta & Fine, 2010; Yang & Wang, 2016). Understanding the situational antecedents of emotions, namely emotion knowledge, has been shown in the Western cultural context to help children maintain social relations and regulate their emotional behaviors, and in turn, serves as a protective factor for children's psychosocial adjustment. Importantly, extensive research has suggested the role of culture in emotional development (Q. Wang & Yang, 2019; Yang & Wang, 2019). Yet little is known about the development of emotion knowledge and its relations to psychosocial adjustment in different cultural contexts, especially during middle childhood. The present study examined the developmental trajectories and longitudinal relations of emotion knowledge and psychosocial adjustment among European American and Chinese immigrant children in the U.S.

Psychosocial Adjustment and the Role of Emotion Knowledge

Some of the most important outcomes of children's psychosocial adjustment include social competence, internalizing problems, and externalizing problems. As children's interaction with peers increases, their socially competent behaviors become more important in middle childhood, during which their internalizing and externalizing problems are common issues (Bongers et al., 2003; Ollendick, 1994). Internalizing problems are characterized by a core disturbance in intro-punitive emotions, such as anxiety, depressive mood, and somatic complaints. Externalizing problems signify the behaviors directed towards the external world, such as aggression, hyperactivity, and conduct problems. Internalizing and externalizing behaviors

are usually stable during early and middle childhood (Hymel et al., 1990). Research has identified a host of individual and environmental factors contributing to children's psychosocial adjustment, such as temperament, executive functioning, parenting behaviors, family structure, and so forth (e.g., Fung, 2021; Muhtadie et al., 2013; Y. Wang & Liu, 2021).

Among the factors, emotion knowledge is a significant factor that influences children's psychosocial adjustment. Emotion knowledge, an important aspect of emotional understanding, is the ability to comprehend what situations are likely to elicit what emotions (Denham, 1986; Q. Wang, 2001). As early as the first two years of life, infants may have built some correlations between emotional expressions (e.g., affective vocalization) and their causes (Wu et al., 2017). From the age of 2-3 years, children start to understand that certain situations can have impacts on one's emotions (Pons & Harris, 2019). By the end of preschool years, most children understand a range of situations that can elicit basic emotions (e.g., happiness, fear, anger, and sadness; Pons et al., 2004; Pons & Harris, 2019). In middle childhood, their more advanced cognitive skills, such as self-concept, enable them to understand more complex self-conscious emotions, such as pride, shame, and guilt (Lagattuta & Thompson, 2007). Therefore, middle childhood is a significant time when emotion knowledge is broadened in scope (Saarni et al., 2007).

Emotion knowledge may provide children with useful information about the possible emotions in specific situations and help children adopt adaptive responses and behaviors in these situations. Children with greater emotion knowledge are more likely to understand the causes for peer's negative emotions, interpret the situation correctly, behave in a socially competent manner, and in turn form positive interpersonal relationships (Denham et al., 1990, 2003). Understanding one's own or other's emotions also allows children to use adaptive strategies to regulate their emotions and select appropriate behavioral responses (Lemerise & Arsenio, 2000; Yang &

Wang, 2016). Lack of knowledge about emotions may mislead children's attribution of others' intentions and in turn lead to aggressive behaviors (Schultz et al., 2000). Moreover, children with difficulties in emotion understanding may relate inappropriate emotions to a given social situation and, consequently, experience and exhibit inappropriate emotions when they themselves are in these social situations (Halberstadt et al., 2001; Mostow et al., 2002). Overtime, these children may experience increased social difficulties or isolation and develop enduring patterns of negative emotions, such as anxiety or depression (Fine et al., 2003). Therefore, children with greater emotion knowledge may better regulate their internalizing and externalizing problems and behave adaptively.

Empirical evidence has shown small-to-medium correlations between emotion knowledge and the three constructs of psychosocial adjustment, internalizing problems, externalizing problems, and social competence (Trentacosta & Fine, 2010). For example, studies with preschoolers revealed negative correlations between children's emotion knowledge and their parent-reported internalizing problems and externalizing problems (Denham et al., 2002; Heinze et al., 2015). Similarly, school-aged children's emotion knowledge was associated with their greater level of social functioning and less withdraw from peers (Schultz et al., 2001). Longitudinal studies showed that children's emotion knowledge predicted their greater social skills and fewer internalizing problems several years later (Fine et al., 2003; Izard et al., 2001). However, most of the research has been conducted in Western countries. Recent cross-cultural studies have indicated cultural variations in values regarding emotions and meanings of certain social and emotional behaviors (Yang et al., 2020, 2021; Yang & Wang, 2019). Therefore, culture may play a role in the development of emotion knowledge and its relations to psychosocial adjustment.

