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East-West Cultural Differences in Context-sensitivity are Evident in Early Childhood

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Abstract

Accumulating evidence suggests North Americans tend to focus on central objects whereas East Asians tend to pay more attention to contextual information in a visual scene. Although it is generally believed that such culturally divergent attention tendencies develop through socialization, existing evidence largely depends on adult samples. Moreover, no past research has investigated the relation between context-sensitivity and other domains of cognitive development. The present study investigated children in the United States and Japan ($N = 175$, age 4–9 years) to examine the developmental pattern in context-sensitivity and its relation to executive function. The study found that context-sensitivity increased with age across cultures. Nevertheless, Japanese children showed significantly greater context-sensitivity than American children. Also, context-sensitivity fully mediated the cultural difference in a set-shifting executive function task, which might help explain past findings that East-Asian children outperformed their American counterparts on executive function.

In the past few decades, cross-cultural psychological research has revealed that North Americans and East Asians have different cognitive styles. For example, North Americans are more likely than East Asians to use rules and formal logic to categorize objects and understand events (Chiu, 1972; Ji, Zhang, & Nisbett, 2004; Norenzayan, Smith, Kim, & Nisbett, 2002), to make dispositional causal inferences (Morris & Peng, 1994), to predict the future as maintaining current states or trends (Ji, Nisbett, & Su, 2001), and to exhibit less tolerance for contradiction (Choi, & Nisbett, 2000; Peng & Nisbett, 1999). In contrast, these studies showed that East Asians are more likely than North Americans to use intuitive reasoning and relationships to group objects and understand events, to consider more situational causal factors, to predict more future change from current states or trends, and to exhibit greater tolerance and preference for contradiction. Nisbett and colleagues referred to North Americans' cognitive style as *analytic* and East Asians' cognitive style as *holistic* (e.g., Nisbett et al., 2001; Nisbett, 2003).

Although analytic and holistic cognitive styles encompass various domains of cognition, the most extensively studied domain is attention focus. That is, North Americans tend to focus on a central object in a visual scene whereas East Asians are more attentive to contexts (Masuda & Nisbett, 2001, 2006). This cultural difference has been repeatedly found with various methods such as change detection (Masuda & Nisbett, 2006), eye tracking (Chua, Boland, & Nisbett, 2005), the Ebbinghaus illusion (Doherty, Tsuji, & Phillips, 2008), and the Framed-Line Test (Kitayama, Duffy, Kawamura, & Larsen, 2003).

It has been suggested that such culturally specific psychological tendencies are acquired and exercised by repeatedly engaging in tasks that are uniquely relevant in the cultural context (Kitayama & Imada, 2010; Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009). Japanese culture has been characterized as a collectivistic high-context culture, where people are expected to adjust themselves to social situations and engage in an indirect communication style to maintain group harmony (e.g., Gudykunst & Matsumoto, 1996; Markus & Kitayama, 1991; Triandis, 1994). In such a cultural milieu, holistic attention, particularly sensitivity to contextual information, is highly demanded to intuit what is expected and appropriate in a given social situation. In contrast, American culture has been characterized as a low-context culture, where communication style is direct and explicit (e.g., Gudykunst & Matsumoto, 1996). Thus, while sensitivity to situational cues is still an important social skill in American culture, it is not as crucial as it is in Japanese culture.

It follows from these proposals that culturally specific cognitive tendencies would develop through early socialization. However, existing evidence mostly depends on adult samples, and little is known about the developmental course of context-sensitivity. Nevertheless, two past studies provide evidence that children also exhibit such culturally specific attention tendencies. Duffy, Toriyama, Itakura, and Kitayama (2009) found that on the Framed-Line Test, American children performed significantly better on the absolute task (focused attention) than on the relative task (holistic attention), whereas their Japanese counterparts showed the opposite pattern. This cultural difference was observed among children age 6 and older but not among younger children (4–6 years), which led to their conclusion that sociocognitive development and socialization around the age of 5 to 7 might be particularly important for fostering culturally specific attention tendencies.

