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Author(s)	KUSANAGI, Emiko; 草薙, 恵美子; HOSHI, Nobuko et al.
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STRUCTURE, DEVELOPMENTAL CHANGE, AND SEX DIFFERENCES IN TEMPERAMENT OF JAPANESE CHILDREN

Emiko Kusanagi, Nobuko Hoshi, Shing-Jen Chen
Hokkaido University

Abstract

In this study, we addressed three issues using parental report temperament questionnaires: the structure and developmental change of temperament from three- to six-year-old children using the Children's Behavior Questionnaire (CBQ) scales, and sex differences using the Toddler Behavior Assessment Questionnaire (TBAQ) and the CBQ scales. The subjects were 483 Japanese children at eighteen months for the TBAQ and 372 3- to 6 year olds for the CBQ. Factor-analyzing the results from 15 CBQ scales, three factors (Surgency, Negative Affect, and Effortful Control) were obtained. The factor pattern we obtained showed considerable similarity to those for America and China samples reported previously by other researchers, a finding supporting the invariance of underlying structure of temperament across cultures. Comparing the factor-loading patterns of the three nations, Japanese children's temperament occupied a middle position. This suggests that the development of temperament might be influenced by children's experiences in socialization which varied according to culture. We found sex differences for the Activity Level, High Intensity Pleasure, Impulsivity, Inhibitory Control, Low Intensity Pleasure, Perceptual Sensitivity, and Shyness scales of the CBQ, but not for the TBAQ scales. Boys were rated higher on the scales related to the Surgency factor, and girls were higher on the scales related to the Effortful Control. As expected, Anger and Discomfort scale scores decreased, and Attention Focusing and Inhibitory Control scale scores increased with age.

Key Words: temperamental structure, developmental change, sex difference, Japanese children

Introduction

Over the past few decades, there has been an increase in temperament research in Western countries (Bates, 1987; Buss & Plomin, 1984; Goldsmith, Buss, Plomin, Rothbart, Thomas, Chess, Hind, & McCall, 1987; Goldsmith & Campos, 1982; Kohnstamm,

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Bates, & Rothbart, 1989; Plomin & Dunn, 1986; Strelau & Angleitner, 1991). In Japan, however, the number of temperament studies is still relatively small and the instruments employed have been limited. Recently, we administered two temperament questionnaires (Toddler Behavioral Assessment Questionnaire (TBAQ) (Goldsmith, 1996) and Children's Behavior Questionnaire (CBQ) (Ahadi & Rothbart, 1994; Rothbart, Ahadi, & Hershey, 1994)) to Japanese mothers, and provided evidence for the usefulness of these questionnaires in assessing temperament of Japanese children (Kusanagi, 1993a; Kusanagi, Hoshi, & Chen, 1997). In the present study, using these same questionnaires, we addressed three important issues concerning temperament and its development.

Our first objective was to identify the structure of temperament in a sample of Japanese preschool children by factor analyzing the results of CBQ scales and to compare our results with those previously reported for American and Chinese samples (Ahadi, Rothbart, & Ye, 1993). As noted by Ahadi and her colleagues, when we hypothesize an invariant underlying structure across cultures, important differences in expression of temperament can still be expected, because the individual's experiences in the socialization would influence the manifestation of temperamental characteristics. From the viewpoint of cultural adaptationism, the socialization context of children can be viewed as an ecosystem in which the physical environment, mode of production, social organization, and belief systems are functionally interdependent and coexisting in an adaptive equilibrium (Segall, Dasen, Berry, & Poortinga, 1990; J. W. M. Whiting, 1961). If the goal of child training is to produce personality trait most adaptive to the given society's economic needs and demands (B. B. Whiting & Whiting, 1975), the structure of temperament in a Japanese sample is similar to that of the American sample due to similarity in the mode of production, social organization, and probably belief system. On the other hand, it is also expected that there are similarities in temperament structure between Japanese and Chinese children due to similarities in race. Comparing our result with those obtained from these countries should lead to further understanding of the cross-cultural differences that might arise from the differences both in the race and in the socialization context of the child, as well as universality of temperament structure.

