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Author(s)	KUSANAGI, Emiko
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A PSYCHOMETRIC EXAMINATION OF THE CHILDREN'S BEHAVIOR QUESTIONNAIRE

Emiko Kusanagi
Hokkaido University

ABSTRACT

The Children's Behavior Questionnaire (CBQ) developed by Rothbart was examined in terms of four psychometric properties of scales and items: distribution of answer for each item, internal consistencies, homogeneities, and discriminant properties of temperamental scales. Although a few items were inadequate in distribution of answer, most items were found to be able to discriminate among Japanese children effectively. All scales proved to have satisfactory internal consistencies and homogeneities, except the Attentional Focusing and Sadness scales. There was found to be moderate levels of correlations across some scales. It is safe to conclude that the CBQ has strong psychometric qualities.

INTRODUCTION

Recently, there has been increased interest in temperament. One reason is that temperament has been useful to clinicians to identify children who pose problems to their caregivers in the future. Another reason is that developmentalists would like to use temperament primarily to refer to characteristics of individuals, usually with the ultimate goal of understanding the causal base of developmental consistencies or changes in behavior or the genesis of individual differences(Hinde, 1989).

Three methods are widely used to assess temperament in infancy and childhood, parent report using questionnires, home observation, and laboratory observation. Of the three, parent report is most widely used because of inexpensiveness and ease of administration. The most frequently used temperamental questionnaires were those developed by Carey and his colleagues (Carey, 1970, 1972; Carey and MeDevitt, 1978; Fullard, McDevitt, and Carey, 1984; McDevitt and Carey, 1978). These were designated on the basis of the New York Longitudinal Study (NYLS) conceptualization of temperarent (Thomas *et al.*, 1963). While these instruments have been successful for clinical purposes, predicting later behavioral problems to some extent, they are problematic for developmental psycholgists to study temperamental stability or instability over time. The questionnaires based on the NYLS dimentions have been criticized for having psychometrically inadequate properties (Buss & Plomine, 1984; Rothbart & Mauro, 1990). For example, the conceptual nonindependence of scales was evident

Request for reprint should be addressed to Emiko Kusanagi at Department of Developmental Psychology, School of Education, Hokkaido University, Sapporo 060 Japan.

between the Mood and Approach scales, and between the Distractibility and Attention Span scales. The overlap of conceptual definition should necessarily bring about item overlap across these scales, in turn yielding high intercorrelations among these scales. Indeed, by factor analysis of the nine dimensions, only two dimentions emerged as relatively pure factors (Buss *et al.*, 1984; Sanson *et al.*, 1987; Sugawara *et al.*, 1988). It was pointed out that a less reliable scale was less capable of demonstrating stability across ages (Rothbart and Mauro, 1990; Sugawara *et al.*, 1988). In order to examine the consistencies or changes of temperament over time, temperamental constructs should have conceptual independence across dimmensions and their scales should have high internal reliabilities.

In contrast to Carey's questionnaires, Rothbart and her colleagues developed questionnaires with strong psychometric qualities that measured individual differences in various facets of temperament (Goldsmith and Rieser-Danner, 1990; Goldsmith and Rothbart, 1991). They wished to assess dimensions of temperament that would be conceptually independent, that is, designed with no conceptual overlap among operational definitions of the measures. Because they expected that parental biases might operate most strongly when parental judgments were global or involve comparing one's own child with others, they worded all items to refer to concrete behaviors in specific situations. In addition, to maximize each scale's internal consistencies, items were deleted selectively on the basis of their item-scale correlations.

The questionnaieres developed by Rothbart and her colleagues are the Infant Behavior Questionnaire (Rothbart, 1981), the Toddler Behavior Assessment Questionnaire (TBAQ) (Goldsmith, Elliott, and Jaco, 1986), the Children's Behavior Questionnaire (CBQ) (Rothbart, 1988), the Early Adolescent Temperament Questionnaire (EATQ) (Capaldi and Rothbart, 1990), and the Physiological Reactions Questionnaire (PRQ) for use with adult subjects (Derryberry & Rothbart, 1988). In all, the questionnaires available allow longitudinal studies of temperament from infancy to adulthood (Goldsmith and Rothbart, 1991). They reported that all of these questionnaires have high internal consistencies for each scale. Additionally, the IBQ scales were demonstrated to have high discriminant properties and considerable convergence with home observation and laboratory measures (Rothbart, 1986; Goldsmith and Campos, 1990). The TBAQ scales were also found to be largely independent (Goldsmith and Rothbart, 1991). These questionnaires seem to be useful to investigate developmental stability or instability of temperament. In this study, the psychometric qualities of the CBQ was examined. Until now, there have been few reports for the CBQ. The CBQ for use between 3-7 years of age is a caregiver-report measure that assesses 15 temperamental scales, each consisting of 12-14 items. Definitions of temperament scales and sample items are presented in the Appendix.