However, caution is needed to interpret such null findings, especially when only one task was used to evaluate children of a wide age range. For example, when the cultural difference is found in 6-year-olds but not in younger children, this might be because the task was too difficult for younger children. In fact, Kuwabara, Son, and Smith (2011) found that Japanese children of 4 years were more likely to take the situation into account when evaluating facial expressions than their American counterparts, suggesting the cultural difference in context-sensitivity might be present as early as age 4.

Although these studies provide initial evidence that cultural differences in context-sensitivity can be observed among children, the findings are far from conclusive, especially in terms of its developmental trajectory – whether context-sensitivity increases with age across cultures and whether cultural differences widen with age, as might be predicted from a sociocultural perspective. In other words, if cultural learning accounts for the differences in context-

sensitivity observed in adults, such cultural differences should emerge and become amplified during development. In fact, such a developmental increase in cultural difference from age 7–11 years was observed by Ji (2008) in Chinese and Canadian children's predictions of change. In the domain of visual context-sensitivity, however, Duffy et al. (2009) did not observe cultural differences in their youngest age group, Kuwabara et al. (2011) tested only one age group, and both studies included only one task, hence these questions need further investigation.

Another important unanswered question is whether there is any relation between context-sensitivity and other domains of cognitive development. For example, it is generally found that East Asian preschoolers outperform their Western counterparts on executive function (EF) tasks (e.g., Oh & Lewis, 2008; Sabbagh, Xu, Carlson, Moses, & Lee, 2006) although this remains to be seen in Japanese children (Lewis et al., 2009). EF refers to a collection of mental processes involved in conscious, goal-directed activity and rule use, including working memory, inhibition, and set-shifting (e.g., Miyake et al., 2000; Stuss & Knight, 2002), which develop dramatically in childhood (e.g., Carlson, Zelazo, & Faja, in press; Garon, Bryson, & Smith, 2008). As proposed in Zelazo's levels of consciousness framework (Zelazo, 2004), set-shifting tasks such as the Dimensional Change Card Sort (DCCS) involve attending to the broader context and selecting relevant sensory information (e.g., color *not* shape) from a higher-order construal of the task. Hence, we propose that context-sensitivity would be positively related to set-shifting performance. In contrast, context-sensitivity would not be related to executive measures that do not require reflection on the broader context, such as in a simple inhibition task (Garon et al., 2008). This is consistent with the finding of Carlson and Choi (2009) that Korean children did not perform better than their American counterparts on impulse-control tasks, although they did perform better on more complex EF tasks.

The purpose of the present study was to add to the literature on cross-cultural comparison of context-sensitivity in three original ways. First, we aimed to obtain more comprehensive evidence for a cultural difference in Japanese and American children by using multiple indices from two very different tasks. The Free Description task was adapted from Masuda and Nisbett (2001). Because this task relies on spoken responses, we also included the Ebbinghaus illusion task (Doherty et al., 2010), which does not involve language abilities. Second, it is critically important for interpreting such cultural differences to know about the developmental pattern in context-sensitivity. Thus, we examined age-related changes in context-sensitivity in three groups spanning a wide age range (4–5, 6–7, and 8–9 years). Third, we examined the relation between context-sensitivity and EF by including two tasks that tap different aspects of EF, namely set-shifting (DCCS) and impulse-control (Gift Delay), expecting that the former would be positively correlated with context-sensitivity but not the latter. If such a relation pertained, we planned to test models of mediation to learn whether cultural differences in context-sensitivity could be fully explained by set-shifting EF (and vice versa).

Method

Participants

Eighty-nine Caucasian American and 86 Japanese typically developing children in three age groups (see Table 1) were recruited in Minneapolis and Kyoto, respectively, via research participant databases at each location and by posting flyers in schools. American parents had higher educational degrees than Japanese parents (e.g., 87% of American mothers had a college or higher degree whereas 44% of Japanese mothers did), but parental education was not significantly correlated with any of the variables of present interest, and thus omitted from further analyses. To ensure that the two cultural groups were equivalent in general cognitive ability, we included Backward Digit Span, which is a commonly used test of working memory (e.g., Flanagan & Kaufman, 2009). There was no significant cultural difference on this measure (i.e., largest number of digits successfully repeated backwards), $t(173) = 1.83$, *ns*.

