

# Inhibitory Control and Harsh Discipline as Predictors of Externalizing Problems in Young Children: A Comparative Study of U.S., Chinese, and Japanese Preschoolers

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**Abstract** We examined associations between child inhibitory control, harsh parental discipline and externalizing problems in 120 4 year-old boys and girls in the US, China, and Japan. Individual differences in children's inhibitory control abilities, assessed using behavioral tasks and maternal ratings, were related to child externalizing problems reported by mothers. As predicted, both child inhibitory control and maternal harsh discipline made significant contributions to child externalizing problems in all three countries. Across countries, child inhibitory control and maternal harsh discipline made significant *independent* contributions to early externalizing problems, suggesting an additive model of association. Our findings supported the cross-cultural generalizability of child inhibitory control and parental harsh punishment as key contributors to disruptive behavior in young children.

**Keywords** Inhibitory control · Parenting · Cultural processes · Externalizing problems · Preschool · Gender differences

The main goal of this study was to examine the cross-cultural generalizability of theoretical models linking deficits in

children's self-regulation and socialization experiences to early symptoms of disruptive behavior. Problems of aggression, impulsivity, and inattention, often labeled "externalizing behaviors", can be identified in the toddler and preschool years (Keenan and Wakschlag 2004). Moreover, individual differences in externalizing behaviors persist at moderate levels across the transition from early to middle childhood (Campbell et al. 2000). Once established, these problems place children at risk for a wide range of escalating negative outcomes including academic failure, rejection by peers, conflicted interactions with parents, siblings, peers, and teachers, and delinquent behavior (Dodge and Pettit 2003). Thus, identifying risk factors associated with early externalizing behaviors has important implications for theory and intervention (Olson et al. 2009). However, most studies of children's early externalizing behavior have been carried out with Western populations. A major gap in knowledge concerns the generalizability of predictive models across different cultural contexts, particularly between Western and non-Western countries (Tardif et al. 2009). In what follows, we discuss two domains of risk factors that have been linked to the emergence of early externalizing problems: difficulties in children's executive self-regulation skills and experiences with harsh parental discipline. Next, we examine these risk factors in cross-cultural perspective and propose tests of integrative predictive models.

## Deficits in Self-Regulation

A growing body of research with Western samples indicates that childhood externalizing problems may reflect inadequate regulation of attention and impulses (e.g., Hughes et al. 2000; Moffitt 2003). Individual differences in executive

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attention and inhibitory control develop rapidly during the toddler and preschool years and are thought to underlie the establishment of children's behavioral adjustment (Carlson 2005; Jones et al. 2003; Zelazo et al. 2003). Supporting this theory, preschool-age children with high levels of externalizing problems have been found to manifest lower levels of inhibitory and attentional abilities than others (Hughes and Ensor 2006; Olson et al. 2005; Raaijmakers et al. 2008). For example, Olson et al. (2005) found that deficits in effortful control, a behavioral index of early inhibitory and attentional focusing skills, predicted concurrent levels of toddlers' externalizing problems at home and at preschool, even after controlling for co-occurring contributions of child IQ and family adversity. Moreover, children's poor effortful control skills have been found to predict the growth of externalizing problem behavior across the school-age years (Zhou et al. 2007).

Most studies linking early behavioral adjustment with deficient self-regulation have been carried out with children growing up in Western cultures. Given that both early externalizing behaviors and self-regulatory skills have important implications for children's later social, emotional, and academic functioning, it is important to examine the generalizability of this theory to children growing up in non-Western countries. One comparative cross-cultural study showed that preschoolers growing up in the Peoples Republic of China performed better on a variety of executive function tasks than their U.S. peers (Sabbagh et al. 2006). However, there is little information linking individual differences in Chinese preschoolers' executive skills to the emergence of externalizing symptoms. Moreover, little is known about associations between executive functioning and adjustment in preschoolers from other East Asian cultures. Finally, as shown below, associations between children's inhibitory skills and adjustment must be understood in the context of early socialization experiences, particularly harsh parenting behaviors that are believed to hinder the development of competent self-regulation (Hughes and Ensor 2006; Olson et al. 2009). Because parenting practices may be strongly influenced by culture (e.g., Bugental and Grusec 2006), it is instructive to consider this association in cross-cultural contexts.

### Early Socialization Experiences

Parents' behavioral strategies have been related to the development of good vs. poor self-regulation skills in young children (e.g., Olson et al. 2009; Spinrad et al. 2004). In this paper we focus on one key dimension of parenting risk, use of harsh disciplinary practices. A large body of research has shown that children who experience relatively high levels of physically and emotionally punitive

disciplinary transactions with caregivers tend to manifest lower levels of self-regulation and higher levels of externalizing problems than others (e.g., Chang et al. 2003; Gershoff 2002; Lansford et al. 2005). For example, in a meta-analysis of studies conducted within the U.S., Gershoff (2002) found that frequent physical punishment was associated with high levels of child aggression and antisocial behavior in all 27 reports. Furthermore, frequent corporal punishment has been linked to the growth of children's aggression across time (Grogan-Kaylor 2005), and to the diminishment of competent self-regulatory skills (Eisenberg et al. 2007; Zhou et al. 2004). Given that impulsive, disruptive behavior elicits upper-limit controls and negative affect from caregivers, these associations have been widely understood as bidirectional in nature (e.g., Sameroff 2009).