Culture in Emotion Understanding and Well-being

Culture shapes the values regarding emotion expression, emotion regulation, and social behaviors (Chen & French, 2008; Markus & Kitayama, 1991). In European American culture, individuals value independence and autonomy. Emotion expression is considered self-assertion and highly encouraged. As a result, parents frequently discuss and explain emotions to facilitate children's emotion understanding (Doan & Wang, 2010; Q. Wang, 2006). In contrast, in East Asian cultures, such as China, group harmony and relatedness are valued to a greater extent. Explicit emotion expression or conversation is viewed as potentially disruptive to group harmony, so is relatively discouraged (Markus & Kitayama, 1991; Q. Wang, 2013). Parents in such cultures engage emotional discussion or explanation less, instead, focus more on behavioral expectations in their conversations with children (Doan et al., 2019; Doan & Wang, 2010; Q. Wang, 2001; Q. Wang & Fivush, 2005).

In line with the cultural values and parental emotion socialization practices, cross cultural studies have shown that the development of emotion knowledge varies in different cultural contexts (Doan et al., 2019; Doan & Wang, 2010; Q. Wang, 2008; Q. Wang et al., 2006; Yang & Wang, 2019). In an emotion judgment task, children were presented with scenarios in which the protagonist experienced discrete emotions and asked to judge what emotion the protagonist experienced in each scenario. Chinese preschoolers scored lower than European American children (Q. Wang, 2003; Q. Wang et al., 2006). Similarly, in an emotion situation production task, children were asked to list situations that could elicit certain emotions. Chinese and Chinese American preschoolers performed poorer than European American preschoolers (Doan et al., 2019; Doan & Wang, 2010; Q. Wang, 2008; Q. Wang et al., 2006), but the gap decreased from 3 to 4.5 years old for knowledge of basic emotions (Doan et al., 2019; Q. Wang, 2008).

Furthermore, studies with older children suggested that the cultural difference in emotion knowledge may further decrease or disappear in middle childhood. Yang and Wang (2016) found Chinese American children did not score lower in emotion knowledge than their European American counterparts around age 8, for both basic and self-conscious emotions. Additionally, in a study with Chinese participants, parents were asked to evaluate whether their children understood the meanings of emotional words (Li & Yu, 2015). Chinese children were reported to have significant improvement during the ages of 6-8 years. Compared to UK children, Chinese preschoolers (4-6 years old) were reported to have lower emotion word comprehension but Chinese school-aged children (7-10 years old) were reported to have greater understanding of the emotional words (Li & Yu, 2015). These studies suggested different developmental patterns of emotion understanding in various cultures, despite of the limitations on the cross-sectional design and parent-report methodologies. It remains as research questions what children's developmental trajectories of emotion knowledge look like during middle childhood in different cultures and when Chinese American children are able to catch up. Longitudinal studies are required to further examine this issue.

Culture also shapes well-being through the meanings and norms of certain emotional and social behaviors. In Western cultures, assertive social skill is an important socialization goal and social initiative is valued as an accomplishment. In contrast, social initiative may not be highly emphasized in East Asian cultures as it may disrupt the group harmony and cohesiveness. Instead, behavioral control may be valued more in such cultures (Chen & French, 2008). Accordingly, Chinese preschoolers participated in peer interactions less actively and displayed more nonsocial behaviors, such as passive solitary and parallel play, than did Canadian preschoolers (Chen et al., 2006). Asian American adolescents who more strongly endorsed

interdependence values exhibited more internalizing problems, whereas those who more strongly endorsed independent values showed more externalizing problems (Huang et al., 2017).

Furthermore, Asian American adolescents were more likely than European American adolescents to report higher rates of internalizing problems (see a review Anderson & Mayes, 2010), higher levels of depression and anxiety (Brown et al., 2007; Ingman, 1999), and lower levels of social adjustment and social skills (Ingman, 1999). Similarly, cross-country studies showed that Asian (Chinese, Japanese, and Thai) school-aged children (6-12 years old) were rated to have more internalizing problems, such as depressive symptoms (Weisz et al., 1987) and anxiety, but lower levels of externalizing problems such as impulsive aggression (without motivation or justification) and delinquency than the children from Greece (Savina et al., 2012) or the U.S. (Kawabata et al., 2010a). Therefore, previous studies suggest that Asian or Asian American children tend to have fewer externalizing problems but more issues on internalizing and socially competent behaviors.

Given the cultural differences in the values regarding emotions and emotion socialization practices, and in the vulnerability to certain emotional and behavioral problems, culture may moderate the relations between emotion knowledge and psychosocial adjustment. Although Trentacosta and Fine's meta-analyses (2010) suggested relatively consistent correlations between emotion knowledge and psychosocial adjustment, ethnicity appeared to moderate the negative relations between emotion knowledge and behavioral problems. For example, the negative correlations between emotion knowledge and internalizing problems were statistically significant in samples of primarily ethnic minorities, but not in samples of primarily European American children. On the other hand, emotion knowledge and externalizing problems were negatively correlated for European American children but not for ethnic minority children. Given the more

externalizing problems among European American children and more internalizing problems among Asians (e.g., Anderson & Mayes, 2010; Ingman, 1999; Kawabata et al., 2010b; Savina et al., 2012), these findings suggest that emotion knowledge may be particularly helpful for children to cope with issues and problems that they are most vulnerable in their specific cultural context. In a longitudinal study with preschool children, Doan and Wang (2018) investigated the relations between emotion knowledge and internalizing problems among European American and Chinese immigrant children and suggested the moderation role of culture. However, they focused on internalizing problems using children's emotion knowledge at age 3.5 to predict their internalizing problems at age 7. Considering the significant development of emotion knowledge during middle childhood, and the variations among different aspects of psychosocial adjustment, further longitudinal cross-cultural studies with various aspects of psychosocial adjustment are needed.