Procedure

Participants were individually tested on five tasks administered by a female or male experimenter in a laboratory or testing area adjacent to their school. All tasks except Gift Delay were performed on a laptop computer with a 15.4" screen (1280 × 800 pixels). On each task, participants were given practice trials, and the experimenter ensured they understood the task before proceeding with test trials. Sessions were videotaped and lasted 60-min.

Context-Sensitivity Measures

Free Description—This method was adapted from Masuda and Nisbett (2001) but modified to be more suitable even for our youngest participants (age 4). Participants were presented with 14 still pictures for 15 seconds each (Figure 1A). After each one, participants were asked to freely describe what they had seen in the picture. Children were prompted up to three times (“And?” or “Anything else?”) until they had nothing more to say. As in Masuda and Nisbett (2001), we examined the first mentioned objects (i.e., the number of pictures for which focal vs. background objects were mentioned first; e.g., “a cat,” “a building”), descriptive accounts (i.e., numbers of descriptions of focal vs. background objects; e.g., “a black cat,” “a small river”), and relational accounts (i.e., numbers of statements that referred to the relation to focal vs. background objects; e.g., “near the cat,” “behind the building”), which were coded from video¹. The scores of these three indices were computed such that larger numbers indicated greater context-sensitivity (e.g., number of background objects minus focal objects named). This subtraction method also served to control for age-related increases in language ability.

Ebbinghaus illusion—Adapted from Doherty et al. (2010), this task tested children’s context-sensitivity through the optical illusion that occurs when target circles are surrounded

¹Two coders coded the responses independently. The inter-coder agreement was above 99% for the first objects mentioned, and the inter-coder reliabilities (Cronbach’s alpha) were .98 and .95 for the numbers of descriptive accounts and the numbers of relational accounts, respectively.

by larger or smaller circles (Figure 1B). In the “no-context” block (10 trials), participants were shown two orange circles that differed in size – one was consistent (100%) across trials whereas the other circle ranged in size (82–118% with 4% intervals). In the following “illusional-context” block (20 trials), participants were shown two orange circles that differed in size as in the “no-context” block, and each orange circle was surrounded by eight larger gray circles (125%), which made the larger orange circle look smaller, or by smaller gray circles (50%), which made the smaller orange circle look larger. As filler items, four trials were included in which the larger (or smaller) center circle was surrounded by smaller (or larger) circles (thus illusion would lead to correct judgments). In both blocks, participants were asked to choose the orange circle that looked larger by pressing a right or left button on a response pad. Because greater illusion should occur when individuals are more attentive to context (i.e., surrounding circles), poorer performance in the illusional-context condition relative to the no-context condition would indicate higher context-sensitivity. Thus, the percentage of correct judgments on the illusional-context trials was subtracted from that of the no-context trials.

Executive Function Measures

Dimensional Change Card Sort—In this computerized version of the DCCS (adapted from Zelazo, Anderson, Richler et al., in press), children were presented with stimulus (red/blue crayon/truck) and asked to select in which of two boxes (labeled with a blue crayon or red truck) it should be placed (Figure 1C) by pressing a right or left button on a response pad. The correct response depended on whether they were instructed to play the color game (red or blue) or the shape game (crayon or truck). Following the color game and shape game (or reversed order, 5 trials each), which are usually passed by age 5, were the more difficult mixed trials in which the rules (color, shape) switched unpredictably (50 trials). Accuracy and response time on these mixed trials were analyzed.

Gift Delay—This task, adapted from Kochanska et al. (1996), was included to measure children’s impulse-control. At the conclusion of the session, the experimenter noisily prepared a wrapped gift inside a bag and explicitly told children not to look at the gift until he or she returned with a bow (3 min). The number of transgressions (e.g., head turns, body turns, leaving seat, peeking inside the bag) and the latency to the first transgression were coded from video.