To date, investigations about temperament of Japanese children have used the questionnaires assessing nine temperament scales identified by Thomas and Chess (Sugawara, Shima, Toda, Sato, & Kitamura, 1994; Windle, Iwawaki, & Lerner, 1988). According to our laboratory research and that of others, these scales are insufficient in capturing children's temperamental characteristics (Kochanska, Coy, Tjebkes, & Husarek, 1998; Kusanagi, 1993b; Hoshi, Kusanagi, & Chen, 1997). The CBQ was developed to assess three theoretical components (arousal, affect, and self-regulation) thought to underlie temperament. Affective component in the CBQ is divided into positive and negative emotionality, which is further divided into more specific emotion systems (fear, anger, sadness, and discomfort). Thus, we think this questionnaire is more powerful for investigating the temperamental structure than that of Thomas & Chess's which does not measure individual differences in these different emotion systems.

The Second objective was to address the sex difference issue. In spite of its utmost psychological and sociological importance, it has not been a well-studied topic in the temperament literature (Kohnstamm, 1989). A key question concerns the onset and

change over age of sex differences in temperamental phenotype. In Rothbart's longitudinal study at 3, 6, 9 months of age, neither parental report (Infant Behavior Questionnaire), home observations, nor composite measure yielded significant sex differences or sex \times age interactions (Rothbart, 1986). Kohnstamm (1989) has reviewed studies on sex difference in activity level and emotionality. His conclusion with regard to motor activity level is that boys on the average show somewhat higher levels than girls and that this difference increases with age until early school years. With regard to emotionality, he stated that the concept of emotionality is far too comprehensive and that the question about sex differences in emotionality cannot be answered without first specifying the kind of emotionality. As the TBAQ and CBQ measure individual differences not in the broad emotionality but in the specific emotions, we could elucidate the sex differences in the expression of specific emotion system. In the present study, we examined the sex differences in temperament at 18 months using TBAQ, and sex differences in the children from 3 to 6 year of age using CBQ.

The third objective of the present study was to investigate developmental change of temperament expression. Research in psychology in general tends to fall into one of two realms, namely, individual differences or group differences. According to McCall (1986), when applied to behavioral development, these two realms translate into a concern with individual differences versus developmental functions. A developmental function (Wohlwill, 1973) is the average behavior for a group or individual over time. Until now, most of temperament researches have been limited to studying individual differences and have focused on demonstrating the consistency of relative rank ordering of individuals from one age to another (Guerin & Gottfried, 1994; Gunnar, Porter, Wolf, Rigatuso, & Larson, 1995; McDevitt, 1986; Pedlow, Sanson, Prior, & Oberklaid, 1993; Plomin, Kagan, Emde, Reznick, Braungart, Robinson, Campos, Zahn-Waxler, Corley, Fulker, & DeFries, 1993; Rothbart, 1986; Thomas & Chess, 1986; Worobey & Blajda, 1989). The issue of developmental change common to all children has been neglected. McCall (1986) has urged researchers of temperament not to limit themselves to studying individual differences but to study developmental functions as well. In the present study, we examined the developmental change of temperament scales of the CBQ for 3 to 6 year-old children cross-sectionally. We expected a decrease in negative emotions and an increase in the scales relating to self-regulation.

Method

Subjects

Mothers who visited three health centers in Sapporo City for their children's physical check-up at 18 months were asked to complete the TBAQ. Questionnaires were sent to mothers by mail from two of the health centers before the children's physical check up, and were collected when they visited the health centers. At the third health center, questionnaires were handed to mothers on visiting days, and were returned by mail. Return rates were 65.9% and 70.1% for the former, and 22.5% for the latter. A total of 483 mothers filled out the TBAQ. Among their children, 258 were boys, 222 were girls, and 3 children were not known in terms of sex. Children's ages range from 16 to 20 months, and 80% of them were 18 months old. There were three children whose ages were not known.

In order to gather data for the CBQ, mothers whose children go to one of the three kindergartens (numbers of children were 104, 161, and 170, respectively) in a town of 50,000 persons near Sapporo City were asked to complete the CBQ. The questionnaires were taken to mothers by their children through each class teacher and were returned after a week. A total of 372 mothers filled out the CBQ, and the return rates were 91.3%, 87.6%, and 80.0%, respectively. Among the children, 206 were boys and 166 were girls. There were 16 3-year-olds, 108 4-year-olds, 164 5-year-olds, and 84 6-year-olds.