Existing research suggests characteristics of East Asian cultures that may have profound effects on the socialization of self-regulation in young children (Tardif et al. 2009). Most relevant work has highlighted families and young children growing up in the Peoples Republic of China. Chinese parents have been shown to strongly endorse the value of promoting emotional restraint and impulse control in their children (Chen et al. 2005; Liu et al. 2005). Furthermore, because of a strong cultural emphasis upon maintaining social harmony, socially disruptive behaviors are viewed negatively and prohibited in family and school settings (Chen et al. 2005). Thus, from a young age Chinese children are taught to suppress impulsivity, anger, and aggression (Cheah and Rubin 2004; Wang et al. 2006). Conversely, cultural values concerning the importance of effortful behavior underpin Chinese parents' socialization practices around rigorous, early self-control training (Chao et al. 2000; Chen et al. 2003). Practices described above predict differences in children's behavior across different cultural contexts. However, individual differences in the association between harsh discipline and child behavior within Chinese culture have been shown to parallel those of children growing up the West. For example, studies have shown that Chinese parents' power assertive discipline (e.g., frequent use of prohibitions, direct commands without explanations) with their toddler-age children predicted high levels of child aggression 2 years later, whereas inductive discipline was associated with low levels of aggression (Chen 2002 and Wang et al. 2006). Similarly, in Chinese families of school-age children, power assertive parenting has been linked with low levels of child inhibitory control, and with high levels of child anger/frustration (Eisenberg et al. 2007) and aggressive behavior (Eisenberg et al. 2009; Nelson et al. 2006).

Examining the socialization of self-regulation among children growing up in Japanese culture also is a compelling issue (Tobin et al. 2009). Historically, Japanese parents

have strongly valued internalized self-regulation (e.g., Kojima 1986). Socialization of self-regulation in young Japanese children is thought to reflect the influence of a close, emotionally supportive mother–child relationship (Lebra 1994). For example, in observational studies comparing the socialization of self-regulation in Japanese and German preschool girls, aggressive and noncompliant behavior was far more frequent among the German preschoolers (Trommsdorff and Kornadt 2002). Among Japanese parent–child dyads, conflict escalation rarely occurred. Instances of child misbehavior (such as noncompliance or displays of temper) also were rare in Japanese children, and were attributed by mothers to the child’s immaturity. In contrast, German mothers were more likely to become angry when their preschoolers did not comply immediately. Conflicts between German mothers and their children frequently escalated, and mothers tended to attribute occurrences of misbehavior to hostile motives on the part of the child. Nine years later, frequent mother–child conflict in early childhood had a small but significant association with German children’s aggressive behavior during the late school-age years (Kornadt and Tachibana 1999). There was no such association for Japanese children. Similarly, other recent observational studies have shown that in comparison with U.S. mothers, Japanese mothers of preschool-age children encourage greater social relatedness (Dennis et al. 2007) and tend to attribute child misbehavior to needs for security and support rather than to needs for individual self-maximization (Rothbaum et al. 2007).

In summary, there has been relatively little research linking child and parenting risk factors with early symptoms of externalizing problems in Chinese and Japanese preschoolers. It is important to understand how culture influences behavioral adjustment in young children, especially during the preschool years when self-regulation skills are rapidly maturing. Ideally, further research also should include simultaneous assessments of child and parenting behavior, so that we can better understand associations between child regulation difficulties, risky parenting behavior, and child behavior problems (e.g., Hughes and Ensor 2006). In what follows, we briefly discuss risk models of early disruptive behavior that integrate both child self-regulation deficits and harsh parenting practices in cross-cultural contexts.

### Mechanisms of Association

There are well-developed theories linking child inhibitory control and harsh parental disciplinary behaviors with children’s early symptoms of aggressive/disruptive behavior. Given that harsh parental discipline and child self-regulation deficits have been found to be intercorrelated, it is important

to simultaneously assess both risk constructs so that we can determine *how* they are linked with children’s early problem behavior. Some studies have supported a mediation model, wherein parenting behavior is linked with externalizing problems through effects on child self-regulation (Gilliom et al. 2002; Valiente et al. 2006). In studies of older children, mediation models have been replicated across cultures. For example, in school-age samples of Chinese children, negative parenting has shown indirect effects on child outcomes through children’s regulation skills (Chang et al. 2003; Zhou et al. 2004; Eisenberg et al. 2009). Parents’ frequent use of harsh punishment may disrupt the acquisition of adaptive regulatory skills through many possible mechanisms, including stimulation of high levels of arousal which interfere with social learning, as well as direct modeling of poor regulatory skills (e.g., Hoffman 2000; Power 2004). Children who fail to develop adequate regulatory skills are at high risk for responding to challenging social situations with high levels of aggression and impulsivity. Other scholars have highlighted the importance of examining interactions between parenting behavior and child self-regulation difficulties. For example, harsh disciplinary control has been found to moderate relations between temperament vulnerabilities and externalizing behavior in young children, such that children who experience both temperament difficulties and harsh parenting are more likely to develop behavior problems than others (e.g., Bates et al. 1998; Morris et al. 2002). A third possibility is that child regulation deficits and harsh discipline could make additive (independent) contributions to the emergence of early disruptive behavior (e.g., Olson et al. 2005).