The psychometric qualities of the CBQ were examined in terms of four fundamental properties of scales and items. First, the distribution of answers was examined for each item to confirm whether each item discriminated the subjects effectively. Second, coefficient alphas for each scale were computed in order to examine internal consistencies of the CBQ scales. According to Rothbart, estimates of alpha were high for the scales of the CBQ except for the Attentional Focusing sale, ranging from .67 (Sad-

ness) to .90 (Shyness) (Goldsmith and Rothbart, 1991). Although Rothbart recently divided original Attentional Focusing scale into two new scales (Attentional Focusing and Attentional Shifting), the items of Attentional Focusing scale in this study were original compositions of scales. Third, factor analysis was done to make sure of the homogeneity of each scale, because the inference of homogeneity solely on the basis of coefficient alpha is insufficient (Windle, 1988). There has been a tendency to equate internal consistency (as indexed by coefficient alpha) with unidimentionality (homogeneity) in the temperament literature. A homogenious test is one in which all items converge on the measurement of a single factor. Finally, the intercorrelations among scales were computed to examine the discriminant varidity of each scale. Interscale correlations are desired to be low. For the IBQ, TBAQ, and PRQ, however, significant correlations were found among temperament scales. It is expected that there are some significant correlations among the CBQ scales, because most of dimensions assessed in the CBQ were derived from the IBQ and PRQ. The scales derived from the IBQ are the Activity Level, Anger/Frustration, Fear, Falling Reactivity & Soothability, and Smiling & Laughter scales. The scales from the PRQ are subcomponents of arousal, self regulation, and emotional reactivity, referring to the Attentional Focusing, Discomfort, High Intensity Pleasure, Inhibitory Control, Low Intensity Pleasure, Perceptual Sensitivity, Fear, Falling Reactivity & Soothability, Sadness, and Anger/Frustration scales.

METHOD

Subjects :

Mothers whose children go to one of the three kindergartens (numbers were 104, 161, and 170) in a town of 50,000 residents near Sapporo City were asked to complete the questionnaires. The questionnaires were taken to mothers by their children through each classroom teacher and were returned after a week. A total of 372 mothers filled out the CBQ, and the return rates for each of the kindergartens were 91.3%, 87.6%, and 80.0%, respectively. The distribution of ages and sexes is presented in Table 1.

The Children's Behavior Questionnaire :

The CBQ is comprised of 195 items that describe children's reactions to a number of situations. All items were directly translated into Japanese, except a few items which referred to a TV show (Mister Rogers) and nursery rhymes, and were transformed according to Japanese practices. Mothers were asked to rate whether each item was a "true" or "untrue" description of their children's reaction within the past six

TABLE 1

Subject Age and Sex Distribution (N=372)

	Age							
	3 Years		4 Years		5 Years		6 Years	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Number of Subjects	8	8	63	45	81	83	54	30
Percentage of Sample	2.1	2.1	16.9	12.1	21.8	22.3	14.5	8.0

months on a scale from 1 (extremely untrue of your child) to 7 (extremely true of your child). When a mother could not answer because of not having seen their child in that situation, mothers were asked to circle X (not applicable). It takes about one hour to complete the CBQ. Scale scores for the CBQ were computed by summing 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

1. *Distribution of answers for each item*

The distribution of answers was checked out for each item. Two items received no response or were marked "dose not apply" by more than 15% of the sample. One item ("My child has a hard time settling down for a nap") comes under the Falling Reactivity & Soothability scale, the other item ("My child rarely smiles and laughs when playing with pets") comes under the Smiling & Laughter scale, and the percent of no response or "does not apply" are, respectively, 32.5 and 23.7.

