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Cultural differences in the development of cognitive shifting: East-West comparison

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Abstract

Prior research has documented that Japanese children's performance on the Dimensional Change Card Sorting task (DCCS task) can be influenced by their observation of another person completing the task, which is referred to as social transmission of disinhibition. The present study explored whether Canadian children would also show a social transmission of disinhibition and whether their performance would be comparable to those with Japanese children. Three- and 4-year-olds in Canada and Japan were given the standard version of the DCCS and the social version of DCCS. Results indicated that Canadian children displayed the social transmission of disinhition, but their effects were significantly weaker than those with Japanese children. On the other hand, performance on the standard DCCS was comparable between the two countries. We discuss the results in terms of cultural differences in the relationship between self and other.

Cultural differences in the development of cognitive shifting: East-West comparison

Executive function is an important cognitive skill for us to make adaptive changes in our complex physical and social environment. It enables us to plan, execute, and monitor appropriate and relevant actions, and to inhibit irrelevant and inappropriate actions, for the attainment of a specific goal (Dempster, 1992; Welsh, Pennington & Groisser, 1991). Extensive evidence suggests that this ability develops rapidly in the preschool years, which may be subserved by the maturation of the prefrontal cortex (Diamond, 2002; Moriguchi & Hiraki, 2009; Zelazo & Müller, 2002). Recent studies suggested that executive function is not unitary; instead, it consists of several components such as inhibitory control, cognitive shifting, and working memory (Garon, Bryson, & Smith, 2008; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000).

One of the major research foci of executive function has been on the Dimensional Change Card Sort task, which is widely used to assess the development of cognitive shifting (Zelazo, Frye, & Rapus, 1996). In the standard version (the standard DCCS), children are asked to sort cards that have two dimensions such as color and shape (e.g., red boats, blue rabbits). There are two phases in the task. In the first phase, children are asked to sort cards according to one dimension (e.g., color) for several trials. In the second phase, children are asked to sort the cards according to the other dimension (e.g., shape) for several trials. Although 3-year-olds are typically able to sort the cards according to the first dimension, they fail to switch the rules in the second phase and perseverate to the first dimension. With increased age, 4- and 5-year-old

children do not perseverate and are able to successfully sort the cards according to the second dimension. This developmental pattern has been replicated in several nations, including Austria, Canada, Korea, and Japan (Kirkham, Cruess, & Diamond, 2003; Kloo & Perner, 2005; Moriguchi & Itakura, 2008; Oh & Lewis, 2008; Zelazo et al., 1996).

While the existing research has exclusively focused on various aspects of executive functioning and how they develop within a child, recent studies have begun to address an intriguing question: whether and how a child's executive functioning can be influenced by another individual's executive actions. It has been proposed that executive functions are not solitary cognitive skills that one possesses independent of others in our social environment. Rather, they can be socially transmitted (Lewis & Carpendale, 2009; Moriguchi, Lee, & Itakura, 2007).

Indeed, Moriguchi et al. (2007) reported such social transmission with the use a modified DCCS task. In their task (henceforth referred to as the social DCCS), instead of sorting cards themselves in the first phase, preschoolers watched an adult model sorting cards according to one dimension (e.g., shape). After that, in the second phase, they themselves were asked to sort according to a different dimension (e.g., color). It was found that 3-year-old Japanese children perseverated to the rule the model had used whereas most 4-and 5-year-olds were able to successfully shift to the new rule. From these results, Moriguchi et al. suggested that social observation can lead to perseverative errors in a manner similar to the typical perseverative errors in the standard DCCS task, which was referred as *social transmission of disinhibition*. This

finding has been consistently replicated with Japanese children (Moriguchi, Sanefuji, & Itakura, 2007; Moriguchi, Kanda, Ishiguro, & Itakura, 2010).