### Research Goals

Our main goal was to examine the cross-cultural generalizability of associations between self-regulatory deficits, harsh parenting practices, and individual differences in children’s early externalizing problem behaviors. Cross-cultural studies of developmental issues in psychopathology have been extremely sparse (Garcia-Coll et al. 2000). To the best of our knowledge, this was the first study linking constructs of inhibitory control and adverse parenting to externalizing problems in Chinese and Japanese preschoolers. Data were drawn from a new cross-cultural study of the biobehavioral dynamics of emotion regulation in preschool-age children, Emotion Regulation as a Complex System (ERCS; authors, 2005). Participants were four-year-old boys and girls growing up in the United States, the Peoples Republic of China, and Japan. First, based on previous research, we hypothesized that low levels of child inhibitory control would be associated with elevated levels of child externalizing problems in all three cultures. Young children with

high levels of externalizing problems have been found to manifest somewhat lower levels of general cognitive maturity, suggesting that hypothesized relations between executive functioning and externalizing may reflect generalized deficits in cognitive competence (Lieberman et al. 2007; Moffitt 1993). Thus, we examined relations between children's inhibitory skills and externalizing problems controlling for individual differences in general cognitive maturity. Second, we expected that indices of parental harsh physical and emotional discipline would be associated with elevated externalizing scores in U.S. preschoolers, and we examined whether this association would generalize to Chinese and Japanese preschoolers. Finally, we tested the cross-cultural validity of *integrative models* to determine whether associations between parenting risk, child self-regulation difficulties, and child externalizing combined in ways that reflected additive, interactional, or mediational mechanisms.

As a secondary goal, we also considered possible gender differences in relations between child inhibitory control, harsh parental disciplinary practices, and externalizing behavior. Child gender has been shown to be a powerful moderator of the development of externalizing behavior in young children: after age 4 boys show higher levels of disruptive behavior than girls (Baillargeon et al. 2007; Keenan and Shaw 1997). Moreover, toddler and preschool-age girls have been found to manifest more advanced effortful control abilities than male age-peers (e.g., Else-Quest et al. 2006; Kochanska et al. 2000; Olson et al. 2005). Most studies have been conducted using Western populations of children. Therefore, we examined the possibility that relationships between children's inhibitory control capabilities and early externalizing problems were moderated by child gender within each country.

## Method

### Participants

As much as was possible, preschoolers were selected from full-time preschools at both university and community samples in each location. In addition, we pre-screened children for major health issues and excluded children who had a history of significant developmental or health concerns. Family demographic data for participants in each country are shown in Table 1. In Beijing, China, 61 children were recruited from a total of 3 preschools in the Southern and Western districts of Beijing. Of these 61, two children dropped out for a total of 59 children. Because of China's single child policy, only two of the children (a pair of twins) were reported to have siblings. Parental education ranged from middle school to graduate-level training for both

mothers and fathers. The US sample was collected in and around Ann Arbor, Michigan, where 58 children were recruited using fliers and newspaper advertisements from a total of 15 preschools. Over half had one or more siblings. Parental education ranged from high school to graduate-level training for both mothers and fathers. In Tokyo, Japan, children were recruited from 2 preschools in Musashino-shi and Suginami-ku, primarily residential middle-class neighborhoods of northwestern Tokyo with very few high-rises and many single-family homes. In contrast to China, over half of the Japanese children had at least one sibling, and 11 of the children had 2 siblings. Most parents reported being married. Parental education ranged from middle school to graduate-level training for both mothers and fathers.

As shown in Table 1, some demographic characteristics differed significantly between countries. Chinese parents were slightly younger than those in Japan and the U.S. Maternal education was significantly greater in the US than in Japan or China. However, there were no significant cross-national differences in paternal education. Relatively few Japanese mothers were employed, and as noted above, most Chinese children did not have siblings. Finally, U.S. parents reported significantly higher levels of divorce or separation than those in the other two countries.

### Procedures

Children were tested across a period of three consecutive days. Tests of child executive function were administered on all 3 days, one task per day, and intellectual maturity was assessed on the third testing day for all children. During the same period of time, mothers completed questionnaires on family demographics, parenting behaviors, and child behavior problem symptoms.

### *Laboratory Measures of Inhibitory Control*

Child inhibitory control was assessed in the laboratory setting as a composite of three Stroop-like switching tasks commonly used with preschoolers: the Grass/Snow Task, Luria's Hand Game, and the Day/Night Stroop Task. Each task involved an imitative component, in which the child copied or followed the experimenter, and a conflict component, in which the child did the opposite of the experimenter. Scores from the conflict phase were used for the composite because the sample had near perfect scores on the imitative phase and therefore no meaningful variation. In addition, the conflict component was designed to directly tap the child's ability to inhibit a dominant response and generate a subdominant response, the key construct of interest in this study. In all cases, higher scores indicated higher levels of inhibitory control.

