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DEVELOPMENTS

The Polish adaptation of the Early Childhood Behavior Questionnaire (ECBQ): Psychometric properties, age and gender differences and convergence between the questionnaire and the observational data

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ABSTRACT


The main aim of the study was to determine the psychometric properties of the version of the Early Childhood Behavior Questionnaire (ECBQ) adapted to Polish culture. Since temperament in toddlers was being observed in a laboratory, an external validity of the ECBQ was also provided. Kagan's observational paradigm was used to test 215 18-month-old children. Their parents completed the ECBQ twice, when the children were 26 and 30 months old. The results showed good internal consistency and confirmed the longitudinal stability of the scale. The same three-factor solution was found in the structure of the scale as in the original American study. The convergence between the observational and parent report data supported the ECBQ's external validity. Similarities in the structure of the scale observed between the Polish and American data are discussed from a cross-cultural perspective. The usefulness of the Polish ECBQ and the limitations of the obtained results are discussed.


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Introduction

Over the last 35 years, empirical research on temperament in infancy and childhood has been strongly influenced by the theoretical approach adopted by Mary Rothbart (1981). She defined temperament as constitutionally-based

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individual differences in reactivity and self-regulation influenced over time by heredity, maturation and life experience (Rothbart, 1981; Rothbart & Bates, 2006). Rothbart's approach has led to the development of a battery of instruments for temperament assessment designed to capture different stages of human development, from infancy to adulthood (Ellis & Rothbart, 2001; Evans & Rothbart, 2007; Gartstein & Rothbart, 2003; Putnam, Gartstein, & Rothbart, 2006; Rothbart, 1981; Rothbart, Ahadi, Hershey, & Fisher, 2001; Simonds & Rothbart, 2004). Most of these measures have been translated into Polish (Dragan, Kmita, & Fronczyk, 2011), as well as many other languages.¹ One of the measures yet to be translated into Polish is that for the study of temperament during toddlerhood. The toddlerhood period seems to be especially important during the development of temperament, as it is at this time that the differentiation of self-regulatory aspects of temperament is most visible (Rothbart, Ellis, & Posner, 2004). Moreover, during this period, temperamental traits not only become more salient and consistent across situations but also increasingly important to the child's adjustment to different situations (Field & Greenberg, 1982). It would therefore appear to be important to adapt the temperament questionnaire designed for this developmental period while taking account of specific properties of Polish culture, since life experience, which influences the development of temperament, incorporates cultural differences in parenting styles, socialization aims and cultural values (Rothbart, 2011).

When analyzing cultural differences in temperament, we assumed that these are influenced by the characteristics of the well-known collective-individual dimension of culture (e.g., Ahadi, Rothbart, & Ye, 1993; Gartstein, Slobodskaya, Żylicz, Gosztyła, & Nakagawa, 2010). Within this context, Polish culture may be of particular interest to the study of temperament, since it is an example of a culture transitioning from collectivistic to individualistic values and practices compounded with the political and economic changes observed over the last 27 years (Gartstein et al., 2010). The parents who completed the Early Childhood Behavior Questionnaire (ECBQ) for their children in our study are the generation most affected by these changes, as they were raised and educated in conditions of political, economic and cultural transformation. These changes in lifestyle and values may particularly influence the development of the regulatory aspect of temperament during toddlerhood, which has been proved to be prone to socialization practices (Kochanska, Murray, & Harlan, 2000). Due to space limitations, this article only focuses on cultural differences and similarities in the structure of temperament.

The ECBQ was designed to assess temperament in children between 18 and 36 months old. It comprises 201 items and assesses 18 dimensions of temperament: Activity Level/Energy, Attentional Focusing, Attentional Shifting,

¹All available translations of questionnaires are listed at <https://research.bowdoin.edu/rothbart-temperament-questionnaires/>.

Cuddliness, Discomfort, Fear, Frustration, High-intensity Pleasure, Impulsivity, Inhibitory Control, Low-intensity Pleasure, Motor Activation, Perceptual Sensitivity, Positive Anticipation, Sadness, Shyness, Sociability, and Soothability. Factor analyses of the ECBQ scales resulted in a three-factor solution, indicating three broad domains of temperament: Negative Affectivity, Surgency/Extraversion and Effortful Control (Putnam et al., 2006). In the original version of the ECBQ, the 18 scales were internally consistent and longitudinally stable, attesting to the questionnaire's reliability. Despite its longitudinal stability, previous studies have shown that temperament develops over time, and significant age changes in toddlerhood were observed for all but one scale of the ECBQ (Putnam et al., 2006). Age-related increases in factor summary scores were also apparent, and this effect was consistent across samples and designs in the case of the Effortful Control factor, which is consistent with the rapid development of frontal neural systems observable in toddlerhood (Posner & Rothbart, 2000; Rothbart & Rueda, 2005), therefore supporting the theoretical validity of this factor. Gender differences in the previous studies (Putnam et al., 2006) were consistent with expectations: girls were rated significantly higher in Negative Affectivity (especially Fear) and higher in Effortful Control. Gender differences in fear levels in early stages of development can be interpreted as evidence of biological factors, but socialization may also be significant (Putnam et al., 2006). The first goal of our study was to describe the psychometric properties of the Polish version of the ECBQ, in particular the scale's reliability, longitudinal stability and validity, while exploring age-related changes, gender differences and the factor structure of temperament in Polish children.

The ECBQ is a parent report questionnaire carrying all the advantages and disadvantages of such instruments. It enables information to be gathered about a child's characteristics that would be hard to observe in a laboratory, but is also prone to the influence of the rater's personal character traits. As Putnam et al. (2006) suggest, both forms of data, i.e., those gathered in a laboratory and those provided by parent reports, yield valid information, but the limitations of each lead the researcher to use both whenever possible. The second goal of our study was to compare the data attained from the ECBQ's and laboratory tests of temperamental dimensions as an important measure of external validity.