Temperament Questionnaire

The TBAQ. Temperament scales were constructed with emphases on theoretical base, conceptual independence, inclusiveness of varied facets of each temperament construct, internal consistency, and empirical distinctiveness (Goldsmith, 1996). The TBAQ is comprised of 111 items that combine situations and responses theoretically postulated to be relevant to the target scales. The TBAQ assesses temperamental scales of Activity Level, Tendency to Express Pleasure, Social Fearfulness, Anger Proneness, and Interest/Persistence. All items were directly translated into Japanese, except for one item in which the name of a TV program (“Sesame Street”) was deleted in the Japanese translation. Mothers were asked to indicate how often they observed their children demonstrating the behavior described during the previous month by circling one of the numbers. Numbers ranged from 1 (=never), through 4 (=about half the time), to 7 (=always), with X (=does not apply) meaning “I did not see my child in this situation”.

The CBQ. The CBQ is comprised of 195 items that describe children’s reactions to a number of situations (Ahadi & Rothbart, 1994; Rothbart, Ahadi, & Hershey, 1994). The CBQ assesses 15 temperamental scales: Activity Level, Anger/Frustration, Approach/Anticipation, Falling Reactivity & Soothability, Smiling & Laughter, Attentional Focusing, Discomfort, High Intensity Pleasure, Impulsivity, Inhibitory Control, Low Intensity Pleasure, Perceptual Sensitivity, Fear, Sadness and Shyness. Most of these scales were derived from the Infant Behavior Questionnaire (IBQ) (Rothbart, 1981), TBAQ and Physiological Reactions Questionnaire (PRQ) (Derryberry & Rothbart, 1988). Each scale consists of 12–14 items except the Attentional Focusing scale. Since Rothbart divided the original Attentional Focusing scale into two new scales (Attentional Focusing and Attentional Shifting), the number of items in the Attentional Focusing scale in this study was fewer than the original one. All items were directly translated into Japanese, except a few items that referred to a TV show (Mister Rogers) and nursery rhymes, which were modified to suit Japanese practice. Mothers were asked to rate whether each item was a “true” or “untrue” description of their children’s reaction within the past six months on a scale ranging from 1 (extremely untrue) to 7 (extremely true), with X meaning “does not apply”. When a mother could not answer because of not having seen her child in that situation, mothers were asked to circle X (not applicable). Scale scores for the TBAQ and the CBQ were computed by averaging all numerical item responses for a given scale. When a mother omitted an item, or checked the “does not apply” response option for an item, that item was not included.

Results

Structure of the Children's Temperament

The 15 CBQ scale scores were factor-analyzed. According to Ahadi and her colleagues (Ahadi, et al., 1993), we employed a principal axis factor analysis, iterated to communalities and rotated the extracted factors obliquely using PROMAX algorithm. Table 1 presents the factor pattern of CBQ scales. Loadings of .40 or greater are presented in bold. Consistent with the results by Ahadi and her colleagues, this analysis resulted in the extraction of three factors. Following these authors, we labeled the three factors as Surgency, Negative Affectivity, and Effortful Control, respectively. Surgency factor loaded Impulsivity, Activity Level, High Intensity Pleasure, and Shyness (negative). Negative Affectivity loaded Anger, Discomfort, Sadness, Approach, Fear, and Soothability (negative). Effortful Control loaded Low Intensity Pleasure, Smiling/Laughter, Inhibitory Control, Perceptual Sensitivity, and Attentional Focusing.

