



## Original Article

## Disagreement between parents on assessment of child temperament traits

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**Abstract** **Background:** Accuracy of temperament assessment is a prerequisite in research studies. To identify the extent to which parental assessment of child temperament is biased by their personal attributes, we proposed a new structural equation model, in which biases of parental attributes in their assessment of child temperament can be separated from the true (i.e. non-biased) associations between the two.

**Methods:** We examined 234 father–mother pairs using questionnaires including Emotionality, Activity, Sociability, and Impulsivity; Social Desirability Scale; Hospital Anxiety and Depression Scale; Temperament and Character Inventory; and State–Trait Anger Expression Inventory.

**Results:** Paternal Depression and Persistence, maternal Trait Anger, and parental Novelty Seeking showed significant bias in assessment of Emotionality. Maternal Self-transcendence showed significant bias in assessment of child Impulsivity.

**Conclusion:** Researchers should be cautious about biases in parental assessment of children's Emotionality and Impulsivity, but other temperament traits may be free from such biases.

**Key words** assessment bias, child temperament, emotionality, activity, sociability, and impulsivity, parental assessment, structural equation model.

Behavioral differences in infants and toddlers have been a major research issue in psychology and psychiatry. Accuracy of temperament assessment is a prerequisite of such studies. Although parents can provide valuable information about their child's behavioral characteristics, parents do not always agree on their own child's temperament assessment.<sup>1</sup> Research shows that systematic distortion of parental reports of children's behavior stems from perceived stressful life events,<sup>2</sup> anticipation about the baby during pregnancy,<sup>3</sup> and maternal depression.<sup>4–11</sup> When calibrating one parent's assessment of his/her child's temperament, most of the previous investigations rely on the other parent's assessment as the external standard.<sup>1,8</sup> The other parent's assessment, however, may also be subject to different types of biases. The true picture of the child may be located somewhere between the assessments of the two parents. Moreover, there may be a true association between the child's temperament and the parent's attribute. For example, the parent may feel frustrated if the child is easily distracted. In contrast, the child may become fearful if the parent is extremely anxious. The parent's and the child's attributes may be predicted by a third variable unobserved by the researcher. The use of structural equation models (SEM) may be a promising means to disentangle biases from true association.

An early endeavor to disentangle biases from real (i.e. without bias) effects between child temperament and parental attributes

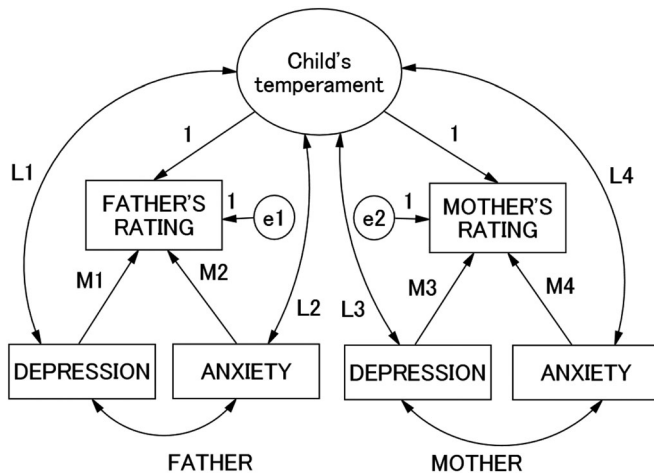
(e.g. mood) was done by Fergusson *et al.*<sup>12</sup> They used three raters of child behavior including mothers, fathers, and teachers and examined the effects of depression only in mothers. They concluded that maternal depression was associated with mothers' overreporting of child behavior problems. Their model, however, failed to take into account the effects of fathers' mood on their report of child behavior. Furthermore, depression was the only attribute for which they disentangled real associations from biases. In the present study, we constructed a SEM (Fig. 1) in which we measured the reports of both fathers and mothers and a variety of attributes of parents at the time of reporting.