The Present Study

The present study examined the developmental trajectories and the longitudinal relations of emotion knowledge and psychosocial adjustment, including internalizing problems, externalizing problems, and adaptive skills among school-aged children from European American and first-generation Chinese immigrant families in the U.S. Children's emotion knowledge was assessed with the emotion situation production task, and their psychosocial adjustment was reported by mothers at each of the 3 time points when they were around 6.5, 7, and 8 years old. We expected children's emotion knowledge to increase over time in both cultural groups. However, according to cross-cultural research on children's emotion knowledge with preschoolers (Doan, et. al., 2019; Q. Wang, 2008) and school-aged children (Yang & Wang, 2016), Chinese immigrant children would have lower scores on overall emotion knowledge, or at

least knowledge of self-conscious emotions, than European American children at the first time point (around age 6.5) but would gradually catch up before the third time point (around age 8). For basic emotions, there might be no cultural difference according to the minimal gap between European American and Chinese immigrant children at 4.5 years old as shown in previous studies (Doan, et. al., 2019; Q. Wang, 2008). Furthermore, based on the studies conducted within the U.S. (Anderson & Mayes, 2010; Brown et al., 2007; Ingman, 1999) and across countries (Kawabata et al., 2010; Savina et al., 2012; Weisz et al., 1987), we expected children's psychosocial adjustment to have different patterns in the two cultural groups. Specifically, Chinese immigrant children might have more issues on internalizing problems and socially adaptive skills, whereas externalizing problems might be relatively more among European American children. Moreover, we expected both cultural similarities and differences in the relations between emotion knowledge and psychosocial adjustment. Specifically, we expected that emotion knowledge would serve as a protective factor for children in both cultural groups, but it would be especially helpful for the behavioral issues more commonly found in their respective cultural groups, namely, externalizing problems for European American children and internalizing problems and issues regarding socially adaptive skills for Chinese immigrant children (e.g., Anderson & Mayes, 2010; Ingman, 1999; Kawabata et al., 2010b; Savina et al., 2012).

Method

Participants

Data were collected at three time points. At Time 1, 68 European American (EA) children (28 boys; *age range* = 5.77 – 7.56 years, *M* = 6.67 years) and 62 Chinese immigrant (CI) children (31 boys; *age range* = 5.73 – 7.63 years, *M* = 6.62 years) and their mothers participated. Children were recruited by word-of-mouth and through local schools in upstate

New York. They were taking part in a larger longitudinal study of socio-cognitive development during middle childhood. All children were from middle-class families and the majority of mothers (EA: 97%, CI: 98%) had college education or beyond. All CI children's parents were first-generation Chinese immigrants in the U.S. CI mothers had on average lived in the U.S. for 12.5 years ($SD = 4.50$). Mothers provided consent for their children to participate in this study, and children provided assent. After six months, at Time 2, 59 EA children (22 boys; *age range* = 6.28 – 8.01 years, $M = 7.18$ years) and 58 CI children (30 boys; *age range* = 6.13 – 8.18 years, $M = 7.11$ years) and their mothers were visited again. Another year later, at Time 3, 54 EA children (19 boys; *age range* = 7.33 – 9.03 years, $M = 8.23$) and 49 CI children (26 boys; *age range* = 7.11 – 9.23 years, $M = 8.12$) remained in the sample. Thirteen families failed to participate at Time 2 and another 14 families dropped at Time 3 primarily due to family move. There was no significant difference in any measures between children who completed all three visits and those who dropped out after the first visit.

Procedure

Two trained female research assistants visited children at their home at each time point. One primary researcher interviewed children and the other researcher videotaped the entire procedure. At each visit, children's emotion knowledge was assessed with an emotion situation production task, and mothers completed a set of questionnaires about their children's psychosocial adjustment, verbal skills, and other aspects of child development. The questionnaires were written in both Chinese and English, and a translation and back-translation procedure was applied to ensure a balanced equality of both literal and sense meaning. Chinese immigrant children were visited by English-Chinese bilingual researchers and completed the emotion knowledge task in the language of the child's choice. There were 14, 10, and 1 child

chose to speak Chinese in the emotion knowledge task at Time 1, Time 2, and Time 3 respectively. Each home visit took approximately 2 hours. Only tasks relevant to the current study are described here.

Measures

Emotion knowledge (EK)

Children's emotion knowledge was assessed with an emotion situation production task (Doan & Wang, 2010; Harris et al., 1987; Q. Wang et al., 2006). Children were asked to describe situations that would provoke a certain emotion in people (e.g., "What makes people happy?"). The interviewer asked, "What else makes people happy?" to prompt children to respond with as many situations as possible until children indicated by speech or gesture that their responses were exhausted. After children finished answering each emotion question, the interviewer gave them a sticker to keep them interested throughout the task. A total of 7 emotions were asked, including happiness, sadness, fear, anger, guilt, pride, and shame. The order of emotions was randomized for each child.