Results

Descriptive statistics and results of context-sensitivity and EF task performance comparing American and Japanese children are shown in Table 2. Also, developmental patterns for the context-sensitivity indices are shown in Figure 2. On each index, analysis of variance was conducted using a 2 (Culture: US, Japan) $\times$ 3 (Age-Group: 4–5, 6–7, 8–9) design (see Table 3), followed by more specific analyses when necessary. To grasp the general pattern, we present the analyses of overall context-sensitivity performance first, followed by analyses of individual tasks.

Overall Performance Across Context-Sensitivity Indices

The context-sensitivity indices included the number of first mentioned objects, the number of descriptive accounts, and the number of relational accounts from the Free Description task, as well as the number of correct answers for the Ebbinghaus task². An aggregated context-sensitivity score was formed by computing *z*-scores for each of the four indices and averaging the Ebbinghaus *z*-score and the average of the three Free Description *z*-scores, so the two tasks were equally weighted.

An ANOVA on this aggregated context-sensitivity score found significant main effects for Culture and Age-Group³. As shown in Figure 2A, older groups were more context-sensitive than younger groups in both cultures ($4-5 < 6-7$, $t^{\text{US}}(58) = 2.14$, $p < .05$, $t^{\text{Japan}}(56) = 3.74$, $p < .001$; $6-7 < 8-9$, $t^{\text{US}}(57) = 2.97$, $p < .01$, $t^{\text{Japan}}(54) = 3.41$, $p = .001$). Nevertheless, Japanese children were significantly more context-sensitive than American children. Follow-up analyses revealed that the cultural difference was significant in the two older groups, but not in the youngest group (Table 2). Although the Culture $\times$ Age-Group interaction was only marginally significant ($p = .095$), there was noticeable increase in effect sizes for cultural differences with age (d s for 4–5, 6–7, 8–9 = .12, .86, and 1.28, respectively; see Table 2). These findings suggest that the cultural difference becomes significant by age 6–7 years and increases with age.

Performance on Individual Context-Sensitivity Indices

Although the aggregated context-sensitivity score illustrated the overall cultural difference and developmental trajectory of context-sensitivity, each of the four indices showed slightly different patterns.

Free Description—An ANOVA on first mentioned objects found significant main effects for Culture and Age-Group. As shown in Figure 2B, Japanese children mentioned more background objects first (relative to focal objects) than their American counterparts, and this pattern was stronger for older children.

An ANOVA on the number of descriptive accounts also found significant main effects for Culture and Age-Group, indicating that Japanese children provided more descriptions of background objects (relative to focal objects) than did American children, and older children did so more than younger children. The Culture $\times$ Age-Group interaction was also significant. As shown in Figure 2C, while the cultural difference was significant in all age groups, it was particularly large in the oldest group (also see Table 2).

²Within each age group and culture, only a few of these indices were significantly correlated at the alpha level of .05: the first mentioned and descriptive accounts in US 8–9; the first mentioned and relational accounts in Japanese 6–7; descriptive accounts and relational accounts in Japanese 6–7 and 8–9; and finally, descriptive accounts and Ebbinghaus in Japanese 4–5. Kitayama and colleagues (Kitayama et al., 2009; Kitayama & Imada, 2010) attributed the weak correlations among such measures to the idea that individuals achieve cultural goals (to be independent or interdependent) by choosing some cultural practices (but not all) available in their context. Also for this reason, we favor including an aggregate measure of context-sensitivity across separate indices.

³These main effects remained significant when the Backward Digit Span score was controlled as a covariate, $F_{\text{Culture}}(1, 168) = 12.32$, $p = .001$, $\eta_p^2 = .07$; $F_{\text{Age-Group}}(2, 168) = 12.68$, $p < .001$, $\eta_p^2 = .13$.

An ANOVA on the number of relational accounts found only a significant main effect for Age-Group. As shown in Figure 2D and Table 2, older children mentioned more relations to background objects (relative to focal objects) than younger children.