However, it is still unclear whether the similar social transmission of disinhibition occurs in other cultures. There is a reason to suspect that children in another culture may not show similar patterns of behavior. According to current cultural psychology theories, in Western cultures, such as those in North America, people are likely to have a more “independent” view of the self whereas in Asian cultures, such as Japan, people tend to have a more “interdependent” view (Marcus & Kitayama, 1991). People in the interdependent cultures are expected to see themselves as part of a social relationship and recognize that one’s behavior is strongly affected by others’ behaviors. Thus, the relationship between self and other is assumed to be closer in the interdependent culture than in the independent culture. On the other hand, people in the independent cultures are expected to be independent from others where each individual expresses one’s own unique attributes.

Rothbaum, Pott, Azuma, Miyake and Weisz (2000) also argued that Japanese people emphasize the symbiotic harmony in relationships between self and other whereas generative tension plays an important role in the relatedness in America. This review suggests that these cultural differences may already exist during infancy and early childhood. For example, Japanese mothers show prolonged proximity and contact with their infants and meet their needs before they are expressed, which may blur the self-other distinction. In contrast, in North America, infants are seen as separate individuals, and the close relationship between mother and child in Japan is often

regarded as unhealthy by North Americans (Chen & Miyake, 1986). During early childhood, both Japanese parents and nursery teachers emphasize the importance of empathy and meeting others' expectations, and children are not expected to express their individual wishes and desires (Ronald, 1988; Tobin, Wu, and Davidson, 1989). On the contrary, American parents emphasize the expression of the self's will, and children are supposed to assert their desires and hope. Taken together, Japanese children are socialized to be dependent and be part of a social community and, as the result, the distinction between self and other may be relatively blurred, whereas American children are socialized to be independent and to assert their personal wills and wishes, which may lead to the clear distinction between self and others.

Given these cross-cultural differences, it is possible that children socialized in the independent cultures may be more likely to separate themselves from another person than those in the interdependent cultures. Consequently, children in the independent cultures may not show the social transmission of disinhibition observed with Japanese children. This possibility was tested in the present study. We compared Japanese and Canadian children's performance in both the standard and the social DCCS tasks. Canadian children were chosen because existing cross-cultural studies have consistently shown that Canadians, like Americans, show strong independent self-construal (for meta-analysis, see Oyserman, Coon, & Kemmelmeier, 2002).

In the social DCCS task, children were asked to watch another person's sorting of cards according to one rule, and then they were asked to sort the cards according to another rule. Thus, children had to separate the rule they were given from the rule that

another person used to sort the cards. Thus, we predicted that Canadian children would outperform Japanese children on the social DCCS task. To ensure that Canadian and Japanese children were comparable in their ability at cognitive shifting, the same children were also tested on the standard DCCS task. This comparison is particularly important given the existing findings showing that Chinese and Korean children were more advanced in their executive function than North American children (Oh & Lewis, 2008: Sabbagh, et al., 2006).

Method

Participants

Canadian participants were drawn from a predominantly White, middle-class community in the Greater Toronto area and included 38 3-year-olds (*M* (*SD*) = 40.1 (2.8) months, range = 36 months to 47 months, 25 males) and 32 4-year-olds (*M (SD)* = 53.5 (3.6) months, range 49 months to 59 months, 12 males). Informed consent was obtained from all parents of children prior to their involvement in the investigation.

The Japanese comparison group consisted of 34 3-year-olds (*M* (*SD*) = 42.0 (4.3) months, range = 38 months to 48 months, 12 males) and 27 4-year-olds (*M* (*SD*) = 52.8 (3.8) months, range 49 months to 60 months, 13 males). They were drawn from a predominantly middle-class community in Fukuoka and Joetsu areas. There were no significant differences in age between the Canadian and Japanese samples overall.

Materials

The same laminated cards (3.5 cm × 7.0 cm) were used as stimuli in both cultures. In the social DCCS, there were two trays (4.5 cm ×10.5 cm × 15.0 cm), one with a red

star and the other with a blue cup on the front. There were 10 sorting cards depicting either a blue star or a red cup. In the standard DCCS, there were two trays (10.0 cm ×12.0 cm × 8.0 cm), one with a green car and the other with a yellow house on the front. There were 12 sorting cards depicting either a yellow car or a green house.