Children's responses in the EK task were coded into categories that address conceptually distinct types of situations (Yang & Wang, 2016). For example, categories of situations that make people feel sad include "losing desirable objects," "unable to engage in desirable activities," "being hurt physically," and so forth. The number of unique categories children provided for each emotion was counted, yielding 7 scores for the 7 emotions, respectively. We then created a composite score of overall EK by averaging children's scores of the seven emotions, a composite score for basic emotions (EK_basic) by averaging the scores of four basic emotions (happiness, sadness, fear, and anger), and a composite score for self-conscious

emotions (EK_SC) by averaging the scores of three self-conscious emotions (guilt, pride, and shame).

Two trained research assistants coded children's responses. For each cultural group, one research assistant coded the data and a second assistant coded 20% of the data independently for reliability check. Both coders were blind to the study hypotheses. The average inter-coder reliability *rs* across all emotions were .83, .89, .87 for EA children, and .87, .88, .89 for CI children at the 3 time points respectively. Disagreements were discussed and resolved among the coders.

Psychosocial adjustment

At each time point, mothers completed the *Behavior Assessment System for Children, Second Edition – Parent rating Scales – Child (BASC-2 PRS-C)*, which concerns the relative frequency of a variety of adaptive and maladaptive behaviors in children (Reynolds & Kamphaus, 2004). The measurement includes 160 items and yields three composite scores, including externalizing problems composite, internalizing problems composite, and adaptive skills composite. Externalizing problems composite measures children's disruptive behaviors, including subscales of hyperactivity, aggression, and conduct problems. Internalizing problems composite includes subscales of anxiety, depression, and somatization. Adaptive skills composite assesses children's core characteristics of adaptive behaviors when interacting with the social environment, including subscales of adaptability, social skills, leadership, activities of daily living, and functional communication. Children's scores for each of the subscales were computed and converted to T-scores based on the age-appropriate General Combined norm set presented in the manual (Reynolds & Kamphaus, 2004). Scores for the composites (i.e., externalizing problems, internalizing problems, adaptive skills) were the sums of the T-scores of the respective

subscales. The Cronbach's alphas for internalizing, externalizing problems, and adaptive skills in the current sample were .84, .91, and .90, respectively for EA children, and .64, .87, and .89 respectively for CI children at Time 1, .88, .90, and .91, for EA children, and .85, .88, and .91 for CI children at Time 2, and .90, .88, and .91, for EA children, and .88, .89, and .91 for CI children at Time 3.

Verbal skills. At all 3 time points, mothers filled out a Child Communication Survey (Feagans & Farrans, 1997) that assessed children's discourse and narrative abilities, including listening, spontaneity, comprehension, production, rephrase, and fluency. Children's abilities were rated on a 5-point scale from 1 (*well below average*) to 5 (*well above average*). The ratings were aggregated to index the children's verbal skills. CI mothers rated their children's communication skills in English and Chinese, respectively. The scores for the language that children used in the interview at each visit were used in analyses.

Results

Preliminary Analyses

Means and standard deviations are presented in Table 1. There was no difference in any measures between CI children who were interviewed in English and those who chose to speak Chinese. Therefore, the whole sample was included in analyses regardless which language children chose to speak during the interview.

The Developmental Trajectory of Emotion Knowledge

To investigate the developmental trajectories of children's emotion knowledge, we used unconditional latent growth curve (LGC) modeling to identify developmental trajectories of children's emotion knowledge overall, as well as knowledge of basic emotions and knowledge of self-conscious emotions separately in Mplus version 6.12. In addition, we controlled for the

effect of intercept on slope (i.e., the effects of initial levels of emotion knowledge on the change rates of emotion knowledge).

We performed LGC models with factor loadings of 0, 1, 3 on slope for Time 1, Time 2, and Time 3 respectively, as the second interval was twice as the first interval. Results showed that the unconditional linear model fitted the data well for overall emotion knowledge, $\chi^2(1) = .13$, $p = .71$, comparative fit index (CFI) = 1.00, root mean square error of approximation (RMSEA) < .001, standardized root mean square residual (SRMR) = .009. The initial level (intercept) and the change rate (slope) were both significantly different from 0. Children's overall emotion knowledge increased over the three time points. The variances of the latent intercept and slope were significant, indicating interindividual variability in both initial level and change rate of emotion knowledge. We further modeled knowledge of basic emotions and self-conscious emotions separately. The two unconditional linear models fitted well for both basic emotions and self-conscious emotions, $\chi^2(1) < .08$, $p > .78$, CFI = 1.00, RMSEA < .001, SRMR = .007. Means and variances of the intercepts and slopes are presented in Table 2, and details of model fit are presented in Table S1.