There have been many instruments that measure child temperament. We used the Emotionality, Activity, Sociability, and Impulsivity (EASI) Survey<sup>13</sup> which is one of the first instruments used in research settings. This questionnaire contains 20 items. Five items each reflect one of four temperament domains: Emotionality, Activity, Sociability, and Impulsivity. The factor structure of the EASI was reported by Buss and Plomin.<sup>13</sup> They also reported the inheritance of these domains in a twin study.<sup>14</sup> The EASI was translated into Japanese by one of us.<sup>15</sup>

In the present SEM (Fig. 1), we posited that child temperament trait (one of the four subscales of the EASI) would be reflected by both the father's and mother's assessments. The parental assessment, however, would be biased by parental attributes (depression, M1 and M3 for father and mother, respectively; anxiety, M2 and M4 for father and mother, respectively). We also posited that there would be real associations between the latent construct of the child's real temperament trait and parents' attributes (depression,

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**Fig. 1** Structural equation model demonstrating real association between child temperament and fathers' and mothers' personal attributes. Depression (M1 and M3) and anxiety (M2 and M4) are set as biases in parental assessment. Child real temperament is reflected as fathers' and mothers' assessment. Depression (L1 and L3) and anxiety (L2 and L4) are also associated directly with the real temperament of the child.

L1 and L3 for father and mother, respectively; anxiety, L2 and L4 for father and mother, respectively). Two indicators of parental attribute (depression and anxiety) would share a covariance within each parent. Correlations found between parental assessments of child temperament and parental attributes could, thus, be separated into biases (M1, M2, M3, and M4) and real associations free from biases (L1, L2, L3, and L4).

## Methods

### Participants

Twenty members of the Kumamoto Paediatric Association agreed to participate in this study. They recruited parents of children aged <4 years who visited the clinic. If they agreed to do so, they were given the questionnaire as well as another copy of the questionnaire so that each partner had a copy. The present sample was a convenient one. The parents were requested to fill in the questionnaire independently. The total number of families who participated in the survey was 447. Mean  $\pm$  SD age of the fathers and mothers was  $33.4 \pm 5.5$  and  $31.5 \pm 5.4$  years, respectively. The fathers were significantly older than the mothers ( $P < 0.001$ ). Mean age  $\pm$  SD of the children was  $1.7 \pm 1.1$  years. There were 225 boys (50.0%) and 209 girls (46.8%). The gender was unknown for the remaining 13 children (2.8%). Nevertheless, only 247 fathers and 434 mothers returned completed questionnaires, and, of these, only 234 families returned completed questionnaires from both parents. These complete couples were used for analysis in the present study.

It is of note that children with serious illness are referred to specialized institutions such as university hospitals in Japan. Clinics such as the one in the present study usually provide generalized child care, therefore it is assumed that most of the

children in this study were unlikely to be suffering from serious medical or psychiatric conditions.

### Measurements

#### Infant temperament

We used the Japanese version<sup>15</sup> of the EASI Survey.<sup>13</sup> The EASI consists of 20 items measuring four temperament dimensions: Emotionality (E), Activity (A), Sociability (S), and Impulsivity (I). Each item was rated on a 5-point scale: from 1, a little, to 5, a lot, but we changed the scale to from 0 to 4 so that the possible score of each dimension would range from 0 to 20. Following our previous exploratory factor analysis study,<sup>15</sup> we used the four subscales: Emotionality (three items, Cronbach alpha, 0.72 for fathers and 0.60 for mothers), Activity (three items, Cronbach alpha, 0.56 for fathers and 0.58 for mothers), Sociability (four items, Cronbach alpha, 0.51 for fathers and 0.56 for mothers), and Impulsivity (four items, Cronbach alpha, 0.59 for fathers and 0.62 for mothers).

#### Parental social desirability

We used the Japanese version<sup>16</sup> of the Social Desirability Scale (SDS).<sup>17</sup> The original SDS consisted of 33 items, but was reduced to 10 items to suit the Japanese population. Respondents used a 5-point scale (from 0 to 4) to rate each item, thus the total SDS score could range from 0 to 40. In the SEM, the first and second halves of the SDS items were combined as parcels for calculation.

#### Parental dysphoric mood

We used the Hospital Anxiety and Depression Scale (HADS)<sup>18,19</sup> as a measure of mood and cognitive symptoms of depression and anxiety. The HADS consists of 14 items; the Depression and Anxiety subscales each includes seven items on a 4-point scale (0–3).