**Table 1** Demographic data: study participants by culture

Variables	United States (N=58)		China (N=59)		Japan (N=59)		p
	M	SD	M	SD	M	SD	
Age (months)	54.12	4.81	52.42	3.32	52.66	6.4	ns
Gender (% male)	48.3%		55%		54.2%		ns
Age mother	36.36	0.67	33.14	0.37	36.55	0.37	$p<0.001$ ; $c<u,j$
Age father	37.45	0.97	35.8	0.45	38.60	0.45	$p<0.05$ ; $c<u,j$
Socioeconomic status							
Mother education	6.23	0.84	5.42	1.12	5.12	0.70	$p<0.001$ , $u>c,j$
Father education	6.02	1.10	5.64	1.15	5.66	0.88	ns
Mother full-time employment (%)	60.3%		76.7%		6.8%		$p<0.001$ , $j<u,c$
Father full-time employment (%)	70.7%		88.3%		81.4%		ns
Number of siblings	1.11	0.725	0.04	0.19	0.83	0.72	$p<0.001$ ; $c<j<u$
Married (%)	84.6%		100%		98.3%		$p<0.01$ ; $u<c,j$

**Grass/Snow Task** During the Grass/Snow task (Carlson and Moses 2001), the experimenter shows the child a board with a white square and a green square, and makes sure the child knows the color of grass and snow. During the imitation phase, the child is instructed to point to the white square when the experimenter says “snow” and the green square when the experimenter says “grass”, for 4 trials. During the conflict phase, the child is instructed to point to the square with the opposite kind of point for 10 trials. In previous research with preschool-age children, the Grass Snow Task has been found to show good reliability and construct validity (e.g., significant associations with similar measures; predictable age-related changes; Carlson and Moses 2001).

**Luria’s Hand Game** During Luria’s Hand Game (Luria et al. 1964), the experimenter points with either one or two fingers. During the imitative phase, the child is instructed to point in the same manner as the experimenter (i.e., using one or two fingers) for 10 trials. During the conflict phase, the child is instructed to point in the opposite manner from the experimenter (i.e., using one finger if the experimenter used two fingers, and vice versa) for 10 trials. In previous research with preschool-age children, Luria’s Hand Game has been found to show good reliability and construct validity (e.g., Carlson et al. 2004).

**Day/Night Stroop** During the Day/Night Stroop task (Diamond and Taylor 1996), the experimenter has a book of pictures that depict daytime scenes or nighttime scenes. During the imitative phase, the child is supposed to say “Day” when the experimenter reveals a daytime scene, and “Night” when the experimenter reveals a nighttime scene for 10 trials. During the conflict phase, the child is instructed to say “Night” when the experimenter reveals

a daytime scene, and “Day” when the experimenter reveals a nighttime scene for 10 trials. In previous research with preschool-age children, the Day/Night Stroop Task has been found to show good reliability and construct validity (Carlson and Moses 2001; Gerstadt et al. 1994).

#### Maternal Rating of Inhibitory Control

Mothers completed an abbreviated version of Rothbart’s Child Behavior Questionnaire (CBQ, Ahadi et al. 1993). The Inhibitory Control scale was extracted for use as an index of child self-regulation in the home setting.

#### Composite Index of Inhibitory Control

As expected, maternal ratings of Inhibitory Control were significantly correlated with children’s performance on an aggregated measure expressing the sum of each individual inhibitory control task,  $r=0.22$ ,  $p<0.01$ . Moreover, in exploratory factor analyses behavioral and maternal rating measures of inhibitory control clustered into a single scale (factor loadings ranged from 0.50 to 0.79). To derive an omnibus measure of children’s inhibitory skills that encompassed multiple settings and levels of analysis (see Kagan et al. 2002, who cogently argued for this approach to measurement of child behavioral traits), we created a composite index by summing children’s scores on the maternal rating and laboratory measures ( $\alpha = 0.55$ ).

#### Measure of Nonverbal Intelligence

The Block Design subscale of the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R, Wechsler 1989) was administered to all children on the third testing

day. The Block Design subtest has been found to correlate highly with full scale IQ and does not require a verbal response from the child. Thus, it was a useful index of cognitive maturity in this multi-national study.

#### Measure of Child Externalizing Problems

Mothers completed the Child Behavior Checklist/1.5-5, a measure of children's behavioral and emotional problems that has shown high levels of reliability and validity (CBCL/1.5-5; Achenbach and Rescorla 2000). Respondents rate the child on items that describe the child's behavior currently or within the previous 2 months. Problem behavior items are rated on 3-point scales ("2" = very true or often true of the child; "1" = somewhat or sometimes true; "0" = not true of the child). There are 2 broadband, factor-analytically derived dimensions of child problem behavior, Internalizing (36 items on subscales Emotionally Reactive, Anxious/Depressed, Somatic Complaints, and Withdrawn) and Externalizing (24 items on subscales Aggressive Behavior and Attention Problems).

The Chinese translation of the CBCL-1.5-5 was used with Chinese parents (Liu et al. 2010). For the Japanese sample, the CBCL-1-5 was translated and back translated by two fully bilingual Japanese researchers.