To examine the factors related to children's development of emotion knowledge, we constructed a conditional LGC model (Model A) with factor loadings 0, 1, 3 on slope for Time 1, Time 2, and Time 3 respectively, using children's culture, gender, age, and verbal skills predicting the intercept and slope of the developmental trajectories of overall emotion knowledge. Results showed that the conditional model fitted well, $\chi^2(5) = 4.60$, $p = .47$, CFI = 1.00, RMSEA < .001, SRMR = .026. The intercept of emotion knowledge was negatively correlated to the slope, indicating that children at Time 1 starting with lower levels tended to increase more in emotion knowledge over time. Culture (EA = 0, CI = 1), gender (male = 0,

female = 1), age, and verbal skills at Time 1 significantly predicted the initial level of emotion knowledge, whereby EAs, girls, older children, and children with a higher level of verbal skills had a higher initial level of emotion knowledge at Time 1 (Table 3) than CIs, boys, younger children, and children with a lower level of verbal skills respectively. There was a marginal cultural difference in the slope, $\beta = 0.23$, $p = .051$, whereby CI children developed faster in emotion knowledge from Time 1 to Time 3 than did EA children. To further examine the factors at Time 2 predicting emotion knowledge at Time 2, we constructed another conditional LGC model (Model B) on overall EK with factor loadings of -1, 0, 2 on slope for Time 1, Time 2, and Time 3. The results of this model showed that gender, age, and verbal skills at Time 2 again positively predicted children's emotion knowledge at Time 2. While there was no cultural difference in intercept of this model, the effect of culture on the slope was significant (Table 3). Specifically, CI children's emotion knowledge increased with a greater rate over the three time points, compared to EA children. The coefficients of each factor predicting the intercepts and slopes are presented in Table 3, and the details of model fit are presented in Table S1.

To examine the factors related to the means and change rates of children's knowledge of basic emotions and self-conscious emotions across the 3 time points, we constructed 2 conditional LGC models (Model As) with factor loadings of 0, 1, 3 on slope, and 2 conditional LGC models (Model Bs) with factor loadings of -1, 0, 2, and additional 2 conditional LGC models (Model Cs) with factor loadings of -3, -2, 0 for Time 1, Time 2, and Time 3 respectively, using children's culture, gender, age, and verbal skills predicting the intercept and slope of the basic and self-conscious emotion knowledge. Results showed no cultural difference in knowledge of basic emotions at any time point, but significant cultural difference in knowledge of self-conscious emotions at Time 1 and Time 2 (Table 3). Specifically, CI children had a lower

level of knowledge of self-conscious emotions than did EA children at Time 1 and Time 2 but caught up at Time 3 (8 years old). Culture also predicted the slope for basic emotions, whereby CI children's knowledge of basic emotions increased with a greater rate over the three time points than did EA children (Table 3). Gender contributed to the mean levels of knowledge of basic emotions across the three time points, but not for self-conscious emotions. Age and verbal skills were also significant factors for knowledge of both basic and self-conscious emotions, especially at Time 1 and Time 2. Detailed results of the conditional LGC models are presented in Table 3, and the details of model fit are presented in Table S1.

Psychosocial Adjustment Over Time

We then conducted three 2 (culture) $\times$ 2 (gender) $\times$ 3 (time point) mixed model analyses on externalizing problems, internalizing problems, and adaptive skills, with culture and gender being between-subject factors, time point being a within-subject factor, and subject being a random factor. Children's verbal skills and age were included as covariates. Results showed that the effects of culture, $\beta = -10.29$, $t = -3.01$, $p = .003$, gender, $\beta = -10.03$, $t = -2.94$, $p = .004$, and verbal skills, $\beta = -0.19$, $t = -2.15$, $p = .03$, on externalizing problems were significant, whereby EAs, boys, and children with a lower level of verbal skills had more externalizing problems than CIs, girls, and children with more verbal skills respectively. However, internalizing problems were not significantly predicted by any of the factors. For adaptive skills, the results revealed significant effects of culture, $\beta = -19.55$, $t = -5.03$, $p < .001$, age, $\beta = 7.63$, $t = 2.16$, $p = .03$, and verbal skills, $\beta = 0.87$, $t = 6.58$, $p < .001$, whereby EAs, older children, and children with more verbal skills had more adaptive skills than CIs, younger children, and children with fewer verbal skills, respectively. No other effects were significant. Full results are presented in Table S2.

The Relations between Emotion Knowledge and Psychosocial Adjustment

To examine the relations between emotion knowledge and psychosocial adjustment, we performed mixed model analyses to examine the concurrent and longitudinal effects of emotion knowledge on the three aspects of psychosocial adjustments with two cultural groups combined, and then for EA and CI children separately to further examine our hypotheses. At first, we examined the concurrent effects of emotion knowledge on psychosocial adjustment, controlling for gender, age, verbal skills, time point, and the random effects of subject. Second, we examined the effects of children's emotion knowledge on their psychosocial adjustment at the next visit (i.e., emotion knowledge at Time 1 predicting psychosocial adjustment at Time 2, and emotion knowledge at Time 2 predicting psychosocial adjustment at Time 3). Finally, we examined how emotion knowledge at Time 1 predicted psychosocial adjustment at Time 3. Additional mixed model analyses with knowledge of basic emotions and self-conscious emotions separately yielded similar results, so we reported the results on overall emotion knowledge below.