One of the most influential traditions in the observational measure of temperament is that modelled on the approach of Jerome Kagan. In his crucial works on temperament, two temperamental profiles were defined: the inhibited and uninhibited types. The difference between these two types is related to both an observable preference for novelty, i.e., new situations, unfamiliar objects or people, and also a preference for being with others or alone (e.g., Kagan, 1994; Kagan, Snidman, & Arcus, 1998). Several studies have proved that these patterns of preference show moderate stability throughout childhood and into adolescence and adulthood (see: Rimm-Kaufman & Kagan, 2005). It has been

proved that the observation of inhibited and uninhibited behaviors in a laboratory setting enables the later prediction of behaviors in social environments.

The adopted experimental procedure (Kagan, Reznick, & Gibbons, 1989) made it possible to observe inhibition in a toddler's behavior by arranging six situations in a laboratory setting in which the child was confronted with novelty. During two free-play episodes, the behavior exhibited by the child while adapting to an unfamiliar room was observed. In these observations, three variables reflecting behavioral inhibition were coded: latency to leave the parent, latency to touch a first object, and the percentage of time the child was within arm's reach of the parent. In the four situations that followed, the child encountered an unfamiliar event after adapting to the unfamiliar room. In these situations, whether or not the child retreated to the parent and latency to interact with the unfamiliar object were coded. Moreover, in two of these situations, the percentage of time the child was within arm's reach of the parent was also taken into account.

We assumed that by using Kagan's procedure, we would be able to compare the indices of inhibited-uninhibited behavior with the level of a child's reactivity measured with selected scales of the ECBQ. Inhibited behavior (withdrawal from a novel situation, long latency to explore a novel/strange object and staying within arm's reach of the parent) can be viewed as a sign of shyness and fear of unfamiliarity, and we therefore predicted that inhibited behavior should be positively related to Rothbart's Shyness and Fear dimensions. Moreover, as the objects used in the study were distinctive for their novelty and high intensity, we predicted a negative relation between inhibited behaviors and Rothbart's High-intensity Pleasure. However, inhibited behavior does not necessarily have to be accompanied by negative emotions like fear or distress (Putnam & Stifter, 2005), but may just reflect a slow speed of response initiation (i.e., non-impulsive behavior in Rothbart's definition), low approach tendency (which may form part of low activity levels) or suppression of approach in uncertain conditions to appraise the situation (which would be akin to Rothbart's Inhibitory Control). We therefore expected inhibited behavior to relate positively to Inhibitory Control and negatively to Impulsivity and Activity Level. On the other hand, we expected that signs of negative emotions accompanying inhibited behavior should be positively correlated to the Discomfort and Fear scales of the ECBQ.

Summing up, the research questions were as follows:

- (1) Is the Polish version of the ECBQ a valid and reliable tool for measuring temperament in toddlers?
- (2) Are the results of the Polish ECBQ stable with age and do the expected gender differences occur?
- (3) Are there cultural differences in the structure of temperament between Polish and American toddlers?
- (4) Is there any congruence between the questionnaire and observational measure of some temperamental traits?

Method

Participants

The participants were children born between February and July 2011. All were white and spoke Polish as their first language. The children were mostly from an urban area (Krakow, Poland; 73.4%) and their parents were generally well-educated (70.8% of the mothers and 56.1% of the fathers to degree level).² Three hundred and fifty eight children (158 girls, 200 boys) participated in the project.

During the lab visit at 18 months, an observational measure of temperament was conducted. Out of 350 children participating in this phase, 335 children (186 boys, 149 girls; mean age 18.4 months, $SD = .41$, Min 17.28, Max 20.07) provided data for at least one trial of observational measure of temperament, among whom 215 also provided data for the ECBQ at 26 months (118 boys, 97 girls); the data from this group were used to conduct an analysis of a comparison between the observational and parent-report measure of temperament. The remaining 120 children did not differ with regard to any of the indicators of temperament at 18 months (see supplementary materials in Appendix B). The ECBQ was used when the children were aged 26 months ($N = 235$; 129 boys, 106 girls; mean age 25.88 months, $SD = 1.05$, Min 24.32, Max 31) and 30 months ($N = 248$; 131 boys, 117 girls; mean age 30.57 months, $SD = 1.27$, Min 28.75, Max 35.03). Two hundred and eight children provided data at both 26 and 30 months, and this group was used to calculate changes in temperament across time (113 boys, 95 girls; mean age 30.55 months, $SD = 1.25$, Min 28.75, Max 35.03).

Procedure

The presented research is part of the *Birth and development of the mentalising ability* longitudinal project conducted at the Jagiellonian University in Krakow, Poland. The parents participated in the project on a voluntary basis and were recruited via an announcement at www.labdziecka.uj.edu.pl or in the local media and via advertisements at children's centers and clinics. All the parents signed a consent form before participating in the first session and the project was positively reviewed by the institutional Ethical Board of the Institute of Psychology. At the end of each session, the children were given small gifts, whereas the parents did not receive any compensation for their participation. The children visited the laboratory with their parents at six month intervals, starting at 12 months of age. Between laboratory visits, the parents were asked to complete questionnaires. The questionnaire data was obtained via the Internet – each parent had a unique login name and password enabling access to a private account on a lab server where the questionnaires could be accessed.

²Data regarding the representativeness of the sample for the population of interest can be found in supplementary materials in Appendix A.

Both mothers and fathers could provide the data, and these results are not separated in this study.

Materials

Observational measure of temperament

The observational measure of temperament was conducted during the lab visit at 18 months. After a period of free play, the child was asked to sit on a sofa next to the parent. The experimenter said to the child *I will show you something*, and then activated an unfamiliar toy. In the first trial, this was a dancing and singing teddy-bear, and in the second, a kitchen timer emitting a loud sound. Both objects were located approximately 2.5 m from the child and were active for 30 s. Both trials were filmed and the behavior of the child was coded according to the inhibition-disinhibition dimension of temperament categories (Kagan et al., 1989); additionally, signs of negative emotions were coded (see also: Białek & Białecką-Pikul, submitted). The coding system, together with the raters' agreement for 20% of the videos, is presented in Table 1.