#### Measure of Parenting Behavior

Mothers completed the Socialization of Moral Affect questionnaire-Preschool Parent (SOMA-PP; Denham et al. 1997). The SOMA presents parents with hypothetical situations involving child behavior, and parents are asked to rate the likelihood that they would employ different behavioral responses on 1- ("Not at all likely") to 5- ("Very likely") point scales. The SOMA has shown good reliability and predictable correlations with similar measures provided by the same informant (Rosenberg 1997). To obtain Chinese and Japanese language versions, the SOMA was translated and back translated by researchers who were bilingual in English and/or Mandarin and Japanese. To improve the cross-cultural validity of this scale, the original English version was given to a separate set of Hong Kong and Beijing parents of preschoolers with open-ended answers. Several of the more frequent of these were incorporated into the final version of the scale and minor cultural modifications of the instruments were also made (see Fung 2004). Two subscales were extracted for use as measures of parental harsh discipline: NonVerbal Punishment (5 items; use of corporal punishment and physical restraint) and Public Humiliation (7 items; using public reprimands as a way of shaming the child for his/her misbehavior). To examine the reliability of these scales with participants in our study, internal reliability coefficients

were computed separately by country. Both subscales had adequate reliability across countries: NonVerbal Punishment,  $\alpha = 0.76, 0.69,$  and  $0.78$ ; Public Humiliation,  $\alpha = 0.64, 0.71, 0.64$  for China, Japan, and the U.S., respectively. In all three countries, these two subscales were significantly interrelated (mean  $\alpha = 0.74,$  range =  $0.71-0.75$ ). Hence, they were summed into a single index, Harsh Discipline.

## Results

### Overview

Initially we present descriptive data on all study variables. Although our research questions did not highlight mean differences in child and maternal behavior between countries, for clarity and completeness we have included these descriptive data as well. Descriptive data were computed using Bonferroni corrections for family-wise error. Our study hypotheses were tested using hierarchical multiple regression (HMR) and structural equation modeling (SEM) techniques. First, using HMR, we tested the hypothesis that individual differences in child inhibitory control would be significant contributors to children's early externalizing symptoms, controlling for variations in nonverbal intelligence. Next, we tested the hypothesis that high levels of harsh parenting would be associated with elevated child externalizing symptoms within each country. Finally, using SEM, we determined whether child inhibitory control and harsh parenting made additive, interactive, or hierarchical contributions to children's early disruptive behavior, and whether these patterns of association differed significantly between countries.

### Descriptive Analyses

Descriptive statistics on all study variables are shown in Table 2, computed separately by country. Analyses of child and maternal behavior revealed relatively few differences by child gender. On the Luria test, U.S. and Japanese girls achieved significantly higher scores than their male peers. All other child gender differences were specific to the Japanese sample. Japanese girls were rated more highly by mothers on Inhibitory Control than Japanese boys. Finally, Japanese boys received significantly higher levels of Harsh Discipline than Japanese girls. Notably, across all three countries there were no gender differences in maternal ratings of child externalizing problems.

### Cross-National Differences

In preliminary analyses, cross-national differences in children's mean scores on all study variables were computed. As

shown in Table 2, there were significant differences between countries in levels of child externalizing symptoms. Post-hoc analyses revealed that mean levels of child Externalizing behavior did not differ between the U.S. and Japan; however, Chinese preschoolers were rated more highly on this scale than children in other countries. Preschoolers in different countries differed significantly on three measures of inhibitory control: the Luria test opposite score, Grass/Snow opposite score, and the maternal rating of inhibitory control. Post-hoc analyses revealed that cross-national differences on the first two tests failed to reach significance; on the maternal rating, U.S. preschoolers were rated significantly higher in inhibitory control than Chinese preschoolers. In addition, there were significant differences in children's performance on the Block Design test. Post-hoc analyses revealed that Chinese preschoolers achieved significantly higher scores on Block Design than Japanese preschoolers, whereas preschoolers in Japan and the US did not differ in their performance levels. Finally, there were significant differences between countries in maternal endorsement of harsh discipline on the SOMA. Post-hoc analyses revealed that Chinese and Japanese mothers endorsed greater use of harsh discipline than U.S. mothers. There were no a priori reasons to expect these patterns of differences on measures of Block Design and parental harsh discipline.

#### Zero-Order Correlations between Study Variables

Maternal harsh discipline and low levels of inhibitory control were significantly correlated with child externalizing problems in all three countries ( $r_s = 0.28$ – $0.52$ ,  $p_s = 0.01$  to  $0.001$ ). Moreover, in China and Japan, child inhibitory control was significantly correlated with maternal harsh discipline, in the expected negative direction (high levels of harsh discipline were associated with lower levels of inhibitory control;  $r_s = -0.41$  and  $-0.37$ ,  $p_s < 0.01$ , respectively). However, this association was not found for U.S. preschoolers.

#### Self-Regulation Model

One primary research goal was to examine the cross-cultural generalizability of a model highlighting individual differences in children's inhibitory control as contributors to early externalizing problems. To provide a conservative test of this hypothesis, we controlled for individual differences in children's nonverbal intelligence. Hierarchical multiple regression analyses were computed separately by country. In each equation, the dependent variable was the child Externalizing Problems scale of the CBCL. The child's score on the WPPSI Block Design scale was entered as the first step, to control for general level of cognitive maturity.

The composite index of Inhibitory Control and child gender were entered on the second and third steps, and the multiplicative term expressing the interaction of inhibitory control and child gender was entered on the final step of each equation. In all three countries, child inhibitory control made a significant contribution to child externalizing problems ( $\Delta R^2 = 0.11, 0.17, 0.22$ ;  $\Delta F = 6.60, 11.53, 12.88$ ;  $p_s < 0.01, 0.001, \text{ and } 0.01$ , for China, Japan and the US, respectively). Child gender did not moderate these associations in Chinese and Japanese preschoolers. However, the interaction between child gender and inhibitory control made a significant incremental contribution to the explanation of externalizing problem behavior in U.S. preschoolers. Post-hoc analyses of children with low, medium, and high inhibitory control scores (each group containing 33.33% of the sample) revealed that boys with higher inhibitory control had lower externalizing problems than those in the low and medium groups, whereas girls showed no relation between inhibitory control and externalizing problems ( $t = -2.39$ ,  $p < 0.05$ ).