#### Parental personality

We used the Japanese version of the Temperament and Character Inventory (TCI).<sup>20</sup> This is a self-report measure of personality based on Cloninger's personality theory. Temperament consists of four heritable dimensions that are manifested early in life: Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), and Persistence (PS). Character was thought of as weakly heritable but a recent study has demonstrated that it is almost equally as heritable as temperament.<sup>21</sup> Character consists of three dimensions, which mature in adulthood. They include Self-directedness (SD), Cooperativeness (CO), and Self-transcendence (ST). To the 125-item short version of the TCI we added five additional PS items because their number was relatively small. The original dichotomous scale was changed into a 4-point scale according to Kijima *et al.*<sup>22</sup> Items were rated from 0, strongly disagree; to 3, strongly agree.

#### Anger trait and anger expression of parents

We used the Japanese version<sup>23</sup> of the State–Trait Anger Expression Inventory (STAXI).<sup>24</sup> The STAXI is a self-report measuring the intensity of anger as an emotional state and the disposition to experience angry feelings as a personality trait. The original STAXI consisted of 44 items yielding five scales: State Anger (10 items), Trait Anger

(10 items), Anger-In (eight items), Anger-Out (eight items), and Anger-Control (eight items). For the sake of brevity of the questionnaire, we excluded all State Anger items and reduced the number of items of Anger-In, Anger-Out, and Anger-Control to three items each.

*Missing values*

We performed Little’s missing completely at random (MCAR) test for each measurement set. Almost all of them showed MCAR: EASI rated by father ( $\chi^2=87.7$ , d.f.=96,  $P=0.715$ ); EASI rated by mother ( $\chi^2=178.4$ , d.f.=162,  $P=0.179$ ); SDS rated by father ( $\chi^2=30.4$ , d.f.=29,  $P=0.395$ ); SDS rated by mother ( $\chi^2=31.7$ , d.f.=43,  $P=0.897$ ); TCI rated by father ( $\chi^2=3404.1$ , d.f.=3337,  $P=0.205$ ); STAXI rated by father ( $\chi^2=31.7$ , d.f.=27,  $P=0.242$ ); STAXI rated by mother ( $\chi^2=26.8$ , d.f.=36,  $P=0.867$ ). Two of them barely reached significance ( $P < 0.05$ ): HADS rated by father ( $\chi^2=97.6$ , d.f.=75,  $P=0.041$ ), and TCI rated by mother ( $\chi^2=4695.9$ , d.f.=4537,  $P=0.049$ ), while only one questionnaire

set (HADS rated by mother) failed to do so ( $\chi^2=92.6$ , d.f.=64,  $P=0.011$ ). Hence missing values were substituted with the item mean if the participant replied to  $\geq 80\%$  of items.

**Ethics**

This research project was approved by the Ethics Committee of Kumamoto University Graduate School of Medical Sciences.

**Statistical analysis**

First, we correlated each of the EASI subscale scores with the scores of the SDS, HADS, TCI, and STAXI. These analyses were conducted separately for fathers and mothers.

Then we conducted SEM analysis (Fig. 1) separately for the effects of social desirability, mood, temperament and character, and trait anger and anger expressions. The fit of each model with the data was examined in terms of chi-squared (CMIN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). A good fit was indicated by  $CMIN/d.f. < 2$ ,  $CFI > 0.97$ , and  $RMSEA < 0.05$ , while an acceptable fit was indicated by