Early Child Behavior Questionnaire

The ECBQ (Putnam et al., 2006) consists of 201 items designed to measure 18 dimensions of temperament. Exemplary items are provided in the supplementary materials in Appendix C. Each item describes a certain child's behavior in different situations, and caregivers are asked to assess how often their child

Table 1. Coding system of behaviors in the measure of temperament.

Child's behavior	Description	Type of coding	Range of scores	Interrater reliability
Getting off the sofa	Child gets off the sofa after the object is activated	Occurrence	0–1	Kendall's τ .95
Getting of the sofa – latency	Time from the activation of the object to child's getting off the sofa	Time interval	0–30	Pearson $r = .99$
Touching an object	Child touches an object when it is active	Occurrence	0–1	Kendall's $\tau = 1$
Touching an object – latency	Time from the activation of the object to child's first touch of the object	Time interval	0–30	Pearson $r = .96$
Touching the parent	Child touches the parent sitting on the sofa or standing on the floor	Time interval	0–30	Pearson $r = .83$
Being close to the parent	Child is close to the parent (parent is within reach of child's hand)	Time interval	0–30	Pearson $r = .4$
Child's negative emotions	Child expresses negative emotions (crying, yelling, facial expression of fear)	Occurrence	0–4	Kendall's $\tau = .44$

Note: All time intervals measured in seconds.

had behaved this way over the previous two weeks. The items are assessed on a 7-point scale, ranging from 1 (never) to 7 (always); 'does not apply' could be checked if the situation described in an item had not occurred during the previous two weeks.

During the adaptation process, the questionnaire was translated by two independent translators. Following this, a final version of the translation was agreed upon. The main study was preceded by a pilot study of 65 children aged ca. 2 years. The caregivers were additionally asked to comment on the questions. After this pilot study, some further items were more precisely worded in order to make them more unequivocal. The final version was back-translated by another translator not involved in the project and not familiar with the original version of the ECBQ. Finally, the ECBQ's co-author, Samuel Putnam, was consulted over the back translation, and all semantic differences between this and the original version were eliminated.

Analytic strategy

All analyses were conducted using IBM SPSS Statistics and IBM SPSS Amos software. The relevant data and IBM SPSS Syntax files can be found in the supplementary materials.

First of all, descriptive statistics and internal consistency were calculated to compare the Polish results with the original ones. Moreover, an alternative index of reliability was calculated using latent variable modeling. While calculating internal consistency coefficients for subscales and subscale scores, missing data for single items (namely 'does not apply' responses) were excluded, for the scores at both 26 and 30 months. Following this, the longitudinal stability was analyzed using Pearson correlation between the scores at 26 and 30 months of age.

A repeated ANOVA measure was performed for each of the ECBQ scales to enable elaboration on the developmental changes. Gender differences were examined by performing a GLM for all of the ECBQ scales.

The ECBQ ratings were compared with observational indicators of temperament to assess the questionnaire's external validity. Missing data in the lab measure of temperament took the form of missing one of the two trials; therefore, the scores for the two trials were summed (for occurrence indices) or averaged (for time and latency indices). As nearly half of the children did not leave the sofa to explore the object in either of the two trials ($n = 99$ out of 215), did not touch the object ($n = 164$) and did not express any sign of negative emotions ($n = 122$), these variables were dichotomized to compare, for each variable, the two groups of children with regard to the temperamental characteristics assessed by the ECBQ.

Finally, the factor structure was examined, using a confirmatory factor analysis, the GLS method, and then an exploratory factor analysis, as the CFA failed to confirm the 3-factor model. In the EFA, principal axis extraction and Varimax

rotation were used to accord with the procedure used in the study of Putnam et al. (2006).

All the tests we used were two-sided.

Results

Internal consistency and longitudinal stability as a measure of reliability

The descriptive statistics and internal consistency coefficients are presented in Table 2, which includes a comparison to data from the original ECBQ (Putnam et al., 2006).³

The internal consistency coefficients for most scales turned out to be satisfactory and similar to those in the original version. Moreover, the original scales with both the lowest and the highest coefficients were the same as in the Polish sample. At 26 months, the coefficients of five scales were under .70, but all were above .60, the value considered to be a threshold for satisfactory internal consistency (DeVellis, 1991). In eight scales, the coefficients were above .80, indicating very good internal consistency. At 30 months, the coefficients were higher – under .70 in just two scales, and above .80 in ten scales. For four scales (Activity Level, Attention Shifting, Cuddliness and Attention Focusing) the alphas at 30 months were significantly higher than at 26 months, with $ps < .05$ (calculation based on Diedenhofen & Musch, 2014). Alternative reliability coefficients, calculated using Latent Variable Modeling (Raykov, 2009), were also high and ranged from .58 (Activity level at 26 months) to .91 (Sociability at 30 months; see Table 2).

Longitudinal stability over a 4-month period was calculated using the Pearson correlation. The r coefficients ranged from .52 for Impulsivity to .74 for Perceptual Sensitivity. The mean correlation coefficient over the 4-month period (from 26 to 30 months) was .64, similar to that in the original sample for a 6-month period ($r = .62$ from 24 to 30 months), indicating moderate longitudinal stability over a short period of time. We supplemented this analysis by asking questions about the differences between the tested age groups.

Age and gender differences

The main effect of age in the repeated ANOVA (always with $p < .05$) was observed for several scales (see Table 2) and only in the case of one scale (Impulsivity) did parents rate older children lower than younger ones. A growth in ratings with age was observed for the remaining scales. In the original sample, the main effect of age was observed for all but one of the scales (Cuddliness), mostly

³Henceforth we refer to Putman and colleagues' (2006) study as the original study that we compared our results with.

Table 2. Descriptive statistics, age differences and reliability coefficients for Polish and American version of ECBQ scales.