#### Parenting Behavior Model

Our second research question highlighted the role of harsh discipline behavior as a contributor to children's early externalizing problems. Hierarchical multiple regression analyses were conducted separately by country. Using child externalizing problems as the dependent variable, the index of harsh discipline was entered on the first step of each equation, child gender was entered on the second step, and the multiplicative term expressing the interaction between harsh discipline and child gender was entered on the final step. We note that Block Design was not included in these models because parental discipline contributed as an independent predictor in each country after controlling for variations in nonverbal IQ. In all three countries harsh discipline made a significant contribution to child externalizing problems,  $\Delta R^2 = 0.11, 0.07, 0.08$ ;  $\Delta F = 6.26, 3.87, 4.51$ ;  $p_s < 0.01, 0.05, \text{ and } 0.05$ , for China, Japan and the US, respectively. Neither child gender nor the interaction between gender and harsh discipline made a significant incremental contribution to the variance in child externalizing problems.

#### Integrative Models: Examining Mechanisms of Association

Our final research goal was to examine *how* child and parenting risk factors were linked with externalizing symptoms, and whether associations between these constructs were moderated by culture. Structural Equation Modeling (SEM; EQS, Bentler 2006) was used to test relations between self-regulation, harsh parenting, and externalizing problems, and to determine whether these paths differed across the three countries. A major advantage of using SEM as opposed to

**Table 2** Means and SD: study variables

Measure	Overall mean (SD)	Male mean (SD)	Female mean (SD)	F (gender; culture)
China				
Grass/snow opposite	7.92 (2.99)	7.23 (3.33)	8.68 (2.4)	F(1.57) = 3.63; F(2.168) = 3.22*
Luria opposite	8.28 (1.89)	8.1 (1.92)	8.48 (1.87)	n.s.; F(2.165) = 3.9*
Day/night opposite	8.49 (1.82)	8.45 (1.62)	8.54 (2.05)	n.s.
WPPSI block design	19.03 (5.44)	18.75 (5.59)	19.36 (5.34)	n.s.; F(2.170) = 6.45**
CBQ inhibitory control	4.52 (0.56)	4.42 (0.54)	4.63 (0.58)	n.s.; F(2.168) = 3.04
SOMA harsh discipline	5.03 (1.06)	5.08 (0.99)	4.96 (1.15)	n.s.; F(2.165) = 37.93**
CBCL externalizing problems	13.4 (6.43)	13.87 (7.12)	12.85 (5.6)	n.s.; F(2.169) = 14.31**
Japan				
Grass/snow opposite	6.31 (3.81)	5.64 (3.95)	7.09 (3.54)	n.s.
Luria opposite	7.35 (2.83)	6.58 (3.06)	8.2 (2.32)	F(1.55) = 4.99*
Day/night opposite	8.26 (3.1)	8.36 (3.3)	8.17 (2.94)	n.s.
WPPSI block design	15.09 (8.32)	14.3 (8.06)	15.96 (8.67)	n.s.
CBQ inhibitory control	4.7 (0.91)	4.37 (0.84)	5.07 (0.84)	F(1.56) = 9.98**
SOMA harsh discipline	4.73 (1.06)	5 (1.08)	4.4 (0.96)	F(1.56) = 4.93*
CBCL externalizing problems	8.24 (6.07)	9.13 (6.64)	7.19 (5.25)	n.s.
US				
Grass/snow opposite	7.03 (3.51)	6.5 (3.78)	7.5 (3.25)	n.s.
Luria opposite	6.99 (2.8)	5.96 (3.21)	7.81 (2.16)	F(1.50) = 6.18*
Day/night opposite	7.72 (2.92)	7.19 (3.53)	8.16 (2.27)	n.s.
WPPSI block design	14.82 (7.37)	14.19 (7.88)	15.41 (6.95)	n.s.
CBQ inhibitory control	4.86 (0.72)	4.68 (0.76)	5.02 (0.66)	F(1.54) = 3.25
SOMA harsh discipline	3.41 (0.98)	3.57 (0.84)	3.27 (1.07)	n.s.
CBCL externalizing problems	8.02 (5.74)	7.46 (6.15)	8.5 (5.41)	n.s.

\*  $p < 0.05$  \*\*  $p < 0.01$

side-by-side multiple regression models was the ability to apply a single model to multiple groups simultaneously to examine difference in path coefficients between groups. Specifically, we tested whether the regression weights between child inhibitory control, harsh parenting and child externalizing differed significantly across countries. The number of missing observations was 21 (5 in China, 6 in Japan, and 10 in the US) and was handled using listwise deletion. Model fit was determined using the normed fit index (NFI) and comparative fit index (CFI) (Raykov et al. 1991), and the root mean square error of approximation (RMSEA) was used as a misfit index. Fit indices that exceeded 0.90 and RMSEA misfit indices at or below 0.06, respectively, are considered to indicate acceptable fit (Hu and Bentler 1999).