Some items were rated two multiple-choice alternatives next to each other by more than 80% of the subiects. These items are the following: "My child notices the smoothness or roughness of objects s/he touches" (Perceptual Sensitivity scale); "My child enjoys funny stories, but usually doesn't laugh at them" (Smiling & Laughter scale); "My child smiles and laughs during play with parents" (Smiling & Laughter scale); "My child doesn't enjoy being read to very much" (Low Intensity Pleasure scale). These items appeared not to discriminate among subjects effectively.

2. *Internal consistencies*

The mean, standard deviation, standard error of the mean, range of scores, and a measure of internal consistency, coefficient alpha for each scale are shown in Table 2. The alphas ranged from .54 to .93, with a median of .76. The Shyness scale evidenced very high internal consistency reliability (.93). Alpha estimates for Attentional Focusing, Low Intensity Pleasure, Perceptual Sensitivity, and Sadness scales were low (less than .70).

3. *Homogeneity*

If a given scale is homogeneous (i.e. items in a given scale measure one factor), the variance explained by the first factor extracted by facter analysis should be much greater than the variance by the second factor, and the first factor loadings of items in a given scale should be high. Table 3 presents the results of factor analysis. Factor 1 eigen values evidenced to be much greater than that of factor 2, and relative contributions of factor 1 to the total variance were more than 60% for almost scales. For the Attentional Focusing and Sadness scales, however, eigen values of factor 1 were less than two times of that of facter 2. In about half of the scales, more than 70% of the items obtained high factor 1 loadings (higher than .40).

4. *Discriminant Properties*

Intercorrelations across temperament scale sores are reported in Table 4. More

TABLE 2

Mean, Standard Deviation, Standard Error of the Mean, Actual Range of Scale Scores, and Cronbach's Alpha Estimates of Scores for Temperament Scales

Scales	Number of items	Mean	S. D.	S. E. M.	Actual range of scale scores	Alpha estimates
ACT	13	4.863	.708	.037	3.15-6.62	.77
ANG	13	3.866	.736	.038	1.15-6.08	.78
APR	13	4.533	.691	.036	2.33-6.62	.75
ATF	14	4.268	.544	.028	2.00-6.08	.55
DIS	12	4.083	.729	.038	1.75-6.17	.77
FAL	13	4.822	.740	.038	2.75-6.77	.76
FEA	12	4.314	.884	.046	1.50-6.67	.76
HPL	13	4.550	.890	.046	1.85-6.85	.84
IMP	13	4.197	.733	.038	1.50-6.54	.76
INH	13	4.709	.802	.042	1.38-6.91	.83
LPL	13	5.124	.561	.029	3.46-6.69	.68
SEN	12	5.059	.632	.033	3.11-6.67	.67
SAD	12	3.919	.603	.031	2.00-5.67	.54
SHY	13	4.105	1.178	.061	1.00-6.77	.93
SMI	13	5.612	.629	.033	3.69-6.92	.81

ACT=Activity Level; ANG=Anger/Frustration; APR=Approach; ATF=Attentional Focusing; DIS=Discomfort; FAL=Falling Reactivity & Soothability; FEA=Fear; HPL=High Intensity Pleasure; IMP=Impulsivity; INH=Inhibitory Control; LPL=Low Intensity Pleasure; SEN=Perceptual Sensitivity; SAD=Sadness; SHY=Shyness; SMI=Smiling & Laughter.

TABLE 3

Factor Analysis of each Scale in CBQ[a]

Scales	Eigenvalues		% of items whose loadings are greater than .40.
	Factor 1	Factor 2	
ACT	3.05 (64.1%)	0.97 (20.5%)	76.9
ANG	3.08 (69.1%)	0.92 (20.7%)	76.9
APR	3.04 (67.1%)	0.81 (17.8%)	69.2
ATF	3.09 (46.5%)	1.90 (28.7%)	60.0
DIS	3.06 (73.2%)	0.75 (18.0%)	41.7
FAL	3.52 (69.0%)	0.96 (18.8%)	46.2
FEA	2.88 (69.1%)	0.75 (18.0%)	83.3
HPL	4.27 (75.5%)	0.79 (14.1%)	76.9
IMP	2.96 (62.0%)	1.20 (25.1%)	69.2
INH	3.95 (76.5%)	0.65 (12.6%)	76.9
LPL	2.30 (63.2%)	0.75 (20.6%)	53.8
SEN	2.84 (68.1%)	0.84 (20.0%)	66.7
SAD	1.41 (44.3%)	1.10 (34.6%)	16.7
SHY	6.82 (83.9%)	0.97 (11.9%)	100.0
SMI	3.66 (75.0%)	0.73 (14.9%)	76.9

[a] Principal factor analysis, N=372. Parcentages in parentheses refer to the percentage of common variance accounted for each factor.