Scale	American sample		Polish samples						Age effect	
	30 months (N = 98)		26 months (N = 235)			30 months (N = 248)			F _(1,207)	η^2_p
	M (SD)	α	M (SD)	Cronbach's α (n ^a)	Reliability coefficient ^b [90% C.I.]	M (SD)	Cronbach's α (n ^a)	Reliability coefficient ^b [90% C.I.]		
Discomfort	2.55 (1.02)	.83	2.38 (.79)	.74 (127)	.67 [.54; .80]	2.63 (.87)	.77 (141)	.68 [.60; .77]	23.63*	.10
Fear	2.52 (.96)	.85	2.29 (.76)	.66 (164)	.68 [.62; .74]	2.34 (.77)	.69 (165)	.68 [.62; .74]	.36	.002
Motor Activation	2.12 (.90)	.85	1.72 (.61)	.70 (187)	.69 [.60; .78]	1.69 (.63)	.73 (193)	.71 [.64; .78]	.32	.002
Sadness	2.75 (.090)	.87	2.64 (.85)	.79 (198)	.81 [.77; .84]	2.75 (.85)	.81 (205)	.81 [.78; .84]	6.05*	.028
Perceptual Sensitivity	4.14 (1.05)	.86	4.15 (1.07)	.85 (179)	.85 [.82; .87]	4.18 (1.15)	.86 (195)	.87 [.85; .89]	.14	.001
Shyness	3.21 (.95)	.86	3.43 (1.09)	.86 (201)	.88 [.86; .90]	3.36 (1.11)	.87 (190)	.89 [.87; .90]	2.11	.01
Soothability	3.46 (.74)	.84	5.33 (.77)	.79 (218)	.79 [.76; .83]	5.29 (.83)	.80 (234)	.81 [.77; .85]	.37	.002
Frustration	3.66 (.88)	.83	3.65 (.96)	.82 (198)	.81 [.78; .84]	3.66 (1)	.81 (202)	.83 [.80; .86]	.21	.001
Impulsivity	4.93 (.72)	.71	5.43 (.68)	.68 (194)	.61 [.54; .69]	5.29 (.76)	.70 (215)	.63 [.56; .71]	6.84*	.032
Activity Level	4.94 (.72)	.71	4.77 (.74)	.69 (220)	.58 [.49; .66]	4.77 (.83)	.75 (208)	.66 [.59; .72]	.039	<.001
High-Intensity Pleasure	5.14 (.87)	.83	4.49 (.83)	.73 (150)	.73 [.68; .77]	4.63 (.85)	.75 (168)	.75 [.71; .79]	9.22*	.043
Sociability	5.74 (.85)	.85	5.36 (1.17)	.88 (165)	.89 [.87; .92]	5.53 (1.13)	.90 (169)	.91 [.89; .93]	5.51*	.026
Positive Anticipation	5.15 (.81)	.85	5.29 (.88)	.82 (175)	.83 [.80; .87]	5.48 (.81)	.82 (186)	.84 [.82; .87]	13.7*	.06
Inhibitory Control	4.08 (.94)	.89	3.82 (1.03)	.87 (197)	.88 [.85; .90]	3.89 (1.05)	.89 (226)	.89 [.86; .91]	1.87	.009
Attention Shifting	4.72 (.65)	.75	4.59 (.67)	.66 (148)	.60 [.52; .69]	4.67 (.72)	.75 (166)	.70 [.62; .77]	3.06*	.02
Low-Intensity Pleasure	4.88 (.74)	.67	4.94 (.74)	.66 (155)	.66 [.59; .72]	4.98 (.72)	.69 (150)	.68 [.62; .73]	.87	.004
Cuddliness	5.02 (.79)	.88	5.29 (.75)	.84 (230)	.84 [.80; .87]	5.36 (.90)	.90 (237)	.90 [.88; .92]	1.51	.007
Attention Focusing	4.61 (.82)	.90	4.59 (.88)	.83 (213)	.84 [.81; .87]	4.81 (.89)	.87 (232)	.87 [.84; .89]	21.85*	.095

^aCalculating Cronbach's α , missing values were excluded, therefore for each α the exact n is provided in parentheses.

^bAlternative reliability coefficient was calculated using Latent Variable Modeling in Mplus.

* $p < .05$.

accompanied by a growth in ratings, as lower ratings were observed only for Motor Activation, Soothability, Impulsivity and Activity Level.

The main effect of gender was observed for several scales of the ECBQ. Girls were rated higher than boys (always $p < .05$) on the scale of Inhibitory Control at 26 months ($F_{(1,233)} = 6.06; \eta_p^2 = .025$) and at 30 months on Cuddliness ($F_{(1,242)} = 5.04; \eta_p^2 = .02$); Inhibitory Control ($F_{(1,242)} = 10.45; \eta_p^2 = .04$); Positive Anticipation ($F_{(1,242)} = 5.53; \eta_p^2 = .02$); and Sociability ($F_{(1,242)} = 8.26; \eta_p^2 = .03$). On one scale at 30 months (Frustration [$F_{(1,242)} = 3.94; p < .05; \eta_p^2 = .016$]), girls were rated lower than boys.

External validity

The ECBQ ratings were compared with observational indicators of temperament to assess the questionnaire's external validity. The ECBQ ratings for dichotomized data are presented in Table 3.

The children who at 18 months did not leave the sofa in either of the two trials were rated at 26 months by their parents as being lower in Activity Level, and higher in Cuddliness, Low-Intensity Pleasure, Shyness and Effortful Control. Similar differences were found at 30 months, with three additional significant results for the Inhibitory Control, Surgency factor (both higher ratings) and High-Intensity Pleasure (lower ratings). Additionally, among the children who got off the sofa the latency to do this correlated significantly with parents' ratings of Shyness at 26 months ($r_s = .21; p < .05$) and Sociability at 30 months ($r_s = -.22; p < .05$).

Moreover, children who did not decide to touch the object in any trial were rated at 26 months as higher in Attention Focus and Shyness (see Table 3), and at 30 months as higher in Shyness and lower in Impulsivity, Sociability and Surgency.

Comparison of children who revealed some negative emotions with children who did not brought only marginally significant differences for the Cuddliness, Low-Intensity Pleasure and Effortful Control factor (higher ratings at 26 months), as well as higher Inhibitory Control at 30 months.