In Table 1 the result of American and Chinese children reported by Ahadi et al. (1993) were presented in parentheses for comparison. At first glance, most of factor patterns of the CBQ scales for Japanese children were very similar to those obtained from American and Chinese children (Ahadi et al., 1993). However, according to Ahadi et al. there were minor differences in factor loadings with regard to Approach, Smiling/Laughter, and Attentional Focusing scale between samples from China and the U.S.. In their result, Approach scale plays a strong role in the definition of the Surgency factor in the Chinese sample, but not in the American sample. In their American sample, Approach scale plays a relatively strong role in the definition of the Negative Affectivity factor. In our Japanese sample, the role of Approach was more evenly distributed between Surgency

Table 1 Factor Pattern of CBQ scales

CBQ Scale	Surgency	Negative Affectivity	Effortful Control
Impulsivity	.93 (.86/ .63)	-.01 (.01/-.01)	-.12 (.00/-.25)
Activity Level	.75 (.68/ .64)	-.10 (.09/-.06)	-.10 (-.12/-.35)
High Intensity Pleasure	.67 (.74/ .68)	-.10 (-.16/-.20)	.03 (.01/-.09)
Shyness	-.58 (-.58/-.46)	.24 (.27/ .39)	-.03 (-.21/-.18)
Anger	.15 (.28/ .30)	.74 (.62/ .59)	-.10 (.03/-.10)
Discomfort	-.15 (-.07/-.07)	.63 (.65/ .71)	-.03 (.10/ .06)
Sadness	-.12 (-.12/ .07)	.61 (.69/ .58)	.18 (.11/ .14)
Approach	.45 (.34/ .69)	.48 (.45/ .26)	.30 (.35/ .25)
Fear	-.21 (-.32/-.17)	.45 (.53/ .64)	.13 (-.06/-.01)
Soothabilty	.20 (-.02/ .05)	-.56 (-.61/-.40)	.27 (.09/ .22)
Low Intensity Pleasure	-.02 (-.16/-.01)	.09 (.09/ .19)	.72 (.85/ .61)
Smiling/Laughter	.46 (.31/ .65)	-.02 (-.02/ .01)	.65 (.72/ .18)
Inhibitory Control	-.40 (-.42/-.22)	-.21 (-.24/-.14)	.63 (.52/ .73)
Perceptual Sensitivity	.05 (.07/ .33)	.11 (.11/ .09)	.58 (.47/ .49)
Attentional Focusing	-.25 (-.32/ .05)	-.05 (-.25/-.24)	.47 (.21/ .64)

Note: $N=372$. Loadings greater than or equal to .40 are presented in bold. For comparison, the loadings for American and Chinese children reported by Ahadi, et al (1993) were included in parentheses (the American ones come first).

and Negative Affectivity factors. With regard to the role of Smiling/Laughter scale, the Japanese sample was more similar to the American than the Chinese sample. On the other hand, for the Attentional Focusing scale, Japanese children were closer to Chinese than American children. Thus, these results suggest that the Japanese sample took a middle position between American and Chinese children concerning the difference of temperamental structure among cultures.

Developmental Change and Sex Differences in Children's Temperament

Analyses of variance were performed across sex for each of the TBAQ scales. No sex differences were found for each temperament scale at 18 months.

As the number of the 3-year-old subjects for the CBQ was too small, we aggregated the three-year-olds and the four-year-olds into one group. Analyses of variance were performed across age and sex for each CBQ scale. Table 2 presents the means and standard deviations by sex and ages for each CBQ scale. Significant sex effects were found for the seven CBQ scales. Boys were rated significantly higher on measures of Activity Level ($F(1, 365) = 7.29, P < .01$), High Intensity Pleasure ($F(1, 365) = 8.00, P < .01$), and Impulsivity scale ($F(1, 365) = 5.12, P < .05$) than were girls. On the other hand, girls had higher scores than boys for Inhibitory Control ($F(1, 365) = 20.92, P < .0001$), Low Intensity Pleasure ($F(1, 365) = 7.99, P < .01$), Perceptual Sensitivity ($F(1, 365) = 14.11, P < .001$), and Shyness ($F(1, 365) = 6.07, P < .05$). Thus, on the whole, boys were rated higher on scales related to the Surgency factor. On the other hand, girls were rated higher on scales related to the Effortful Control factor.