To examine the concurrent relations between EK and psychosocial adjustment, three 2 (gender) $\times$ 3 (time point) $\times$ 2 (culture) mixed model analyses were conducted on externalizing problems, internalizing problems, and adaptive skills, with EK as the major predictor, verbal skills and age as covariates. Results showed that there was no main effect of EK or the interaction effect of Culture $\times$ EK on any aspect of psychosocial adjustment. To further examine our hypotheses, we investigated the concurrent effects of EK on psychosocial adjustment for each cultural group separately but found no significant effect. Full results are presented in Table S3.

To investigate whether EK had lag effects on psychosocial adjustment, we first looked at the effects of EK at time $t-1$ (EK_{t-1}) on psychosocial adjustment at time t ($t=time\ 2\ or\ time\ 3$).

We conducted three 2 (culture) $\times$ 2 (gender) $\times$ 2 (time point) $\times$ EK_{t-1} mixed models on externalizing problems, internalizing problems, and adaptive skills, with EK_{t-1} as the major predictor, children's verbal skills, age, and concurrent EK as covariates. There was a significant main effect of EK_{t-1} on internalizing problems, $\beta = -2.65$, $t = -2.38$, $p = .018$, qualified by a marginally significant interaction effect of Culture $\times$ EK_{t-1} , $\beta = -4.04$, $t = -1.90$, $p = .059$. No other main or interaction effect of EK_{t-1} was significant. Full results are presented in Table S4.

To further examine our hypothesis, we conducted three 2 (gender) $\times$ 2 (time point) mixed models on externalizing problems, internalizing problems, and adaptive skills for each cultural group, with EK_{t-1} as the major predictor, children's verbal skills, age, and concurrent EK as covariates. The results showed that EK_{t-1} negatively predicted internalizing problems reported at the next visit for CI children, $\beta = -4.54$, $t = -3.21$, $p = .002$, but not for EA children, $\beta = -1.24$, $t = -0.76$, $p = .45$. Furthermore, EK_{t-1} had a marginal positive effect on adaptive skills for CI children, $\beta = 4.65$, $t = 1.79$, $p = .077$, but not for EA children, $\beta = 1.17$, $t = 0.57$, $p = .57$. No other effects of EK_{t-1} on psychosocial adjustment for the two cultural groups were significant.

Finally, we examined the lag effects of EK at Time 1 on psychosocial adjustment at time 3. We conducted another three mixed model analyses on externalizing problems, internalizing problems, and adaptive skills, with EK_{t-2} as the major predictor, gender, verbal skills, age, concurrent EK, and EK_{t-1} as covariates. There were no significant main effects or interaction effects of EK_{t-2} . Full results are presented in Table S5. However, the results from the models conducted for each cultural group revealed a significant negative effect of EK_{t-2} on externalizing problems for EA children, $\beta = -6.64$, $t = -2.09$, $p = .04$, but not for CI children, $\beta = 4.00$, $t = 1.22$, $p = .23$. No other effects of EK_{t-2} were significant for the two cultural groups. The lag effects of EK on psychosocial adjustment for each cultural group are illustrated in Figure 1.

In order to examine the possibility of the other direction of the relation between emotion knowledge and psychosocial adjustment, we used mixed models to examine the concurrent and lag effects of externalizing problems, internalizing problems, and adaptive skills on emotion knowledge. We did not find any concurrent or lag effects of psychosocial adjustment on emotion knowledge.

Discussion

The present study is the first to examine the developmental trajectory of school-aged children's emotion knowledge as it relates to psychosocial adjustment in a cross-cultural context. The results revealed both cultural similarities and differences. First, on one hand, both European American and Chinese immigrant children's emotion knowledge increased over time. On the other hand, European American children had greater overall emotion knowledge at the initial time point when children were around age 6.5, compared to Chinese immigrant children whose emotion knowledge grew faster over the 1.5 years and were able to catch up. Second, European American children were reported more externalizing problems and adaptive skills than Chinese immigrant children. Finally, children's emotion knowledge did not have concurrent correlations with, but had lag effects on, their psychosocial adjustment which were differential in the two cultures. Specifically, emotion knowledge was a protective factor for Chinese immigrant children's internalizing problems and adaptive skills during the next visit, whereas emotion knowledge around at Time 1 (6.5 years old) protected European American children from externalizing problems at Time 3 (8 years old). Our findings suggested that the relation between these two aspects of social and emotional development was only from emotion knowledge to psychosocial adjustment, instead of the opposite or being bidirectional.

Children's emotion knowledge increase in middle childhood, with a faster growth rate among Chinese immigrant children than European American children. The current findings regarding the improvement of emotion knowledge are consistent with previous studies with children in middle childhood. For example, Pons and colleagues found children's understanding of external causes of emotions increased drastically from 5 to 7 years old with cross-sectional data (Pons et al., 2004) and from 7 to 8 years old with longitudinal data (Pons & Harris, 2005).