TABLE 4

Intercorrelations of CBQ Scales

	ACT	ANG	APR	ATF	DIS	FAL	FEA	HPL	IMP	INH	LPL	SEN	SAD	SHY
ACT														
ANG	.12													
APR	−.29*	.44*												
ATF	.28*	−.26*	−.05											
DIS	.05	.44*	.21*	−.17*										
FAL	.16*	−.42*	−.14*	.20*	−.36*									
FEA	−.07	.23*	.14*	−.09	.47*	−.13								
HPL	.55*	.20*	.38*	−.03	−.22*	.11	−.35*							
IMP	.64*	.25*	.43*	−.29*	−.01	.07	−.12	.58*						
INH	−.37*	−.34*	−.15*	.57*	−.14*	.26*	.03	−.18*	−.45*					
LPL	−.13	−.06	.28*	.37*	.00	.14*	.14*	−.05	−.07	.36*				
SEN	.07	.06	.22*	.21*	.12	.13	.15*	.07	.03	.37*	.35*			
SAD	−.17*	.47*	.40*	−.02	.27*	−.34*	.23*	.02	−.05	.01	.13*	.17*		
SHY	−.35*	.09	−.18*	.10	.12	−.20*	.20*	−.30*	−.62*	.16*	−.03	−.03	.15*	
SMI	.32*	.01	.40*	.16*	−.05	.28*	.08	.28*	.34*	.16*	.52*	.39*	.05	−.31*

* $p<.01$

than 60% of 105 inter-scale correlations were found to be significant ($P<.01$), and 13 correlations were strong ($r>.40$). The Activity Level, High Intensity Pleasure, and Impulsivity scales were strongly interrelated ($r=.55$, .64, and .58). The Shyness scale showed high negative correlation with the Impulsivity scale ($r=-.62$), and the Inhibitory Control scale showed high positive correlation with the Attentional Focusing scale ($r=.57$). Four negative emotion scales (Anger/Frustration, Discomfort, Fear, and Sadness) were found to be intercorrelated positively with each other (r's between .23 and .47). On the other hand, for positive emotionality scales, while the Smiling & Laughter and Low Intensity Pleasure scales showed to be strongly interrelated ($r=.52$), the High Intensity Pleasure scale was unrelated to the Low Intensity Pleasure scales ($r=-.05$) and was moderately related to the Smiling & Laughter scale ($r=.28$). The relations between the positive emotion scales and the negative emotion scales were not necessarily negative. All of the negative emotion scales were found to be unrelated to the Smiling & Laughter scale (mean $r=.02$), and two scales of negative emotion (Anger/Frustration and Discomfort) were not related to the Low Intensity Pleasure scale (mean $r=-.03$). The High Intensity Pleasure scale, however, related differentially to the negative emotion scales, correlationg with the Fear scale and the Discomfort scale negatively (mean $r=-.29$) and with the Anger/Frustration scale positively ($r=.20$). The Perceptual Sensitivity scale moderately correlated with the Low Intensity Pleasure scale ($r=.35$) and the Smiling & Laughter scale ($r=.39$), while it did not show relations with the negative emotion scales of Anger/Frustration and Discomfort (mean $r=.09$) and the High Intensity Pleasure scale ($r=.07$).