The time a child spent close to his/her parent correlated significantly (although weakly) with parents' ratings of their child's temperament at both 26 (Attention Focus ($r_s = .15$); Cuddliness ($r_s = .16$), Discomfort ($r_s = .14$), Inhibitory Control ($r_s = .15$), Low-Intensity Pleasure ($r_s = .15$), Motor Activation ($r_s = .14$), Perceptual Sensitivity ($r_s = .15$), Shyness ($r_s = .14$), Effortful Control ($r_s = .18$)) and 30 months (Discomfort ($r_s = .23$), Fear ($r_s = .14$), Impulsivity ($r_s = -.15$)).

Factor structure

The confirmatory factor analysis failed to confirm the original 3-factor model, either for the 26-month sample ($\chi^2/df = 4.63, p < .001, RMSEA = .097 [.089; .105]$,

Table 3. ECBQ ratings for dichotomized data from laboratory measure of temperament.

ECBQ scale/factor	Laboratory measure of temperament										F	df	r_p^2			
	Getting of the sofa					Touching the object								Signs of negative emotions		
	Yes: M (SD)	No: M (SD)	Yes: M (SD)	No: M (SD)	No: M (SD)	Yes: M (SD)	No: M (SD)	Yes: M (SD)	No: M (SD)	Yes: M (SD)				No: M (SD)		
Activity Level 26 months	4.87 (.77)	4.64 (.69)												5.66*	213	.03
Cuddliness 26 months	5.16 (.78) ^a	5.45 (.71) ^a								5.40 (.71) ^b	5.21 (.79) ^b			8.20*** ^a	213 ^a	.04 ^a
Low-Intensity Pleasure 26 months	4.84 (.73) ^a	3.94 (.79) ^a								5.04 (.73) ^b	4.85 (.78) ^b			3.47 ^{1b}	213 ^b	.02 ^b
Shyness 26 months	3.21 (1.01) ^a	3.71 (1.14) ^a	3.08 (.98) ^b	3.55 (1.11) ^b										3.40 ^{1b}	213 ^a	.02 ^a
Attention Focus 26 months			4.31 (.84)	4.66 (.88)										11.89*** ^a	213 ^a	.05 ^a
Effortful Control factor 26 months	4.57 (.55) ^a	4.73 (.54) ^a	4.51 (.52) ^b	4.68 (.55) ^b	4.73 (.48) ^c	4.58 (.59) ^c								7.47*** ^b	213 ^b	.03 ^b
Activity Level 30 months	4.92 (.81)	4.59 (.82)												6.49*	213	.03
Cuddliness 30 months	5.22 (.90)	5.47 (.87)												4.88 ^a	213 ^a	.02 ^a
High-Intensity Pleasure 30 months	4.80 (.79)	4.47 (.80)												3.62 ^{1b}	213 ^b	.02 ^b
Inhibitory Control 30 months	3.71 (.99) ^a	4.08 (1.03) ^a								4.07 (.97) ^b	3.73 (1.04) ^b			4.11 ^{1c}	213 ^c	.02 ^c
Shyness 30 months	3.11 (1.00) ^a	3.65 (1.16) ^a	3.02 (.98) ^b	3.46 (1.13) ^b										8.55**	218	.04
Impulsivity 30 months			5.49 (.62)	5.24 (.78)										4.35*	218	.02
Sociability 30 months			5.89 (.92)	5.38 (1.16)										9.36**	218	.04
Surgency factor 30 months	5.25 (.57) ^a	5.02 (.57) ^a	5.36 (.55) ^b	5.07 (.58) ^b										7.06*** ^a	218 ^a	.03 ^a
														6.23 ^{1b}	219 ^b	.03 ^b
														13.56*** ^a	218 ^a	.06 ^a
														6.41 ^{1b}	219 ^b	.03 ^b
														4.33*	219	.02
														8.67**	219	.04
														8.78*** ^a	218 ^a	.04 ^a
														9.86*** ^b	219 ^b	.04 ^b

¹ $p \leq .07$

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; abc-values in the row that share ^a, ^b or ^c symbol belong to the same analysis.

CFI = .57), or the 30-month sample ($\chi^2/df = 5.19, p < .001, RMSEA = .104$ [.097; .112], CFI = .57). As in the original research the CFA analysis was not reported (Putnam et al., 2006), so comparison of the obtained results was not possible. Therefore, in the next step, an exploratory factor analysis was performed. The EFA was conducted separately for data gathered for 26- and 30-month-old children. For both groups, in the first step, a four-factor solution was found based on the eigenvalue > 1 criterion; however, at both ages the fourth factor explained only a small percent of the variance (4%) and the analysis of the scree plots indicated that a three-factor solution would be more appropriate. Therefore, in the next step a three-factor solution was established, explaining together 39% of the variance at 26 months and 41% of the variance at 30 months. The factor loadings for both groups are presented in Table 4.

The factor structures at 26 and 30 months are similar, since at both ages, Negative Affectivity, Surgency/Extraversion and Effortful Control factors were found. Moreover, the scales and factor loadings in each factor were similar across ages (with the exception of the first factors, which had many cross-loadings across scales). However, there was a difference in the amount of explained variance between these ages (see Table 4).

In the original sample (the children were aged between 18 and 32 months), the order of factors was similar to that of the Polish sample at 30 months and the factor loadings were similar. The same method was therefore used as in the original study to calculate summary scores for the factors: the scores for the primarily loading scales were averaged.⁴

Analysis of the correlation pattern of the summary scores for the factors revealed that only two factors were weakly correlated, much like in the original sample, as Negative Affectivity correlated negatively with Effortful Control ($r = -.16$ at 26 months and $r = -.19$ at 30 months; both $ps < .05$). Surgency/Extraversion was not correlated to Negative Affectivity ($r_s = .012$ and $.04$ at 26 and 30 months, respectively, both ns.) or Effortful Control ($r_s = -.12$ and $-.08$ at 26 and 30 months, respectively, both ns.).

Discussion

The first aim of the study was to describe the psychometric properties of the Polish version of the ECBQ. This proved to be a reliable and valid measure of temperament in toddlerhood. The test-retest reliability and the internal consistency of the scales were satisfactory and similar to the original version. Interestingly, the alpha coefficients were higher for older (30 months) than for younger (26 months) children, although these differences were statistically significant only in 4 scales out of 18. This growth in internal reliability may be due to the parents' growing experience, as they completed the questionnaire twice over

⁴Calculating summary scores for the factors using SPSS yielded similar results – see Appendix D.