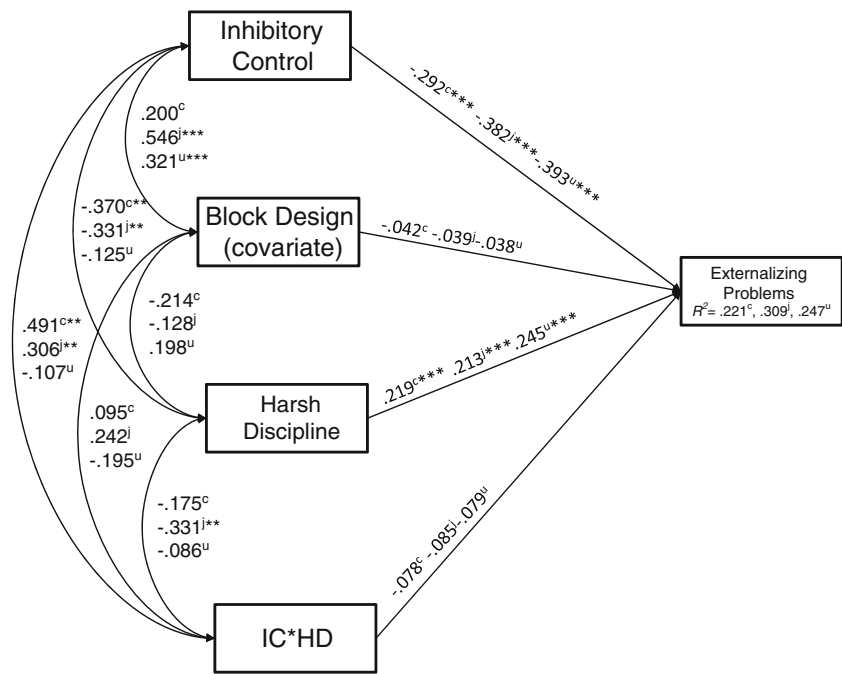
**Additive and Interactive Models** This set of analyses focused on how additive and interactive models of externalizing problems applied to Chinese, Japanese, and American preschoolers. First, we fit the covariance matrices of the three groups simultaneously to the same model while constraining the paths from the exogenous variable to behavior problems to be equal. The analysis produced a good fit to the data (See Fig. 1;  $\chi^2$  (China  $n = 55$ , Japan  $n = 52$ , US  $n = 48$ ) = 4.38,

$df = 9$ ,  $p > 0.05$ , NFI = 0.963, CFI = 1.0, RMSEA = 0.000). As shown in Fig. 1, in the constrained model IC ( $\beta = -0.292$ , China;  $\beta = -0.382$ , Japan;  $\beta = -0.393$ , US,  $p < 0.001$ ) and Harsh Discipline ( $\beta = 0.219$ , China;  $\beta = 0.213$ , Japan;  $\beta = 0.245$ , US,  $p < 0.001$ ) predicted externalizing problems, such that lower IC and higher Harsh Discipline predicted higher externalizing problems, but their interaction did not.

Next, we tested whether this fit could be improved significantly by releasing the equality constraints on the IC, Harsh Discipline, and IC\*Harsh Discipline paths. A significant improvement would imply that making the paths to externalizing problems equal between the cultures is not the best fit for the data. The change in chi-square test was used to determine whether model fit improved significantly. When the three constraints were released together, the model was still a good fit ( $\chi^2$  (China  $n = 55$ , Japan  $n = 52$ , US  $n = 48$ ) = 0.142,  $df = 2$ ,  $p > 0.05$ , NFI = 0.999, CFI = 1.0, RMSEA = 0.000). However, the model did not improve significantly when these previously constrained paths were released. Given that the model did not improve significantly when the constrained paths were released, the most parsimonious model for the three cultures was one in which paths between the cultures were fixed to be equal.



**Fig. 1** Multigroup structural equation model for Chinese ( $n=55$ ), Japanese ( $n=52$ ), and US ( $n=48$ ) preschoolers, denoted with superscript c, j, and u, respectively. Paths from exogenous variables to behavioral problems were constrained to be equal. \* $p<0.05$ , \*\* $p<0.01$ , \*\*\* $p<0.001$



**Mediation Models** Finally, we determined whether the relation between harsh discipline and externalizing problems was mediated by individual differences in child effortful control. Because it was not significant in any of the analyses, the IC\*Harsh Discipline variable was dropped from the mediation model. As was done in the additive/interactive model, we constrained the paths from exogenous variables to externalizing problems to be equal across the three groups. The analysis produced a good fit to the data ( $\chi^2$  (China  $n=55$ , Japan  $n=52$ , US  $n=48$ ) = 2.83,  $df=6$ ,  $p>0.05$ , NFI = 0.976, CFI = 1.0, RMSEA = 0.000). However, the significance level of the path between Harsh Discipline and externalizing problems was not reduced, suggesting that IC was not a significant mediating factor. Next, we tested whether the model fit could be improved significantly by releasing the constraints on the paths from IC and Harsh Discipline to externalizing problems and from Harsh Discipline to IC. Change in chi square tests revealed that freeing up any of these constrained paths did not improve the model significantly. Thus, child inhibitory control did not appear to be a significant mediating factor in the relation between harsh discipline and child externalizing problems.