Conditional LGC models revealed several factors that affected the development of children's emotion knowledge, such as age, verbal skills, and culture. Consistent with previous studies, children with greater verbal skills tend to better understand emotions (Doan & Wang, 2018; Jenkins et al., 2003). Cross-cultural studies on children's emotion knowledge have been majorly focused on preschoolers. Chinese and Chinese American preschoolers had lower levels of emotion knowledge than European American counterparts (Doan & Wang, 2010; Q. Wang, 2008; Q. Wang et al., 2006). This study extended the previous cross-cultural studies and revealed the faster growth rates of Chinese immigrant children compared to European American children in middle childhood. The additional conditional Latent Growth Curve Model with Time 2 predictors showed that culture was not a significant factor for children's emotion knowledge at Time 2 after controlling for children's gender, age and verbal skills at Time 2, indicating that Chinese children's overall emotion knowledge might be able to catch up around age 7. Separate conditional LGC models for basic and self-conscious emotions suggested that Chinese immigrant children's knowledge of basic emotions had caught up before age 6.5, consistent with previous studies (Doan, et. al., 2019; Q. Wang, 2008). However, Chinese immigrant children had a lower level of knowledge for self-conscious emotions at Time 1 and Time 2 but were able to catch up at Time 3 (age 8). Middle childhood may be an important period for children to gain

knowledge of self-conscious emotions, especially for Chinese immigrant children, as these emotions are relatively more complex to understand and require more sophisticated cognitive skills, such as self-understanding, self-evaluation, understanding others' minds and so on (Lagattuta & Thompson, 2007).

Similar to emotion knowledge, children's psychosocial adjustment was also related to their verbal skills and cultural background. Specifically, children's verbal skills were negatively related to their externalizing problems, but positively related to adaptive skills, supporting the important role of language and communication skills in children's socio-emotional development (Eisenberg et al., 2005; Trentacosta & Fine, 2010). Consistent with previous cross-cultural studies with adolescents (Ingman, 1999; Kawabata et al., 2010), Chinese immigrant school-aged children had fewer externalizing problems and lower levels of adaptive skills, than did European American children. However, the internalizing problems did not differ significantly between two cultural groups in the current sample, possibly because children's internalizing problems were less prevalent in childhood compared to adolescence (Bongers et al., 2003; Davey et al., 2008; Ollendick, 1994). The cultural differences in internalizing problems may emerge later in adolescence when the rates further increase.

In line with our hypothesis, emotion knowledge is a significant contributor to children's psychosocial adjustment during middle childhood for both cultural groups, despite of differences in specific relations. Greater emotion knowledge may allow children to predict their own and others' emotions in certain situations, and in turn help them regulate their own emotions and behave adaptively in these situations (Denham et al., 2003; Lemerise & Arsenio, 2000; Yang & Wang, 2016). Interestingly, we found that emotion knowledge was particularly helpful for the issues common in the cultural group (i.e., externalizing problems among European American

children; internalizing problems and adaptive issues among Chinese immigrant children). Specifically, greater emotion knowledge predicted fewer externalizing problems only for European American children but predicted fewer internalizing problems and better adaptive skills only for Chinese immigrant children. It is possible that for the issues that children are more vulnerable to, understanding emotions is especially important and helpful. However, the findings regarding internalizing problems are not completely consistent with previous cross-cultural comparisons conducted by Doan & Wang (2018). They found that emotion knowledge at age 3.5 predicted fewer internalizing problems at age 7 for European American children but more internalizing problems for Chinese immigrant children (Doan & Wang, 2018). These differences may be due to the significant increase in emotion knowledge during early middle childhood for Chinese immigrant children. Their emotion knowledge at later age may be more predictive for their psychosocial adjustment. Some studies among Chinese children in China also revealed that children's emotion understanding predicted fewer internalizing problems and better social competence (Yao et al., 2020; Zhao et al., 2006), consistent with our findings for Chinese immigrant children.

Future cross-cultural studies are needed to corroborate the findings in this paper and examine the mechanism behind them. Although parental report is an appropriate approach for children at this age and has been extensively used in previous studies, children's psychosocial adjustment, especially internalizing problems may not be easy to detect given the internal nature. Studies with data from multiple sources, such as reports from both teachers and parents, and interviews with children might improve the measurement. Furthermore, this study suggested the important and unique role of children's emotion knowledge in their later psychosocial adjustment among European American and Chinese immigrant families. However, the

underlying mechanisms are unclear yet. Further studies may examine how and why emotion knowledge contribute to the specific aspects of psychosocial adjustment for each cultural group.

In conclusion, this study illustrates the growth patterns of emotion knowledge in early middle childhood with children from two cultural groups in the U.S. It also signifies the critical role of emotion knowledge in children's psychosocial adjustment. These findings shed light on the intervention programs on children's well-being and mental health, and particularly valuable for programs that target immigrant children or children from different cultural backgrounds.