DISCUSSION

The purpose of this study was to examine the CBQ developed by Rothbart. No problem was found in the distribution of answers except for a few items. Estimates of internal consintency attained satisfactory levels for almost all temperament scales except the Attentional Focusing, Low Intensity Pleasure, Perceptual Sensitivity, and Sadness scales, which had low alpha estimates. Alpha estimates (median=.76) obtained in this study are of highest magnitude among temperament questionnaires for infants and children. Hubert, Wachs, Martin, and Gandour (1982) have observed that the following temperament questionnaires have coefficient values in the range from median=.75 to median=.50 : the Buss and Plomin EASI-I Scale, Toddler Temperament Scale, Behavior Style Questionnaire, Parent Temperament Scale Revised, Infant Characteristics, and Abbreviated Temperament Questionnaires and Baby and Toddler Behavior Questionnaires. The result of factor analysis for each scale suggests that all scales except the Attentional Focusing and Sadness scales are homogeneous. In two thirds of scales, items more than 60% of a scale showed to have high first factor loadings (>.40). For the RITQ, all scales proved not to have homogeneities (Sugawara *et al.*, 1988). In her study, the proportion of items which have factor 1 loadings (>.40) were from 30% to 60% for each scale. Thus, the results concerning internal consistencies and homogeneity of the CBQ scales suggests that the CBQ is superior to Carey's Questionnaires. The Attentional Focusing and Sadness scales, however, are in need of modification.

Although temperament scales are designated to avoid conceptual overlap, it was found that there were empirical intercorrelations among temperamental scale scores. Some relations were similar to those found in the PRQ and IBQ (e. g., positive correlations among negative emotion scales). While the relations between the negative emotion scales and positive emotion scales were expected to be negative from the result of the infant questionnaire, the result showed these scales were relatively independent of. This is the same result as those obtained in the questionnaire with adults. It is interesting that the High Intensity Pleasure and Low Intensity Pleasure scales are not correlated with each other in spite of measuring positive emotion. This suggests that the pleasure might already differentiate into two independent components in children, similarly to that found in adults. The evidences that the Perceptual Sensitivity scale was unrelated to both negative and positive emotion scales and was moderately related to the Low Intensity Pleasure scale were also consistent with the result in adults, where Perceptual (External) Sensitivity scale was a subscale of the arousal construct. Thus, the inter-scale correlations similar to those in the adults were found to emerge in the children. Although the correlations between Inhibitory Control and Attentional Focusing scales was modest in the PRQ, the relation between these scales were strong in this study. This may imply that these scales are not differentiated in the children, taking into account that these scales were constructed as self-regulation subscales in the PRQ.

To summarize, the CBQ seems to have strong psychometric qualities, except a few scales which need to be reconstructed in order to maximize their internal reliabilities. In future analysis of the CBQ, test-retest reliability and convergence with home observation and laboratory measures need to be assessed.

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APPENDIX

Definitions of Temperament Scales with Sample Items

Activity Level. Level to gross motor activity including rate and extent of locomotion. "My child seems always in a big hurry to get from one place to another."

Anger/Frustration. Amount of negative affect related to interruption of ongoing tasks or goal blocking. "My child gets angry when told s/he has to go to bed."

Approach. Amount of excitement and positive anticipation for expected pleasurable activities. "My child gets so worked up before an exciting event that s/he has trouble sitting still."

Attentional Focusing. Tendency to maintain attentional focus upon task-related channels. "When picking up toys or other jobs, my child usually keeps at the task until it's done."

Discomfort. Amount of negative affect related to sensory qualities of stimulation, including intensity, rate or complexity of light, movement, sound, texture. "My child is not very bothered by pain."

Falling Reactivity and Soothability. Rate of recovery from peak distress, excitement, or general arousal. "My child has a hard time settling down for a nap."

Fear. Amount of negative affect, including unease, worry or nervousness related to anticipated pain or distress and/or potentially threatening situations. "My child is not afraid of large dogs and/or other animals."

High Intensity Pleasure. Amount of pleasure or enjoyment related situations involving high stimulus intensity, rate, complexity, novelty and incongruity. "My child likes going down high slides or other adventurous activities."

Impulsivity. Speed of response initiation. "My child usually rushes into an activity without thinking about it."

Inhibitory Control. The capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations. "My child can lower his/her voice when asked to do so."

Low Intensity Pleasure. Amount of pleasure or enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty and incongruity. "My child rarely enjoys just being talked to."

Perceptual Sensitivity. Amount of detection of slight, low intensity stimuli from the external environment. "My child notices the smoothness or roughness of objects s/he touches.

Sadness. Amount of negative affect and lowered mood and energy related to exposure to suffering, disappointment and object loss. "My child cries sadly when a favorite toy gets lost or broken."

Shyness. Slow or inhibited aproach in situations involving novelty or uncertainty. "My child sometimes prefers to watch rather than join other children playing."

Smiling and Laughter. Amount of positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity. "My child laughs a lot at jokes and silly happenings."