Ebbinghaus illusion—Because the largest illusion was observed when the size difference between the two center circles was 6%, we focused our analyses on this data point. An ANOVA found significant main effects for Culture and Age-Group. As Figure 2E shows, the illusion increased with age, which is consistent with Doherty et al.'s (2010) finding with children ages 4 to 10 in the U.K. Moreover, Japanese children showed greater illusion than their American counterparts, particularly in the two older groups, but the Culture $\times$ Age-Group interaction did not reach statistical significance. Thus, although the individual context-sensitivity task measures had more variable results for the interaction term, the pattern of main effects for Culture and Age Group was consistent across all indices, including verbal and nonverbal tasks.

Executive Function

DCCS—As anticipated, performance on the DCCS single-rule trials (i.e., sorting by either color or shape) did not differ cross-culturally in accuracy or RTs due to ceiling effects, hence we focused our analyses on the mixed-trial phase. As shown in Table 2, Japanese children outperformed their American counterparts on both accuracy and response time⁴.

Because there is often a trade-off between accuracy and response time, we combined these two indices by reversing RTs and averaging the *z*-scores so a larger score indicates overall better performance. An ANOVA showed a significant main effect for Culture, indicating Japanese children's better performance than their American counterparts. This cultural difference is similar to Sabbagh et al.'s (2006, see also Lan et al., 2011) finding that Chinese children's DCCS performance was superior to that of American children. Age-Group also was significant; not surprisingly, performance improved with age.

Gift Delay—An ANOVA on the number of transgressions showed significant main effects for Culture and Age-Group, indicating that impulsive peeking behavior decreased with age across cultures, and Japanese children transgressed more often than their American counterparts. The Culture $\times$ Age-Group interaction was significant, with the cultural difference being pronounced at age 4–5 but not in the older age groups (Table 2).

An ANOVA on the latency of the first transgression showed significant main effects for Culture and Age Group. These findings indicate that Japanese children transgressed sooner than their American counterparts, and the latency of transgressions increased with age across cultures. Thus, in contrast to their superior performance controlling attention in the set-shifting task, Japanese children had more difficulty controlling the impulse to peek at a gift than American children⁵.

⁴The correlation between DCCS accuracy and RT was significant, $r = -.23$, $p < .01$.

⁵DCCS average *z*-score was correlated with the number of transgressions on the Gift Delay task, $r = -.21$, $p = .05$, but not with the latency of transgressions, $r = .06$, *ns*.

Relation Between Context-Sensitivity and Executive Function

As predicted, DCCS average z -scores were positively correlated with aggregated context-sensitivity scores, $r(147) = .46$, $p < .001$, and the correlation was significant even when age in months was controlled, $r(146) = .19$, $p < .05$. This raised a question whether DCCS performance was mediating the cultural difference in context-sensitivity, or vice versa. Two mediation analyses showed that the cultural difference in DCCS performance was fully mediated by context-sensitivity (Figure 3A, $Sobel-z = 2.85$, $p < .01$), but the reverse showed only a partial mediation effect (Figure 3B, $Sobel-z = 2.28$, $p < .05$), which suggests that while the mediation effect of DCCS performance and context-sensitivity is bi-directional, the influence of context-sensitivity on DCCS performance is stronger than the reverse. In contrast, neither the frequency nor latency of the transgression in Gift Delay was significantly correlated with context-sensitivity scores, $r(165) = -.14$; $r(171) = .06$, ns , respectively. These findings are consistent with our prediction that context-sensitivity is beneficial for EF tasks that involve set-shifting but not impulse-control.

Discussion

The overarching aim of this study was to examine the developmental trajectory of East-West cultural differences in context-sensitivity. Using multiple measures, our data suggest that younger children's attention is relatively focused, but they become more context-sensitive with development in both East-Asian and American cultures. Nevertheless, the results from both verbal and nonverbal measures indicated that Japanese children were more context-sensitive than American children, consistent with the adult cultural cognition literature. In fact, the cultural difference in context-sensitivity observed in our 8–9 year age group ($d = 1.28$) is similar to what has been reported in adults (e.g., $d = 1.08$ for Ebbinghaus by Doherty et al., 2008); $d = 1.57$ in first-mentioned objects by Masuda & Nisbett, 2001). Although the Culture $\times$ Age interaction was significant only in the descriptive accounts of the Free-Description task (and marginally significant in the overall measure of context-sensitivity across tasks), considerably larger effect sizes in older groups are also suggestive of developmental amplification of the cultural difference. Taken together, our findings suggest that a cultural difference in context-sensitivity emerges by 6–7 years and reaches the adult level by 8–9 years. From the sociocultural view that children's cognitive styles develop through socialization practices, cultural environments coinciding with early elementary school might be especially important for fostering culturally desirable levels of context-sensitivity.