There were significant age effects for the four temperament scales. Although there was no significant difference between five- and six-years-olds, mothers of the five-year-olds rated their children as lower in Anger ($F(2, 365) = 2.99, P < .06$) and Discomfort

Table 2 Means and Standard Deviations for CBQ from 3 to 6 year of age

Scale	3-4 years		5 years		6 years	
	Male	Female	Male	Female	Male	Female
	(N=71) M (SD)	(N=53) M (SD)	(N=81) M (SD)	(N=82) M (SD)	(N=54) M (SD)	(N=30) M (SD)
Impulsivity	4.39 (.73)	4.17 (.77)	4.19 (.71)	4.03 (.67)	4.27 (.82)	4.13 (.69)
Activity Level	5.10 (.70)	4.80 (.72)	4.87 (.66)	4.75 (.69)	4.88 (.79)	4.69 (.65)
High Intensity Pleasure	4.66(1.01)	4.31 (.75)	4.58 (.86)	4.41 (.89)	4.83 (.93)	4.52 (.66)
Shyness	3.83(1.20)	4.30(1.17)	4.04(1.07)	4.33(1.22)	4.05(1.19)	4.11(1.21)
Anger	4.05 (.70)	3.90 (.70)	3.78 (.68)	3.75 (.71)	3.99 (.86)	3.73 (.80)
Discomfort	4.23 (.68)	4.17 (.66)	4.00 (.69)	4.00 (.76)	4.06 (.799)	4.09 (.81)
Sadness	3.85 (.45)	3.82 (.71)	3.92 (.61)	4.01 (.60)	3.88 (.67)	4.10 (.61)
Approach	4.56 (.64)	4.37 (.70)	4.56 (.68)	4.52 (.72)	4.56 (.74)	4.68 (.68)
Fear	4.36 (.79)	4.39(1.01)	4.21 (.91)	4.35 (.80)	4.25 (.93)	4.35 (.91)
Soothability	4.85 (.87)	4.93 (.70)	4.78 (.72)	4.73 (.67)	4.95 (.73)	4.69 (.76)
Low Intensity Pleasure	5.15 (.53)	5.20 (.49)	5.05 (.56)	5.18 (.58)	4.93 (.60)	5.35 (.52)
Smiling/Laughter	5.68 (.60)	5.53 (.66)	5.56 (.60)	5.60 (.67)	5.58 (.60)	5.79 (.65)
Inhibitory Control	4.28 (.85)	4.70 (.69)	4.70 (.69)	5.01 (.65)	4.65 (.93)	5.04 (.82)
Perceptual Sensitivity	5.08 (.69)	5.41 (.63)	5.22 (.67)	5.41 (.63)	5.20 (.86)	5.56 (.64)
Attentional Focusing	4.22 (.81)	4.37 (.69)	4.46 (.79)	4.57 (.89)	4.52 (.84)	4.56 (.68)

($F(2, 365) = 2.82, P < .06$) than those of the three- and four-year-olds. On the other hand, the Attentional Focusing scale score of the five-year-olds was higher than that of three-, and four-year-olds ($F(2, 365) = 3.48, P < .05$). For Inhibitory Control, there were significant differences between the three- and four-year-olds and five-year-olds and between three- and four-year-olds and six-year-olds. That is, Inhibitory Control scale score of three- and four-year-olds was lower than that of five- and six-year-olds.

Discussion

We factor-analyzed the 15 CBQ scales from a Japanese sample and obtained three factors (Surgency, Negative Affect, and Effortful Control), similar to those obtained in the U.S. and the China samples by Ahadi et al. (1993).

In the results by Ahadi et al., there was a large degree of similarities between the two samples from the U.S. and China for factor loading patterns of twelve scales among fifteen scales. Similarly, for Japanese children, factor loading patterns concerning these twelve scales were very similar to those derived from both American and Chinese samples. The strong similarity in factor structure among the three nations supports the view of invariance of underlying structure of temperament across cultures, a view that converges with that of other researchers (Sugawara, et al., 1994; Windle, et al., 1988). With respect to factor loadings of the other three scales, Japanese children took middle positions between American and Chinese children. What does this result imply? Given both that Japanese are akin to Chinese in race and that temperament is defined as constitutionally based individual differences, temperamental structure of Japanese children should be more similar to that of Chinese rather than American. Our result suggests that the development of the phenotype of some temperament dimensions might be influenced over time by the culturally varied children's experiences in socialization which are organized culturally and are related to the ecosystem.