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Table 1

Means and Standard Deviations of Emotion Knowledge and Psychosocial Adjustment at the 3 Time Points

	Time 1				Time 2				Time 3			
	EA		CI		EA		CI		EA		CI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
EK	2.78	.95	2.38	.85	3.07	1.12	2.51	.91	3.22	1.17	3.34	1.07
EK_basic	3.71	1.35	3.28	1.21	3.90	1.58	3.41	1.11	3.93	1.56	4.17	1.33
EK_SC	1.55	.74	1.15	.71	1.95	.94	1.32	.89	2.27	.95	2.22	1.05
Externalizing problems	149.99	25.07	141.61	17.86	147.34	23.90	141.72	19.19	150.13	21.00	143.18	19.12
Internalizing problems	145.37	19.89	146.39	18.19	145.29	18.81	146.28	17.41	146.67	21.71	144.41	19.23
Adaptive skills	258.39	31.52	230.81	15.95	255.93	30.11	232.37	27.92	258.02	27.67	238.46	28.87

Note. EA represents European American children, and CI represents Chinese immigrant children. EK_basic and EK_SC indicate children's knowledge of basic emotions and self-conscious emotions respectively.

Table 2

Unconditional LGC Models for Emotion Knowledge

<i>Unconditional LGC models (unstandardized)</i>	intercept		Slope	
	<i>M</i>	Variance	<i>M</i>	Variance
EK	2.59***	.73***	.22***	.15**
EK_basic	3.50***	1.24**	.17**	.23**
EK_SC	1.36***	.35**	.29***	.05

Note. EK_basic and EK_SC indicate children's knowledge of basic emotions and self-conscious emotions respectively.

** $p < .01$ *** $p < .001$

Table 3

Conditional LGC Models for Emotion Knowledge

<i>Conditional LGC models predicting the intercepts and slopes of <u>overall emotion knowledge</u> at Time 1 (T1), Time 2 (T2) and Time 3 (T3)</i>						
	T1 predictors (Model A1)		T2 predictors (Model B1)		T3 predictors (Model C1)	
<i>Predictors</i>	Intercept	Slope	Intercept	Slope	Intercept	Slope
Culture	-.19*	.23†	-.12	.30*	.17	.31**
Gender	.23**	.10	.34***	.08	.33**	.06
Age	.25**	.13	.44***	.09	.37***	.11
Verbal skills	.19*	.19	.16*	.02	.04	.003
<i>Conditional LGC models predicting the intercepts and slopes of <u>basic emotion knowledge</u> at Time 1 (T1), Time 2 (T2) and Time 3 (T3)</i>						
	T1 predictors (Model A2)		T2 predictors (Model B2)		T3 predictors (Model C2)	
<i>Predictors</i>	Intercept	Slope	Intercept	Slope	Intercept	Slope
Culture	-.13	.21†	-.06	.29*	.21	.30*
Gender	.30***	.04	.40***	.03	.30**	.01
Age	.25**	.05	.41***	<.001	.28*	.03
Verbal skills	.16†	-.08	.15†	.07	.04	.02
<i>Conditional LGC models predicting the intercepts and slopes of <u>self-conscious emotion knowledge</u> at Time 1 (T1), Time 2 (T2) and Time 3 (T3)</i>						
	T1 predictors (Model A3)		T2 predictors (Model B3)		T3 predictors (Model C3)	
<i>Predictors</i>	Intercept	Slope	Intercept	Slope	Intercept	Slope
Culture	-.38*	.41	-.32*	.53	.03	.48
Gender	-.03	.39	.17	.35	.44	.27
Age	.21†	.53	.53***	.57	.92	.47
Verbal skills	.28*	-.12	.20†	-.18	.10	-.07

Note. The coefficients are standardized. The value of culture for European American was 0, for

Chinese immigrant children was 1. The value of gender for male was 0, for female was 1. In

Model As with Time 1 predictors, the factor loadings on slope were 0, 1, 3 for Time 1, Time 2,

and Time 3. In Model Bs with Time 2 predictors, the factor loadings on slope were -1, 0, 2 for

Time 1, Time 2, and Time 3, respectively. In Model Cs with Time 3 predictors, the factor

loadings on slope were -3, -2, 0 for Time 1, Time 2, and Time 3, respectively. Therefore, the

intercept in Model As was EK at Time 1, the intercept in Model Bs was EK at Time 2, and the

intercept in Model Cs was EK at Time 3.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

Figure 1

The Lag Effect of Emotion Knowledge on Psychosocial Adjustment in European American (EA) and Chinese immigrant (CI) Children

a

b

Note. Each dot represents an individual participant. Among Chinese Immigrant children (CI, red triangles), emotion knowledge (t-1) positively predicted adaptive skills and negatively predicted internalizing problems (red dashed lines). For European American children (EA, blue squares), emotion knowledge at Time 1 negatively predicted externalizing problems at Time 3 (blue solid line). Other associations were not significant. The shadows indicate the 95% confidence intervals for the regression lines.

† $p < .10$ * $p < .05$ ** $p < .01$