Procedure

Children were given the social DCCS and the standard DCCS. The dimension order was counterbalanced between children for each task, (either color or shape first). The task order was also counterbalanced between participants. About half of the children (N = 35 for Canada, N = 31 for Japan) were given the social DCCS first, and the other half of the children (N = 35 for Canada, N = 30 for Japan) were given the standard DCCS first.

Social DCCS

The child was introduced to the model and told that a model would sort the cards first ("Now she [the model] is going to sort the cards first. Please watch carefully"). The model was instructed to sort the cards according to one dimension (e.g., shape). The model performed four trials. At the beginning of each trial the experimenter told the model the rule of the game, randomly selected a sorting card, and asked her to sort the card. The model sorted it correctly according to the prescribed rule and was given feedback on every trial ("Yes"). The experimenter withdrew the sorting card from the tray after each trial.

After the demonstration, the model made an excuse and left the room. The child was instructed to begin a new game ("Now, it is your turn. We are going to play a

new game. This game is different from the game she [the model] played.”) If the model sorted the cards according to the shape dimension, the child was asked to sort the cards according to the color dimension. The child was given six sorting trials. On each trial, the experimenter told the child the rule of the game and randomly selected a sorting card for him/her to sort. The child was required to place the card in one of the two trays. The child was not given any feedback about whether he/she sorted the cards correctly.

Standard DCCS

Next, a new set of trays was brought out and the child was instructed to sort the cards according to one dimension (e.g., in the shape game, “This is a shape game. All the cars go here and all the houses go there”). In this first phase of the Standard DCCS task, the child was given four trials, and on the beginning of each trial the experimenter told the child the rule of the game, randomly selected a sorting card and asked him/her to sort cards. The child was required to place the card on one of two trays. The child was given a feedback on every trial (“Yes”/ “No”). The experimenter withdrew the sorting card from the tray at the end of each trial. When they had completed the first phase of the task, the child was asked to stop playing the game and told to switch to a new game. If the child sorted the cards according to the shape dimension on the first phase, he/she was asked to sort cards according to the color dimension (e.g., “The new game is a color game. The color game is different from the shape game. In the color game, all the yellow ones go here and all the green ones there.”). The child was then given six trials that were identical to those in the first phase except for the dimension (e.g., color). In the second phase, the child was not given feedback as to whether he/she

sorted the cards correctly.

Results

Preliminary analyses showed no significant effect of sex in the social and standard DCCS. Therefore all data were collapsed across gender.

Social DCCS

Data of five Japanese 3-year-old children and one Canadian child were excluded from the analysis because they did not observe the model's actions, whereas all other children closely observed the actions of the model. Children were scored as correctly completing a trial if they sorted a card according to the dimension instructed by the experimenter. As in previous studies, children were regarded as passing the task when they correctly completed 5-6 trials. The reason for doing so was that, like most of the existing studies using the DCCS task, the distribution of the number of correct and incorrect trials was bimodal with children either making 5-6 correct responses or incorrect responses (Kirkham et al., 2003).

In the social DCCS task, 72 % of the Canadian children were classified as having passed the task. Indicating that after observing another person's sorting, Canadian children were able to correctly sort the cards according to the second instructed rules. In contrast, Japanese children had difficulty with the social DCCS task, with only 57% of the children passing the task (Figure 1).

Next, we examined whether children's performances in the social DCCS task was affected by age, country and task order. Following Oh and Lewis (2008), a binary logistic regression analysis was conducted on children's performances (pass vs. fail).

Because they were chosen for theoretical reasons (see Menard, 2002), age, country and task order were first entered as predictors. The interaction between the predictors was added to determine whether it contributed significantly to the model. Significance was assessed by a block chi-square test (also known as the chi-square difference test). In this test, the retention of each predictor in a model must lower the variability significantly to justify using a more complex model. The final model that resulted from this procedure was compared with the full model (i.e., all predictors and the interaction) to confirm that it was the best-fitting model.