**Table 1** Correlations between EASI subscale and other variables

		EASI subscales			
		Emotionality	Activity	Sociability	Impulsivity
Father	SDS				
	Social desirability	-0.24***	-0.05	-0.04	-0.05
	HADS				
	Depression	0.24***	0.02	0.06	0.12
	Anxiety	0.20**	0.08	-0.01	0.12
	TCI				
	Novelty Seeking	0.17*	0.15*	-0.09	0.25***
	Harm Avoidance	0.06	0.09	-0.07	0.13
	Reward Dependence	-0.07	-0.02	-0.04	-0.19**
	Persistence	0.11	-0.0	0.06	-0.10
	Self-directedness	-0.22***	-0.15*	0.07	-0.34***
	Cooperativeness	-0.03	-0.01	0.06	-0.16*
	Self-transcendence	0.06	-0.02	0.07	0.04
	STAXI				
	Trait Anger	0.28***	0.12	-0.04	0.19**
Anger-in	0.19**	0.11	-0.10	0.14*	
Anger-out	0.14*	0.04	0.02	0.11	
Anger-control	0.07	0.11	-0.07	0.01	
Mother	SDS				
	Social desirability	-0.20**	-0.11	-0.17*	-0.06
	HADS				
	Depression	0.17*	0.12	0.06	0.17**
	Anxiety	0.12	0.12	0.03	0.22***
	TCI				
	Novelty Seeking	0.15*	0.10	0.05	0.12
	Harm Avoidance	0.13*	0.12	-0.03	0.13
	Reward Dependence	-0.14*	-0.12	0.0	-0.21***
	Persistence	-0.01	0.07	0.17*	0.02
	Self-directedness	-0.24***	-0.15*	0.05	-0.21**
	Cooperativeness	-0.25***	-0.13	0.04	-0.23***
	Self-transcendence	0.02	-0.02	0.19**	0.01
	STAXI				
	Trait Anger	0.23***	0.02	0.13	0.08
Anger-in	0.18**	0.14*	0.13	0.23***	
Anger-out	0.15*	-0.01	0.08	0.05	
Anger-control	-0.01	0.11	0.0	0.02	

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . EASI, Emotionality, Activity, Sociability, and Impulsivity; HADS, Hospital Anxiety and Depression Scale; SDS, Social Desirability Scale; STAXI, State-Trait Anger Expression Inventory; TCI, Temperament and Character Inventory.

**Table 2** Parental social desirability path coefficients and goodness-of-fit indices (n = 195)

EASI subscales			Emotionality	Activity	Sociability	Impulsivity
Real associations	Fathers	Parcel 1	-0.09	-0.12	-0.02	0.02
		Parcel 2	0.10	0.01	0.09	0.18
	Mothers	Parcel 1	-0.05	-0.03	0.02	-0.12
		Parcel 2	-0.13	0.01	-0.03	0.06
Biases	Fathers	Parcel 1	-0.09	-0.02	-0.05	0.03
		Parcel 2	-0.20*	0.01	-0.02	-0.16
	Mothers	Parcel 1	-0.05	-0.04	-0.16	0.01
		Parcel 2	-0.15	-0.06	-0.03	-0.08
Goodness-of-fit indices	Chi-squared/d.f.		0.21	0.21	0.21	0.21
	CFI		1.000	1.000	1.000	1.000
	RMSEA		0.000	0.000	0.000	0.000

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . CFI, comparative fit index; EASI, Emotionality, Activity, Sociability, and Impulsivity; RMSEA, root mean square error approximation.

**Table 3** Parental dysphoric mood path coefficients and goodness-of-fit indices (n = 188)

EASI subscales			Emotionality	Activity	Sociability	Impulsivity
Real associations	Fathers	Depression	-0.25*	0.06	0.09	-0.10
		Anxiety	-0.06	0.09	0.16	0.03
	Mothers	Depression	0.09	0.06	0.16	-0.03
		Anxiety	0.10	0.14	-0.02	0.11
Biases	Fathers	Depression	0.34***	-0.06	0.10	0.17
		Anxiety	-0.02	0.06	-0.18	-0.04
	Mothers	Depression	0.17	0.10	-0.03	0.24**
		Anxiety	0.02	-0.03	0.04	0.06
Goodness-of-fit indices	Chi-squared/d.f.		0.27	0.27	0.27	0.27
	CFI		1.000	1.000	1.000	1.000
	RMSEA		0.000	0.000	0.000	0.000

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . CFI, comparative fit index; EASI, Emotionality, Activity, Sociability, and Impulsivity; RMSEA, root mean square error approximation.