Concerning the patterns of sex differences on the CBQ scales, Japanese children were very similar to those of American children, but not to those of Chinese children. Indeed, among the seven significant sex differences in the CBQ scales for Japanese children, six of them were reversed in comparison with those of Chinese children (Ahadi, et al., 1993). Boys in our sample scored higher on the Surgency scales of Activity Level, High Intensity Pleasure, and Impulsivity. In the Chinese sample, however, girls scored higher on these three scales. Moreover, although boys in our Japanese sample scored lower on Effortful Control scales of Inhibitory Control, Low Intensity Pleasure, and Perceptual Sensitivity, boys in the Chinese sample scored higher on these same scales. What are the implications of these findings? Sex differences in temperamental characteristics are viewed as functions of both culture and worldwide constitutional factors (i.e. sex differences in gene). Given that sex differences in genes are universal among the races, these findings lead us to the conclusion that the cross-cultural differences in sex differences of temperamental characteristics could arise from the differences in socialization due to sex role stereotyping. However, we need to investigate whether or not there are differences in sex role stereotyping and in socialization of boys and girls between Japan and China.

Our findings regarding sex differences were consistent with what might be consid-

ered stereotypical sex differences in Japan. This suggests that the CBQ is useful in assessing the temperament of Japanese children. However, to the extent that parental report includes subjective judgements of the parents (Bates & Bayles, 1984), these findings need to be verified by more objective measures in future study. The fact that there were sex differences in the Activity Level on the CBQ scales for three- to six-year-olds, but no sex differences on the TBAQ scales at eighteen months was consistent with the conclusion from the overview of studies by Kohnstamm (1989). Sex differences on the Shyness scale were found on the CBQ scales, but not on the corresponding TBAQ scales (Social Fear) at eighteen months. These results and the other sex differences on the CBQ demand us to examine when and how these sex differences appear in future longitudinal temperament research.

The results concerning the developmental change of temperament measures fit with our expectations. As expected, Anger and Discomfort scale scores decreased, and Attentional Focusing and Inhibitory Control scale scores increased with age. We suppose that developmental changes in these negative emotions are due to the increase of capabilities in focused attention and inhibitory control. Ahadi & Rothbart (1994) also suggested that Effortful Control may be implicated in the regulation of anger tendencies. Indeed, Kochanska and her colleagues (Kochanska, et al., 1998) recently demonstrated that children who were capable of longer and more intense focused attention responded to aversive stimuli with fewer discomfort behavior and had lower intensity of angry distress. Furthermore, in their result, children who are capable of a more inhibited approach to grasping objects were slower to respond to discomfort and tended to have lower intensity and longer latency to anger. Thus, her results in the laboratory setting endorse our assertion with regard to the causal relationships between these negative emotions, and attentional focusing and inhibitory control. However, we should keep Kochanska's words of caution in mind that the direction of causality is somewhat ambiguous. That is, attention may serve to modulate reactivity to aversive stimuli, or the proneness to negative emotion may interfere with focused effortful attention.

As described by Kochanska and her colleagues (1998), given the salience of the topic of emotion regulation, our findings concerning the developmental change in negative emotionality and effortful control may prove important. Moreover, given the recent fact that there is an increase in the number of elementary school children in Japan who exhibit "Kireru" behaviors, it is very important to reveal how a child becomes able to inhibit anger behavior. The term "Kireru" means to be incapable of inhibiting one's anger and to express anger in an explosive manner. To clarify this issue, we need to observe more closely in future studies what kinds of self-regulative behaviors a child actually uses to suppress the anger behaviors. Furthermore, it is also necessary to reveal how a child acquires these self-regulative behaviors in the actual developmental course. There is a succession of phases in transition from dyadic regulation toward self-regulation of emotion in the preschool years (Sroufe, 1996). Sroufe noted that learning to inhibit anger behaviors under the guidance of the caregiver paves the way for later self-regulation. We believe that clarifying this developmental transition in negative emotion regulation should lead to an understanding of the process in which self-regulative behaviors were acquired.

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