As a result, the final model included the main effects of age (3 years of age vs. 4 years of age), country (Canada vs. Japan) and task order (social vs standard first). The overall regression model was significant, χ^2 (2, N = 125) = 19.37, $p < .001$, Nagelkerke $R^2 = .20$. Age was found to significantly contribute to the model ($B = 1.38$, Wald = 10.34, $p < .001$, odds ratio = 3.97). The odds ratio indicated that 4-year-olds were approximately four times more likely to pass the social DCCS task than 3-year-olds above and beyond the common contributions of age and country. In addition, country was found to significantly contribute to the model ($B = -0.85$, Wald = 4.15, $p < .05$. odds ratio = 2.29). For the country factor, the odds ratio indicated that Canadian children were over two times more likely to pass the social DCCS task than the Japanese children above and beyond the common contributions of all other variables in the model. Also, the task order was a significant factor ($B = -0.82$, Wald = 3.87, $p < .05$. odds ratio = 2.39). Children who were given the social DCCS secondly were two time more likely to perform the task correctly than those who were given the task first.

Standard DCCS

Data of six Canadian children and two Japanese 3-year-old children were excluded from the analysis because they made errors during the sorting of the first dimension in the first phase of the task. The rest of the children performed perfectly on the first sorting dimension. Children were scored as correct if they sorted a card according to the dimension instructed by the experimenter. As in the social DCCS, children were regarded as passing the task when they correctly completed 5-6 trials.

Canadian children's performances on the standard DCCS were comparable with those of Japanese on the same task (Figure 1). Seventy percent of the Canadian children and 71 % of the Japanese children passed the standard DCCS task. We examined whether the children's performance in the standard DCCS task was affected by age, culture, and task order. A logistic regression analysis was conducted with children's performance as the predicted variable (pass vs. fail) and age (3 years of age vs. 4 years of age), country and task order as the predictors. As in the social DCCS, the regression model was significant, χ^2 (2, N = 123) = 14.29, $p < .01$, Nagelkerke $R^2 = .16$. Age was found to significantly contribute to the model, $B = 1.48$, Wald = 10.37, $p < .01$, odds ratio = 4.53. The odds ratio for age indicated that 4-year-olds were approximately four times more likely to pass the DCCS task than 3-year-olds above and beyond the common contributions of age and country. However, country and task order did not significantly contribute to the model, $B = .12$, Wald = .09, $p = .77$ and $B = .55$, Wald = 1.68, $p = .20$, respectively, indicating that culture and task order did not affect children's performance on the standard DCCS above and beyond the common contributions of all

other variables in the model. The results indicated that Canadian children's performance was comparable with those of the Japanese children in the standard DCCS task.

Relation between the social DCCS and the standard DCCS

Finally, we examined the relationship between performances on the two tasks in each culture. We conducted McNemar tests to examine which tasks were more difficult for children in each culture. We found no significant differences between the tasks in Canada (p >.78); however, a significant difference was found between the social and standard DCCS in Japan (p <.03) with the social DCCS task to be more difficult than the standard one.

Discussion

The present investigation examined whether children's executive functioning can be influenced by another individual's executive actions. Specifically, we assessed whether children who were raised in either a culture that emphasizes independence or that emphasizes interdependence would exhibit a social transmission of disinhibition when completing the DCCS task.

Consistent with previous findings (Moriguchi et al., 2007), about half of Japanese children failed the social DCCS task. In contrast, the majority of Canadian children passed the social DCCS by successfully sorting the cards according to the rule they were given, not the rule by which the model sorted the cards. When examining children's performance on the standard DCCS task, no significant differences were found based on country. Scores on the standard DCCS demonstrate that without the social influence of the model, children in both countries performed similarly on the

executive functioning task. However, comparing children's performance on the social DCCS with the standard DCCS we found that Japanese children showed the more difficulty with the social DCCS than the standard DCCS, while Canadian children basically showed similar performances in both tasks. These results suggest that Japanese children are more strongly influenced by the model's behavior on the social DCCS whereas Canadian children are equally influenced by the model's sorting behavior on the social DCCS as they are by their own initial sorting behavior on the standard DCCS.