Another important contribution of the current research is revealing the complex relation between context-sensitivity and EF. It has been suggested that set-shifting tasks such as the DCCS require reflecting on multiple features of stimuli at the same time (e.g., color and shape) and responding in light of a broader construal of the current context rather than focusing narrowly on specific features of the stimulus (Zelazo, 2004). Consistent with this suggestion, the present study found an association between context-sensitivity and DCCS performance. Moreover, the cultural difference favoring Japanese children in DCCS performance was fully mediated by context-sensitivity, which suggests the intriguing

possibility that East-West differences in children's EF performance arise, to a great extent, from differences in context-sensitivity, rather than early inculcation of self-control.

In keeping with this suggestion, we predicted that context-sensitivity would not be beneficial for an EF task that does not require holistic attention, such as controlling behavioral impulses. Consistent with our prediction, no significant relation was found between context-sensitivity and Gift Delay performance and, indeed, in this case the American children significantly outperformed their Japanese counterparts. Considering Japanese custom that it is inappropriate to open a gift immediately in front of the gift-givers like Americans often do, this finding at first appears counter-intuitive. However, as East Asians tend to adjust themselves to situations (e.g., Church et al., 2008; Suh, 2002), the discrepancies in their behavior between social and solitary situations (e.g., being left alone with a gift) might be more exaggerated. The relation between context-sensitivity and EF is likely to be complicated, and it is important to test specific predictions about a variety of EF tasks. For example, although context-sensitivity was associated with better performance on a set-shifting task (DCCS) in our study, it might impair performance on an attentional focus task like the Flanker, in which one needs to ignore peripheral stimuli and, by the same token, to assist performance on the Reverse Flanker (e.g., Diamond, 2009).

The present findings also raise important questions for future research. We should note that while the aggregated data showed the cultural difference in the two older age groups, one of the Free-Description indices (the number of descriptive accounts) revealed a significant cultural difference even in the youngest age group. Thus, the cultural difference might begin to emerge at the age of 4–5 or possibly earlier, as Kuwabara et al. (2011) suggest. As Eastern vs. Western behavioral differences in very young children have been documented (e.g., Caudill & Weinstein, 1986; Miyake et al., 1985; Shweder, Jensen, & Goldstein, 1995; Whiting, 1964), it would not be too surprising if cultural environment and practices begin influencing children's cognitive tendencies from the day they are born, specifically by way of making East-Asian infants more attuned to the holistic context of daily interactions. Thus, an important next step in our research is to test infants and toddlers to see how early the cultural difference in context-sensitivity might emerge.

Yet another possibility to consider is genetic covariation with culture. That is, the cultural difference in context-sensitivity is not solely due to cultural learning but also due to individuals' predispositions. For example, population prevalence of the 7-repeat allele of the dopamine D4 receptor gene (DRD4) was found to be very small in East and South Asia in comparison to that in the Americas (Chang et al., 1996). The DRD4 7-repeat allele has been implicated in the development of attention and attention-deficit hyperactivity disorder (e.g., Faraone et al., 2001; Swanson et al., 1998). Thus, it is also important to examine the possibility that context-sensitivity is related to such genetic factors.

Although cross-cultural research has been expanding in the past few decades and demonstrated various cultural differences, little is known about the *development* of culturally specific psychological tendencies among children. Focusing on context-sensitivity, the current research makes an important contribution to the literature by demonstrating its significant cultural difference among children. Moreover, although correlational, the finding

that context-sensitivity fully mediated a cultural difference in EF performance on a set-shifting task provides clues to the underlying mechanisms involved in EF development and a potential source of cultural differences in EF.