Table 4. Factor loadings at 26 months (N = 235) and 30 months (N = 248^a), compared to original sample (N = 327).

Scale	Negative Affectivity			Surgency/Extraversion			Effortful Control		
	26 months	30 months	Original sample	26 months	30 months	Original sample	26 months	30 months	Original sample
	18.6%	11.5%	13%	10%	10%	14%	10.8%	19.6%	21%
Discomfort	.65	.76	.70						
Fear	.63	.66	.68						
Sadness	.60	.51	.57						
Frustration	.59	.50	.58				-.37	-.35	-.32
Soothability	-.56	-.35	-.42				.36	.41	.33
Motor Activation	.53	.56	.40				.50	.35	.37
Perceptual Sensitivity	.40	.56	.38						
Shyness	.35	.35	.47	-.41		-.37			
Activity Level	.34			.62	.62	.64			
Positive Anticipation	.31	.31		.48	.63	.51		-.35	
High-Intensity Pleasure				.58	.65	.57			
Sociability				.51	.44	.49		.35	
Impulsivity				.48	.56	.52			
Inhibitory Control					-.34				
Attention Shifting							.69	.69	.66
Low-Intensity Pleasure							.61	.70	.70
Attention Focusing							.51	.49	.64
Cuddliness							.43	.43	.51
							.39	.45	.51

Note: Factor loadings <.30 not included in table. Scales used to create summary scores for factors are bolded.

^aFour children with missing data in scales Sociability and Shyness were excluded from the analysis.

this short period of time, or maybe due to a real growth in consistency in some behavioral tendencies in children (Field & Greenberg, 1982).

One important advantage of our study is that the observational measure of temperament was used to find the convergence between parent report and observational measure of temperament. The external validity of the ECBQ, measured by the analysis of relations between the ECBQ and the observational measure of temperament, was satisfactory. The observed indices of inhibited temperament were positively related to such temperamental traits assessed using the ECBQ as shyness, inhibitory control, cuddliness and low-intensity pleasure, and negatively with activity level, high-intensity pleasure, impulsivity and sociability, although the effect sizes were small. The hypothesized relations between the expression of negative emotions in lab settings and the parents' reports of negative emotionality scales were only marginally significant. We can argue that the inhibited behavior observed in the laboratory was only partially connected with fear of novelty, as a minority of children expressed negative emotions in these situations, and children who approached the presented object only differed from the children who did not approach the object with regard to their parents' ratings of shyness (but not fear). On the other hand, the inhibited behavior was related to lower activity level and lower impulsivity, as well as higher cuddliness, inhibitory control and preference for low- rather than high-intensity pleasure – temperamental traits that create a construct of effortful control. Moreover, the factor of effortful control also differentiated children that behaved differently during the observational measure of temperament. It may therefore be hypothesized that this behavior could be a sign of observing behavior while trying to assess the novel situation. The small size effects may not necessarily suggest the low external validity of the ECBQ. First of all, the observational measure of temperament was limited to only one situation, in a context that was atypical and unknown to the child. On the other hand, the parents were assessing their children's behavior in many different contexts and generally very familiar situations. Secondly, any similarities between a child's behavior in the laboratory situation and that in everyday contexts could be limited, resulting in the low correlations between these measures. Moreover, usually the convergence of observational and questionnaire measures of different traits is low to moderate (e.g., Majdandžić & van den Boom, 2007). The obtained results suggest that both ways of measuring temperament could provide complementary data.

Secondly, we asked about the construct validity of the ECBQ when assessing the longitudinal stability of the results. Over the 4-month period (from 26 to 30 months), we observed growing ratings for Discomfort, Attention Focusing, Positive Anticipation, High-Intensity Pleasure, Sadness, Sociability and Attention Shifting and a drop in Impulsivity. These changes are in line with data describing the rapid development of effortful control of behavior (Rothbart et al., 2004) and an increase in ratings for social and affective temperamental traits (Goldsmith,

1996) during toddlerhood. However, the mean correlation coefficient over the 4-month period was .64, similar to that in the original sample for a 6-month period ($r = .62$ from 24 to 30 months), indicating moderate longitudinal stability over a short period of time. In the original sample, the effect of age was observed for the majority of scales, but the age range in the original was much wider than in the Polish sample (from 18 to 32 months). However, the direction of developmental change in the Polish sample is similar to that observed in American toddlers for both the drop in impulsivity and growth in other scales, indicating similar developmental patterns in these two cultures.

Thirdly, several studies have noted significant gender differences in temperament, in both infancy and toddlerhood (Putnam et al., 2006). In the original sample, boys and girls were rated as differing significantly with regard to Fear, Positive Anticipation, Shyness, Cuddliness, Inhibitory Control and Sociability (girls being rated higher than boys), and High-Intensity Pleasure (girls being rated lower than boys). In the presented study, girls were rated higher than boys with regard to Inhibitory Control, Positive Anticipation, Sociability, and Cuddliness, and lower than boys, with regard to Frustration. This pattern confirms the previous observation that girls are rated higher in effortful control of behavior (Eiden, Edwards, & Leonard, 2004), but is not similar to results suggesting higher negative affectivity in girls (Putnam et al., 2006). Moreover, gender differences were more visible at 30 months than 26 months. These results may indicate a growing differentiation of temperament in boys and girls, possibly a consequence of different parenting styles and expectations, or even of stereotypical traits related to girls and boys (Lytton & Romney, 1991; Williams, Satterwhite, & Best, 1999), with girls expected to be generally quieter and 'good'.