**Table 4** Parental TCI temperament domain path coefficients and goodness-of-fit indices (n = 200)

EASI subscales			Emotionality	Activity	Sociability	Impulsivity
Real associations	Fathers	Novelty Seeking	-0.13	0.34**	-0.19	-0.03
		Harm Avoidance	0.07	0.12	0.11	0.18
		Reward Dependence	-0.02	0.14	-0.02	-0.12
		Persistence	-0.05	-0.08	0.03	-0.10
	Mothers	Novelty Seeking	0.04	0.12	-0.02	0.21
		Harm Avoidance	0.17	0.09	0.09	0.12
		Reward Dependence	-0.12	0.03	0.07	-0.02
		Persistence	-0.17	0.17	0.23*	-0.12
Biases	Fathers	Novelty Seeking	0.31***	-0.07	0.00	0.25**
		Harm Avoidance	0.08	0.02	-0.14	0.03
		Reward Dependence	-0.11	-0.09	-0.04	-0.16*
		Persistence	0.27***	-0.03	-0.03	0.06
	Mothers	Novelty Seeking	0.26***	0.02	0.06	0.09
		Harm Avoidance	0.17*	0.05	-0.03	0.08
		Reward Dependence	-0.09	-0.13	-0.07	-0.23**
		Persistence	0.16	0.03	0.03	0.20**
Goodness-of-fit indices	Chi-squared/d.f.		1.18	1.18	1.18	1.18
	CFI		0.980	0.980	0.980	0.980
	RMSEA		0.030	0.030	0.030	0.030

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . CFI, comparative fit index; EASI, Emotionality, Activity, Sociability, and Impulsivity; RMSEA, root mean square error approximation; TCI, Temperament and Character Inventory.

CMIN/d.f. < 3, CFI > 0.95, and RMSEA < 0.08.<sup>25</sup> Because of multiple comparisons (four temperament traits [Emotionality, Activity, Sociability, and Impulsivity] × five domains of personal attributes [social desirability, dysphoric mood, temperament, character, and anger]), we set the alpha level of path estimates at  $P < 0.001$ .

All statistical analysis was conducted using SPSS version 21.0 (IBM, Japan) and Amos 21.0 (IBM, Japan).

**Results**

Among fathers, bivariate correlation analysis indicated statistically significant ( $P < 0.001$ ) associations between child Emotionality and the scores of the SDS (reverse), HADS Depression, SD (reverse), and Trait Anger as well as between child Impulsivity and the scores of NS and SD (reverse; Table 1). Among

mothers, child Emotionality was significantly associated with SD (reverse), CO (reverse), and Trait Anger, and child Impulsivity was significantly associated with HADS Anxiety, RD (reverse), CO (reverse), and Anger-In.

In SEM analysis (Tables 2–6), the number of families was decreased because of cases of missing values. Parental social desirability did not show any statistically significant biases on the parent ratings of child temperament traits. Nor did it have any real association with child temperament traits (Table 2).

Depression or anxiety on SEM analysis had no real association with the real temperament traits of the child. Fathers' depression, however, showed significant bias in the fathers' assessment of child Emotionality. Thus the more depressed, the more likely fathers were to rate their child as emotionally unstable (Table 3).

**Table 5** Parental TCI character domain path coefficients and goodness-of-fit indices (n = 200)

EASI subscales			Emotionality	Activity	Sociability	Impulsivity
Real associations	Fathers	Self-directedness	-0.06	-0.24*	0.01	-0.19
		Cooperativeness	-0.11	-0.05	0.09	0.02
		Self-transcendence	-0.06	-0.06	-0.03	-0.12
	Mothers	Self-directedness	-0.25*	-0.10	0.00	-0.07
		Cooperativeness	-0.30*	0.03	0.04	-0.20
		Self-transcendence	-0.21	-0.04	0.30*	-0.30**
Biases	Fathers	Self-directedness	-0.19*	-0.02	0.07	-0.15
		Cooperativeness	0.12	0.02	-0.02	-0.13
		Self-transcendence	0.10	0.02	0.10	0.14
	Mothers	Self-directedness	-0.11	-0.06	0.04	-0.15*
		Cooperativeness	-0.09	-0.14	-0.02	-0.11
		Self-transcendence	0.13	-0.01	0.02	0.25***
Goodness-of-fit indices	Chi-squared/d.f.		0.74	0.74	0.74	0.74
	CFI		1.000	1.000	1.000	1.000
	RMSEA		0.000	0.000	0.000	0.000

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . CFI, comparative fit index; EASI, Emotionality, Activity, Sociability, and Impulsivity; RMSEA, root mean square error approximation; TCI, Temperament and Character Inventory.