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A. Free Description

B. Ebbinghaus Illusion

No-Context

Illusional-Context

C. DCCS

Color Rule

Shape Rule

Figure 1.

Examples of task stimuli: A) Free Description, B) Ebbinghaus Illusion, C) DCCS.

Figure 2.

Context-sensitivity indices by Culture and Age-Group: A) aggregated context-sensitivity z-score, B) first mentioned objects in the Free Description task, C) descriptive accounts in the Free Description task, D) relational accounts in the Free Description task, and E) percentage of correct answers in the Ebbinghaus illusion task. All scores were computed such that larger numbers indicate greater context-sensitivity. Error bars indicate standard error of the mean.

Figure 3. Mediation effects of context-sensitivity on DCCS (A) and DCCS on context-sensitivity (B).

Table 1

Sample size, gender, and mean age of the participants

	Age Group							
	All		4-5		6-7		8-9	
	US	Japan	US	Japan	US	Japan	US	Japan
N	89	86	30	30	30	28	29	28
Gender	43F	42F	13F	14F	13F	13F	17F	15F
	46M	44M	17M	16M	17M	15M	12M	13M
Mean age in months (<i>SD</i>)	83.89 (19.78)	83.40 (20.38)	61.77 (6.48)	61.07 (6.54)	83.17 (7.05)	83.75 (7.50)	107.52 (5.59)	106.96 (8.09)

Note. Two Japanese participants (age 5 and 6) did not perform the Free Description task because they were too shy. Three American participants' responses (two age 8 and one age 9) for the Free Description task were not coded due to unclear speech and video recording failure. Twelve American (five age 4, two age 5, two age 6, two age 8, and one age 9) and eight Japanese (five age 5 and three age 6) children did not perform the DCCS mixed trials as they failed to answer correctly on at least four out of five single-rule trials. Also, five American (one age 5, one age 6, one age 8, and two age 9) and one Japanese (age 5) children's DCCS data were not collected due to computer failure. Two American (age 6) and six Japanese (one age 4, two age 5, one age 6, one age 7, and one age 9) participants were not included in the number of transgressions on Gift Delay because we could not accurately count transgressions as they left their seat and disappeared from the range of video recording.

Table 2

Means (SDs) for the context-sensitivity and Executive Function tasks

Task	Age Group					
	All	4-5		6-7		8-9
	US	Japan	US	Japan	US	Japan
Aggregated Context-Sensitivity Z-Score						
Free Description						
First mentioned objects (background – focal)	–1.17 (.61)	.17 *** _(d=.50) (.78)	–.51 (.68)	–.42 _(d=.12) (.83)	–.18 (.52)	.27 *** _(d=.86) (.53)
		.00 (.72)		–.47 ^a (.75)		.04 ^b (.56)
						.44 ^c (.50)
Descriptive accounts (background – focal)						
	–7.90 (4.64)	–4.50 *** _(d=.64) (5.91)	–8.57 (4.61)	–6.79 _(d=.38) (4.62)	–7.37 (5.07)	–3.96 *** _(d=.62) (5.81)
	–6.22 (5.56)		–7.69 ^a (4.67)		–5.75 ^b (5.65)	–5.09 ^b (6.09)
Relational accounts (background – focal)						
	4.14 (12.10)	20.06 *** _(d=.70) (30.04)	–.27 (10.02)	5.59 *** _(d=.53) (12.03)	4.07 (12.38)	14.30 *** _(d=.55) (23.42)
	12.01 (24.10)		2.61 ^a (11.35)		8.91 ^b (18.99)	25.54 ^c (32.16)
Ebbinghaus Illusion						
Percentage of correct answers (no context – illusional context)	68.26 (47.02)	78.49 *** _(d=.27) (34.76)	52.50 (47.50)	55.00 _(d=.05) (46.61)	67.50 (39.47)	85.71 *** _(d=.59) (18.54)
	73.29 (37.77)		53.75 ^a (46.67)		76.29 ^b (32.25)	90.79 ^c (18.68)
DCCS						
Accuracy (number of correct answers)						
	41.31 (7.54)	43.13 _(d=.28) (5.32)	38.68 (7.66)	39.42 _(d=.10) (7.81)	39.74 (8.73)	44.32 *** _(d=.71) (2.63)
	42.25 (6.53)		39.07 ^a (7.66)		41.94 ^a (6.89)	45.43 ^b (2.30)
Response time (in msec)						
	1295.12 (436.77)	1147.79 *** _(d=.35) (399.53)	1630.46 (407.83)	1432.44 _(d=.45) (463.19)	1205.11 (441.44)	1156.36 _(d=.13) (304.17)
						896.15 *** _(d=.81) (215.76)