We had originally expected that children in the more independent culture of Canada would perform much better on the social DCCS than the standard DCCS because they would be able to more easily disregard the model's sorting behavior and solely focus on the rule they were given. If the model's sorting behavior had no impact on Canadian children's performance in the social DCCS task, they should have reached ceiling in their sorting according to the rule that was given to them. This is because they would have treated the rule as if it was the first rule of the game. This situation would have been similar to the initial phase of the standard DCCS task in which they were given the first rule to sort. In this initial phase, nearly all of the children in both age groups sorted successfully (note that the few who failed to do so were excluded from further data analyses). However, contrary to our initial predictions, Canadian children performed similarly on the social and standard DCCS tasks. In other words, after observing another model sorting according to one rule, some Canadian children were also influenced by the model's executive action and displayed social transmission of disinhibition. More generally speaking, while Canadian children's performance on the

social DCCS task was not as strongly influenced by observing the model as the Japanese children, their performance was still influenced.

Given that both Japanese children and Canadian children did not significantly differ in their performance on the standard DCCS task, the cross-cultural differences found on the social DCCS task cannot be attributed to potential differences in Japanese and Canadian children's executive functioning per se. This lack of cross-cultural difference on the standard DCCS appears to be inconsistent with previous studies that have found that children in Asian cultures performed better on executive function tasks than those in Western cultures (Oh & Lewis, 2008; Sabbagh et al., 2006). However, when specifically examining cross-cultural differences with the DCCS task, results have been mixed with one study demonstrating the advantage in Asian children (China) over western children (United States: Sabbagh et al., 2006), and another study failing to find this advantage (Korea vs. UK: Oh & Lewis, 2008).

In addition to cross-cultural differences on the social DCCS task the present investigation found age differences on both the social and standard DCCS. Consistent with previous findings (e.g., Moriguchi et al., 2007; Zelazo et al., 1996) 4-year-olds were significantly more likely to pass both the social and standard DCCS tasks than 3-year-olds demonstrating a developmental increase in children's cognitive shifting abilities. Furthermore, children in both countries developed cognitive shifting skills in the social and standard DCCS between three and four years of age. Indeed we found no significant interactions between age and country in both social and standard DCCS. The differences of performances between cultures may originate from infancy, which is

consistent with the proposal that cultural differences in relationship between self and other may already exist during early childhood (Rothbaum et al., 2000).

In general, our findings with Japanese and Canadian children support the proposal that executive functions are not cognitive skills residing in one individual, isolated from another; rather, they can be socially situated and can be influenced by another individual's executive actions (Lewis & Carpendale, 2009; Moriguchi, et al., 2007). This social transmission of disinhibition may be a universal phenomenon. However, our findings regarding the cross-cultural differences suggest that the extent of this social transmission of disinhibition may depend on the culture in which children are socialized. When a culture socializes children to become an interdependent member of their society, their executive actions may become more attuned to similar actions of others in their social environment. In contrast, when children are socialized to be independent from one another, their executive action may be less dependent on that of another person.

Furthermore, there may be specific factors that explain the Japanese children's performance. One possible factor is "amae", which refers to complete dependence on parents (mostly, mothers) and characterizes the intense interdependent nature of the mother-child relationship unique to Japan (Doi, 1973). Amae is an indigenous Japanese concept of relatedness that might be similar to attachment (Behrens, 2004). On the one hand, as described in the Introduction, Japanese mothers show prolonged proximity with their children and meet children's needs before they are even expressed. On the other hand, Japanese children usually show amae-based behaviors toward their mother,

such as snuggling. It has been shown that Japanese mothers are more likely to accept preschool children's dependent behaviors (amae) than American mothers (Johnson, 1993; White & LeVine, 1986). The bidirectional relationship between Japanese mothers and children from infancy may contribute to the higher likelihood of social transmission of disinhibition in the Japanese children.