**Table 6** Parental trait anger and anger expression path coefficients and goodness-of-fit indices (n = 202)

EASI subscales			Emotionality	Activity	Sociability	Impulsivity
Real associations	Fathers	Trait Anger	0.18	0.08	-0.12	-0.02
		Anger-in	0.04	0.08	-0.17	0.22*
		Anger-out	0.14	0.08	-0.01	0.00
		Anger-control	-0.01	-0.09	-0.10	0.20
	Mothers	Trait Anger	-0.01	0.05	0.22	0.04
		Anger-in	0.16	0.28**	0.19	0.11
		Anger-out	0.17	0.05	0.11	0.03
		Anger-control	-0.07	0.05	0.01	0.10
		Trait Anger	0.22*	0.11	0.03	0.20*
Biases	Fathers	Anger-in	0.06	0.00	-0.05	-0.07
		Anger-out	-0.03	-0.06	0.02	-0.02
		Anger-control	0.16	0.10	-0.01	-0.06
	Mothers	Trait Anger	0.36***	0.03	0.00	-0.12
		Anger-in	0.03	-0.07	0.04	0.25**
		Anger-out	-0.11	0.02	-0.02	0.03
Goodness-of-fit indices	Chi-squared/d.f.		1.60	1.60	1.60	1.60
	CFI		0.975	0.975	0.975	0.975
	RMSEA		0.055	0.055	0.055	0.055

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . CFI, comparative fit index; EASI, Emotionality, Activity, Sociability, and Impulsivity; RMSEA, root mean square error approximation.

Both temperament and character domains of the parents showed no real associations with child temperament traits, but parental NS and paternal PS showed significant biases in assessment of child Emotionality (Table 4). Maternal ST showed significant bias in assessment of child Impulsivity (Table 5).

Regarding trait anger and anger expression, only maternal Trait Anger showed significant bias in assessment of child Emotionality (Table 6).

## Discussion

This study identified the extent to which parental assessment of child temperament was biased by parental attributes. As a trial to statistically separate real associations from assessment biases, the present SEM indicated that parental attributes including mood, personality, and anger traits, showed no real association with child temperament traits. Biases of such attributes, however, on the parental assessment of child temperament traits were identified. Thus, child Emotionality was more likely to be overestimated if fathers were depressed, scored high in NS, PS and if mothers scored high on NS. Child Impulsivity was likely to be overestimated if mothers scored high in ST. Assessment of other child temperament traits was not affected by the parental attributes. Significant zero-order correlations between EASI subscales and personal attributes may be reflections of biases. Moreover, there were instances where there were little zero-order correlations but the directions of real associations and biases were opposite. For example, the path between mother's ST and Impulsivity was negative ( $-0.30$ ) in real association but positive ( $0.25$ ) in biases. These findings suggest that researchers should be cautious about biases in parental assessment of child Emotionality and Impulsivity but other temperament traits may be free from such biases. Research results regarding child Emotionality and Impulsivity may be inflated if the data are dealt with as true values.

With regard to the limitations of this study, the number of families was relatively small and not representative of Japanese parents. A very important methodological drawback is the use of only two raters, that is, father and mother, regarding child temperament. Based on the multi-rater principle, we need a third rater, for example a school or nursery teacher using the same instrument. When replicating the present results, future studies should be designed to include at least three raters. The present study, however, is unique in that a variety of parental attributes were studied in terms of their links with fathers' and mothers' assessment of child temperament. To our knowledge, this is the first report to examine this issue comprehensively. Finally, it should be noted that this is the first study to use the Japanese version of the EASI for a Japanese population, and concurrent validity, obtained by comparison with data obtained from other types of measurement of child temperament, is still to be determined. Data from informants other than parents (e.g. nursery teachers) may function as the external variables to validate the data of EASI. The present study focused on the biases of assessment of child temperament caused by parent characteristics. Hence we should still be cautious about the validity of the instrument when using this in a Japanese child population.

Taking into consideration these shortcomings, the present preliminary study implies that there are no real association between child temperament traits and parental personal attributes including mood, personality, and trait anger and anger expression. In contrast, we should be cautious about possible biases of personal attributes, particularly depression, personality, and trait anger in the parental assessment of Emotionality and Impulsivity. Father–mother disagreement regarding assessment of child temperament reported in previous studies<sup>1,8</sup> may be explained by these biases.

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