**Discussion**

The main goal of this study was to examine the cross-cultural generalizability of theoretical models linking deficits in children’s self-regulation and socialization experiences to

early symptoms of disruptive behavior. Significant problems of aggression, impulsivity, and inattention can be identified in the toddler and preschool years, and predict persistent and cascading problems in children’s social and academic functioning. Thus, identifying risk factors associated with early externalizing behaviors has important implications for theory and intervention. However, most studies have focused on school-age children growing up in the United States, and have not included simultaneous assessments of child and parenting risk factors. Examining data from a new study of preschool-age children growing up in China, Japan, and the U.S. allowed us to address these gaps in the literature.

To avoid stereotyping cultures, it is desirable to compare theoretical models of individual differences in children’s development within different cultural contexts (Garcia-Coll et al. 2000; Tardif et al. 2009; Tobin et al. 2009). Thus, we did not wish to highlight cross-national differences in singular child and parenting behaviors. Rather, using identical measures and procedures, we determined whether complex models of early disruptive behavior held true for young children growing up in three different countries.

As hypothesized, relatively low levels of inhibitory control were good predictors of externalizing problem behavior in all three countries, even after controlling for co-occurring effects of nonverbal intelligence. Thus, associations between individual differences in inhibitory control and child externalizing problems generalized to preschoolers growing up in different cultural settings, a unique extension of prior research (e.g., Olson et al. 2005; Raaijmakers et al. 2008).

Similarly, we also questioned whether prior research linking harsh parental discipline with high levels of child externalizing behavior would generalize to preschool-age children growing up in different cultural settings. In a study of school-age children in six countries, parents' use of physical punishment was linked with higher levels of child behavior problems, although these links were weaker in countries where corporal punishment was viewed as a typical child rearing strategy (Lansford et al. 2005). Our findings extended these data by showing that in all three countries, parents' endorsement of harsh punishment was significantly associated with relatively high levels of externalizing behavior in their preschool-age children. Thus, associations between harsh punishment and child behavior problems generalized "downward" to the preschool period, and most impressively, held true for children growing up in different cultural contexts.

Our final research goals were to examine *how* these risk factors were linked with disruptive behavior, and whether the nature of these associations differed between the three countries. Prior studies of school-age children (e.g., Eisenberg et al. 2009; Valiente et al. 2006; Zhou et al. 2004) have supported mediation models, wherein associations between parenting behavior and children's externalizing problems have been mediated by individual differences in child effortful control. However, consistent with findings from a large study of 3-year-old children (Olson et al. 2005), in all three countries child inhibitory control and maternal harsh discipline made significant *independent* contributions to early externalizing problems, supporting an additive model of association. We speculate that associations between child effortful control, harsh parental discipline and child externalizing problems may change as children transition from early childhood to later stages of development, reflecting increasing levels of internalization. Indeed, a recent follow-up study conducted using a large sample of preschool-age children supported this idea (Chang et al. 2011). Moreover, across the transition from preschool to the early school-age years, evidence that child effortful control deficits mediated associations between parental discipline and externalizing problems was clearest for boys. Although gender moderated patterns of association were not salient in this study, explanatory mechanisms linking child behavior problems with socialization influences may become more sex differentiated as children mature into the school-age years.

### Strengths and Limitations

To our knowledge this was the first study to examine associations between inhibitory control, harsh discipline and disruptive behavior in Chinese and Japanese preschoolers. A major strength of our study was that identical measures were used to assess child inhibitory control, parenting behavior, and child externalizing behavior among preschool-age children

growing up three different cultures. Other strengths included our use of multiple measures of children's regulatory competence, and a focus on understanding complex associations between child and parental risk factors.

Our study also had several noteworthy limitations. Participants primarily were drawn from two-parent, middle class families. Thus, our findings may not generalize to children in other family constellations or to those whose families are experiencing severe economic hardship. Our samples were drawn from typically developing preschoolers, limiting generalizability to clinically referred populations of young children.

The mediation model was based on theoretical evidence that supported the direction of effects from parenting behavior to child self-regulation. However, impulsive, disruptive child behavior often elicits upper limit controls and negative affect from parents (Sameroff 2009). Empirical studies have shown that the early development of disruptive behavior reflects reciprocal relations between child and parent behaviors (e.g., Combs-Ronto et al. 2009; Scaramella and Leve 2004). Thus, our findings should not be used to draw causal inferences concerning the directionality of parent-child influences.

Although laboratory measures of child inhibitory control were included, parenting behaviors and child externalizing problems were evaluated using maternal report. Incorporating other sources of information may prevent possible informant-bias as well as provide a more detailed and comprehensive understanding of mothers' early contributions to children's disruptive behavior. Furthermore, investigating fathers' roles in these relations may lead to a richer pattern of findings (e.g., see Chang et al. 2003).

Finally, over 50 different risk factors have been related to the development of child externalizing problems (Dodge and Pettit 2003). In singling out child inhibitory control and parental harsh discipline for intensive study, we do not mean to imply that other sources of child vulnerability and environmental risk are insignificant in the development of early onset externalizing symptoms.

In sum, child inhibitory control and parental harsh discipline were significant risk factors for early disruptive behavior among preschoolers growing up in all three countries, supporting the salience of these constructs. In future work with multi-national samples, it would be interesting to examine these associations longitudinally, and to determine whether interventions focused on parenting or inhibitory control would have an impact on the development of early externalizing behavior.

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