In summary, the present study revealed social transmission of disinhibition in both Japanese and Canadian children. More importantly, we found social transmissions of disinhibition to be significantly stronger among Japanese children than among Canadian children, which we attributed to the fact that compared to Canadian children, Japanese children are more tolerated for their strong dependency on their caregivers and socialized from early infancy to be interdependent with other members of their social environment. Because different cultures in the world socialize their children differently in terms of independence and interdependence, one should expect children in various cultures (e.g., U.S.A, United Kingdom in the West and China and Korea in East Asia) would show different levels of social transmission of disinhibition, an intriguing hypothesis to be tested in future studies. Future studies also need to be expanded to include older children with perhaps latency rather than accuracy measures to examine whether such social transmission of disinhibition continues to exist among older children, and whether there are age-related changes associated with this phenomenon. Furthermore, we need to develop additional tasks to evaluate the "social" aspects of executive function to assess whether these findings go beyond the DCCS task. The present work and those in the near future taken together, we hope, will help elucidate

the social dimension of executive functioning, which has long been neglected despite the explosive increase in research on executive functioning in the last several decades.

References

Behrens, K. (2004). A multifaceted view of the concept of *amae*: Reconsidering the indigenous Japanese concept of relatedness. *Human Development, 47,* 1–27.

Chen, S., & Miyake, K. (1986). Japanese studies of infant development. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), Child development and education in Japan(pp. 135-146). New York: Freeman.

Dempster, F. N. (1992). The rise and fall of the inhibitory mechanism: Toward a unified theory of cognitive development and aging. *Developmental Review, 12*, 45-75.

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (pp. 466-503). New York: Oxford University Press.

Doi, T . (1973). *The anatomy of dependence.* New York: Kodansha.

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin, 134*, 31-60.

Johnson, F. A. (1993). Dependency and Japanese socialization: Psychoanalytic and anthropological investigation into amae. New York: New York University Press.

Kirkham, N. Z., Cruess, L., & Diamond, A. (2003). Helping children apply their knowledge to their behavior on a dimension-switching task. *Developmental Science*, *6*, 449-476.

Kloo, D., & Perner, J. (2005). Disentangling dimensions in the dimensional change card-sorting task. *Developmental Science*, *8*, 44-56.

Lewis, C., & Carpendale, J. I. M. (2009). Links between social interaction and

executive function. *New Directions in Child and Adolescent Development*, *123*, 1-15

Markus, H.R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*, 224–253.

Menard, S. (2002). *Applied logistic regression analysis.* Thousand Oaks, CA: Sage.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*, 49-100.

Moriguchi, Y. & Hiraki, K. (2009) Neural origin of cognitive shifting in young children. *Proceedings of the National Academy of Sciences USA*, *106*, 6017-6021.

Moriguchi, Y., & Itakura, S. (2008). Young children's difficulty with inhibitory control in a social context. *Japanese Psychological Research*, *50*, 87-92.

Moriguchi, Y., Kanda, T., Ishiguro, H., & Itakura, S. (2010). Children perseverate to a human's actions but not to a robot's actions. *Developmental Science*, *13*, 62-68.

Moriguchi Y., Lee, K., & Itakura S. (2007). Social transmission of disinhibition in young children. *Developmental Science*, *10*, 481- 491

Moriguchi, Y., Sanefuji W., & Itakura, S. (2007). Disinhibition transmits from television to young children. *Psychologia*, *50*, 308-318.

Oh, S. & Lewis, C. (2008). Korean preschoolers' advanced inhibitory control and its relation to other executive skills and mental state understanding. *Child Development*, *79*, 80-99.