Task	Age Group					
	4-5		6-7		8-9	
	US	Japan	US	Japan	US	Japan
Average z-score (accuracy and reversed RT)	1218.99 (423.02)	1527.15 ^a (444.16)	1181.67 ^b (378.80)	979.08 ^c (241.34)		
	-.16 (.85)	.15 ^{*(d=.41)} (.69)	-.18 (.95)	.23 ^{*(d=.56)} (.38)	.42 (.28)	.61 ^{*(d=.69)} (.26)
Gift Delay						
		.02 ^a (.76)	.53 ^b (.28)	.00 ^c (.78)		
Number of transgressions	1.26 ^{****(d=.56)} (1.92)	2.56 (2.67)	1.57 ^(d=.39) (1.87)	2.38 (2.25)	.97 ^(d=.07) (2.20)	1.11 (1.48)
	1.89 (2.39)			1.96 ^a (2.08)		1.04 ^b (1.87)
Latency for the first transgression (in sec)	107.92 ^{****(d=.51)} (78.34)	68.25 (76.89)	87.21 ^(d=.27) (80.54)	65.78 (75.95)	132.41 ^(d=.40) (70.72)	101.82 (83.61)
	88.43 (79.92)			76.88 ^a (78.40)		117.39 ^b (78.16)

Note. Significant cultural differences within each age group are indicated by

* $p < .05$,

** $p < .01$, and

*** $p < .001$. Effect sizes of cultural differences are indicated by Cohen's d 's. Significant age-group differences are indicated by superscript letters (a, b, c).

Table 3

Culture $\times$ Age-Group ANOVA: Fs and effect sizes (η_p^2)

	Culture		Age-Group		Culture $\times$ Age-Group	
	<i>F</i> (<i>df</i>)	η_p^2	<i>F</i> (<i>df</i>)	η_p^2	<i>F</i> (<i>df</i>)	η_p^2
Aggregated Context-Sensitivity Z-Score						
Free Description						
First mentioned objects (background – focal)	16.35 *** (1, 169)	.09	35.51 *** (2, 169)	.30	2.39 + (2, 169)	.03
Descriptive accounts (background – focal)	18.26 *** (1, 164)	.10	3.70 * (2, 164)	.04	1.42 (2, 164)	.02
Relational accounts (background – focal)	25.77 *** (1, 164)	.14	17.85 *** (2, 164)	.18	6.25 ** (2, 164)	.07
	1.56 (1, 164)	.01	13.94 *** (2, 164)	.15	.18 (2, 164)	.00
Ebbinghaus Illusion						
Percentage of correct answers (no context – illusional context)	4.14 * (1, 169)	.02	17.34 *** (2, 169)	.17	.77 (2, 169)	.01
DCCS						
Accuracy (number of correct answers)	2.81 (1, 143)	.02	14.05 *** (2, 143)	.16	2.47 (2, 143)	.03
Response time	5.99 * (1, 143)	.04	28.48 *** (2, 143)	.29	.67 (2, 143)	.01
Average z-score (correct answers and reversed RT)	8.21 ** (1, 143)	.05	39.45 *** (2, 143)	.36	.40 (2, 143)	.01
Gift Delay						
Number of transgressions	15.05 *** (1, 161)	.09	8.71 *** (2, 161)	.10	6.38 ** (2, 161)	.07
Latency for the first transgression (in sec)	11.66 ** (1, 167)	.07	6.34 ** (2, 167)	.07	1.38 (2, 167)	.02

Note.

+ $p < .10$,* $p < .05$,

100' > d

p < .01, and

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