Finally, the structure of the Polish version of the ECBQ was analyzed. In the original American sample, a three-factor solution was obtained. However, in the Polish sample this solution was not confirmed in the CFA, and this could be due to the relatively small percentage of variance explained by the three-factor model, with more than 50% of variance not being explained. On the other hand, using the EFA led to a similar three-factor solution incorporating the Surgency/Extraversion (S/E), Negative Affectivity (NA) and Effortful Control (EC) factors. However, some interesting differences also emerged. First of all, the percentage of variance explained by each factor differed, with growth of variance being explained by the Effortful Control factor. Moreover, it was accompanied by a growth in cross-loadings of this factor. This change may indicate the growing role of active, effortful control of behavior in development (Rothbart et al., 2004). The active system of behavioral control mainly consists of inhibitory control and attentional processes that are the basis for overcoming the system of reactive emotions like fear or approach (Rueda, Posner, & Rothbart, 2005).

Cross-cultural variation in temperament is a very inspiring research question. However, in our study the most important factor is the cross-cultural similarity in the three-factor structure of temperament. It should be noted that parents who completed the ECBQ belong to a generation subject to an era of transformation, in which the collectivist perspective promoted by previous generations is being displaced by an individualistic one. Instead of information about bringing up children being acquired through traditional intergenerational transmission, it is being drawn by parents from other sources, such as new media. Parents in this time of transformation are experiencing uncertainty about how to bring up a child, but are also actively seeking advice on parenting, which may contribute to the occurrence of a specific constellation of scores in different dimensions of temperament. Understanding the essence of cross-cultural differences would appear to present a major challenge for future research.

Our study also has some limitations. Firstly, the age span in the Polish sample was very small – all the children were assessed at similar time points of 26 and 30 months. As the questionnaire is designed to measure temperament in children between 18 and 36 months, a broader age span should be considered for the next study. Secondly, the gender of the parent completing the questionnaire was not taken into account. Although in other studies ratings of mothers and fathers regarding child temperament were highly correlated (Dragan et al., 2011), perception (and evaluation) of a child's behavior may differ between mothers and fathers. The results can also only be generalized to a limited extent, as the studied sample was characterized by a rather high SES (as measured by parents' education) and was mainly drawn from a large city. The next study should feature a more differentiated sample, additionally representing different social groups and different surroundings.

Though important, the limitations mentioned here do not diminish the presented results, which suggest that the Polish version of the ECBQ is a valid and reliable tool for measuring temperament during toddlerhood. To our knowledge, it is the first such tool in Poland, as all the other currently available questionnaires apply to other developmental periods. As the factor structure obtained in the Polish sample was similar to that found in the original research, the meaning of the scales and factors is probably similar in both cultures, and cross-cultural comparisons are therefore justified.

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Appendix A. Demographic data from Poland

Live births in 2011 in Poland: 388,416.

Live births in Poland between February and June 2011: 194,356.

Live births in 2011 in Lesser Poland Voivodeship: 35,524.

Live births in 2011 in Krakow: 7417.

Table A1. Live births by education level of mothers in 2011.

Level of education	Number of live births	Percent of all live births (%)
Total	388,416	100
Higher	168,139	43.28
Secondary	129,709	33.39
Basic vocational	54,161	13.94
Lower	32,813	8.44
Other	3226	.83
Unknown	368	.12

Table A2. Live births by education level of fathers in 2011.

Level of education	Number of live births	Percent of all live births (%)
Total	388,416	100
Higher	115,338	29.69
Secondary	132,084	34.01
Basic vocational	93,599	24.10
Lower	28,868	7.43
Other	2532	.65
Unknown	15,995	4.12

Source: Główny Urząd Statystyczny, Rocznik Demograficzny, Warszawa, 2012 (Central Statistical Office, Demographic Yearbook of Poland, Warsaw 2012).

http://stat.gov.pl/cps/rde/xbcr/gus/rs_rocznik_demograficzny_2012.pdf.

Table A3. The education level of mothers of newborns in Poland in years 2006–2013.

Level of education	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)
Higher	29.23	31.62	34.12	37.31	40.60	43.27	45.46	47.46
Secondary	37.25	36.95	36.76	35.79	34.61	33.43	32.56	32.05
Basic vocational	21.56	19.98	18.28	16.51	15.02	13.99	12.96	12.04

Note: Bolded are values for the year of birth of children participating in the study.

Table A4. The education level of mothers of newborns in Poland, cities, in years 2006–2013.

Level of education	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)
Higher	37.89	40.57	43.01	45.94	49.45	52.27	54.17	55.96
Secondary	35.96	35.01	34.23	32.92	31.22	29.57	28.53	27.74
Basic vocational	15.84	14.52	13.24	12.01	10.73	9.86	9.17	8.50

Note: Bolded are values for the year of birth of children participating in the study.

Source: Sytuacja demograficzna Polski, Raport 2013–2014, Warszawa 2014 (Demographic situation of Poland, raport 2013–2014, Warsaw 2014).

http://bip.stat.gov.pl/files/gfx/bip/pl/defaultstronaopisowa/461/1/1/raport_rll_2013-2014.pdf.

Appendix B. Comparison of children with and without ECBQ data, regarding temperamental traits at 18 months

Table B1. Results of the analysis of variance regarding temperamental traits of two groups of children: with and without ECBQ data.

Index of temperament	Children with ECBQ data at 26 months (<i>n</i> = 215)	Children without ECBQ data at 26 months (<i>n</i> = 120)	<i>F</i> _(1, 334)	<i>p</i>
	<i>M</i> (SD)	<i>M</i> (SD)		
Touching the parent (mean time)	10.73 (10.30)	10.41 (9.64)	.074	.79
Being close to the parent (mean time)	19.08 (10.98)	18.64 (10.46)	.13	.72
Getting off the sofa (latency)	23.51 (7.20)	22.55 (7.66)	1.31	.25
Touching the object (latency)	27.41 (4.93)	26.94 (5.21)	.67	.41

Table B2. Results of the χ^2 tests regarding temperamental traits of two groups of children: with and without ECBQ data.