Oyserman, D., Coon, H. M., & Kemmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin, 128,* 3–72.

Roland ,A . (1988). *In search of self in India and Japan.* Princeton, NJ: Princeton University Press.

Rothbaum, F., Pott, M., Azuma, H., Miyake, K. & Weisz, J. (2000). The Development of Close Relationships in Japan and the United States Paths of Symbiotic Harmony and Generative Tension. *Child Development, 71,* 1121-1142.

Sabbagh, M., Xu, F., Carlson, S. Moses, L., & Lee, K. (2006). The development of executive functioning and theory-of-mind: A comparison of Chinese and U.S. preschoolers. *Psychological Science, 17,* 74-81.

Tobin, J.J., Wu, D.Y.H., & Davidson, D.H. (1989). *Preschool in three cultures: Japan, China, and the United States.* New Haven, CT: Yale University Press.

Wellman, H., Cross, D. & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development, 72,* 655–684.

Welsh, M. C., Pennington, B. F. & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology, 7,* 131-149.

White, M. I., & Le Vine, R. A. (1986). What is an Ii Ko (good child)? In H. Stevenson, H. Azuma, & K. Hakuta (Eds.),Child Development and Education in Japan (pp. 55-67). New York: W . H. Freeman

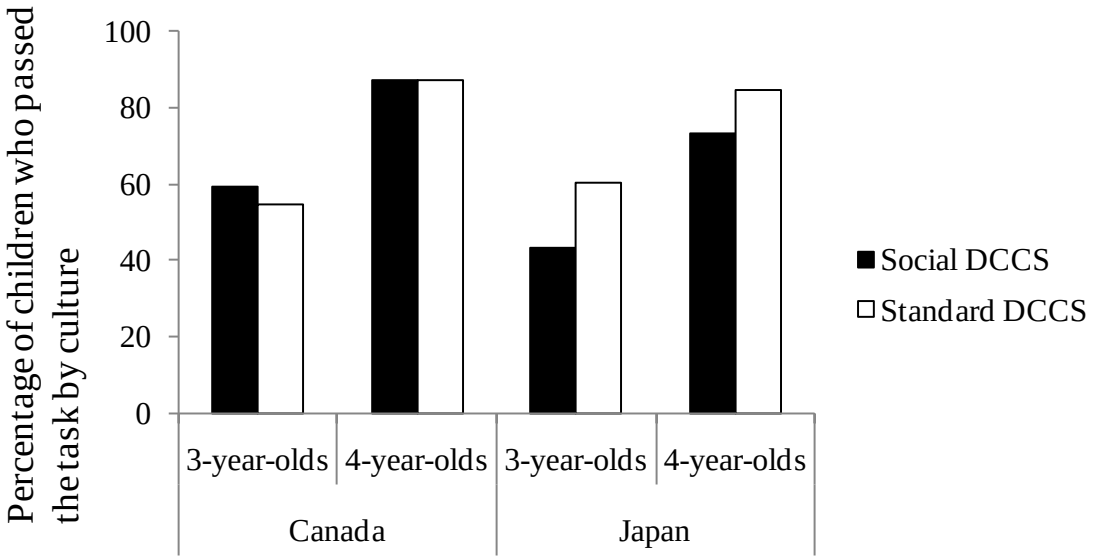
Zelazo, P. D., Frye, D., & Rapus, T. (1996). An age-related dissociation between

knowing rules and using them. *Cognitive Development, 11*, 37-63.

Zelazo, P. D. & Müller, U. (2002). Executive Function in typical and atypical development. In U. Goswami (Ed.), *Blackwell handbook of childhood cognitive development* (pp445-469). Oxford, England: Blackwell.

Figure Legends

Figure 1. Percentage of children who passed the tasks by culture and age


Percentage of children who passed the task by culture
100
80
60
40
20
0
3-year-olds
4-year-olds
3-year-olds
4-year-olds
Canada
Japan
Social DCCS
Standard DCCS