Index of temperament		Children with ECBQ data at 26 months (<i>n</i> = 215)	Children without ECBQ data at 26 months (<i>n</i> = 120)	χ^2	<i>p</i>
		Percent of children	Percent of children		
Getting off the sofa	Yes	54	62	2.12	.15
	No	46	38		
Touching the object	Yes	24	32	2.49	.11
	No	76	68		
Signs of negative emotions	Yes	43	46	.21	.65
	No	57	54		

Appendix C. Exemplary items of the Polish version of ECBQ

All interested researchers can acquire the measure by completing the request form available at <https://research.bowdoin.edu/rothbart-temperament-questionnaires/request-forms/>.

Table C1. Exemplary items of the Polish version of ECBQ.

ECBQ scale	Item number	English version	Polish version
Activity Level	42	While bathing, how often did your child splash, kick, or try to jump?	Podczas kąpieli, jak często Pani/Pana dziecko chlapało, kopało, lub próbowało podskakiwać?
Attentional Focusing	49 R	When engaged in play with his/her favorite toy, how often did your child play for 5 minutes or less?	Podczas zabawy swoją ulubioną zabawką, jak często Pani/Pana dziecko bawiło się przez 5 minut lub krócej?
Attentional Shifting	60	After having been interrupted, how often did your child return to a previous activity?	Kiedy mu w czymś przeszkodzone, jak często Pani/Pana dziecko wracało po przerwie do poprzedniego zajęcia?

Table C1. (Continued)

ECBQ scale	Item number	English version	Polish version
Cuddliness	15 R	When your child was carried, how often did s/he push against you until put down?	Gdy dziecko było u Pani/Pana na rękach, jak często dziecko odpychało się, dopóki nie zostało postawione?
Discomfort	8	During everyday activities, how often did your child get irritated by scratchy sounds?	Podczas codziennych zajęć, jak często Pani/Pana dziecko stawało się rozdrażnione z powodu zgrzytliwych dźwięków?
Fear	39	While at home, how often did your child seem afraid of the dark?	Będąc w domu, jak często Pani/Pana dziecko sprawiało wrażenie, jakby bało się ciemności?
Frustration	135	When s/he asked for something and you said 'no', how often did your child protest with anger?	Kiedy o coś poprosiło i powiedziało/a mu Pan/i 'nie', jak często Pani/Pana dziecko protestowało ze złością?
High Intensity Pleasure	11	While playing outdoors, how often did your child like making lots of noise?	Bawiąc się na podwórku, jak często Pani/Pana dziecko z przyjemnością robiło dużo hałasu?
Impulsivity	82 R	When encountering a new activity, how often did your child sit on the sidelines and observe before joining in?	Kiedy miało wykonać jakąś nową czynność, jak często Pani/Pana dziecko siedziało z boku i obserwowało, zanim się zaangażowało?
Inhibitory Control	26 R	When asked NOT to, how often did your child run around your house or apartment anyway?	Kiedy poprosił/a Pan/i dziecko, aby czegoś NIE robiło, jak często dziecko mimo zakazu biegało po domu lub mieszkaniu?
Low Intensity Pleasure	12	While playing outdoors, how often did your child enjoy sitting quietly in the sunshine?	Bawiąc się na podwórku, jak często Pani/Pana dziecko z przyjemnością siedziało spokojnie w słońcu?
Motor Activation	7	During everyday activities, how often did your child tap or drum with fingers on tables or other objects?	Podczas codziennych zajęć, jak często Pani/Pana dziecko postukiwało palcami w stół lub inne przedmioty?
Perceptual Sensitivity	34	During everyday activities, how often did your child notice that material was very soft (cotton) or rough (wool)?	Podczas codziennych zajęć, jak często Pani/Pana dziecko zwracało uwagę, że jakiś materiał jest bardzo miękki (np. bawełna) lub szorstki (np. wełna)?
Positive Anticipation	65	When told that loved adults would visit, how often did your child get very excited?	Kiedy Pani/Pana dziecko dowiedziało się, że odwiedzi go dorosły, którego bardzo lubi, jak często dziecko było bardzo podekscytowane?
Sadness	88	When another child took away his/her favorite toy, how often did your child sadly cry?	Kiedy inne dziecko zabrało mu ulubioną zabawkę, jak często Pani/Pana dziecko płakało ze smutku?
Shyness	52	When approaching unfamiliar children playing, how often did your child watch rather than join in?	Kiedy spotykało bawiące się, nieznanne dzieci, jak często Pani/Pana dziecko raczej przyglądało się niż dołączało do zabawy?
Sociability	21	When a familiar child came to your home, how often did your child engage in an activity with the child?	Kiedy odwiedziło Państwa znajome dziecko, jak często Pani/Pana dziecko angażowało się z nim we wspólną aktywność?
Soothability	10	After getting a bump or scrape, how often did your child forget about it in a few minutes?	Po uderzeniu się lub zadrapaniu, jak często zdarzało się, że Pani/Pana dziecko zapomniało o tym w ciągu kilku minut?

Appendix D. Results for factor scores in EFA (regression method)**Table D1.** Correlation coefficients for factor scores at 26 months.

	Factor 1 (Negative Affectivity)	Factor 2 (Effortful Control)
Factor 2 (Effortful Control)	$r = -.05$ $p = .48$	–
Factor 3 (Surgency/Extraversion)	$r = .04$ $p = .56$	$r = -.02$ $p = .82$

Table D2. Correlation coefficients for factor scores at 30 months.

	Factor 1 (Effortful Control)	Factor 2 (Negative Affectivity)
Factor 2 (Negative Affectivity)	$r = -.03$ $p = .66$	–
Factor 3 (Surgency/Extraversion)	$r = -.01$ $p = .83$	$r = .02$ $p = .74$

Table D3. Gender differences in factor scores at 26 months.

ECBQ factor	Girls	Boys	$F_{(1, 233)}$	p
	M (SD)	M (SD)		
Factor 1 (Negative Affectivity)	.004 (.90)	–.003 (.92)	.003	.96
Factor 2 (Effortful Control)	.18 (.90)	–.15 (.86)	7.79	.006
Factor 3 (Surgency/Extraversion)	.002 (.94)	–.001 (.83)	.001	.98

Table D4. Gender differences in factor scores at 30 months.

ECBQ factor	Girls	Boys	$F_{(1, 242)}$	p
	M (SD)	M (SD)		
Factor 1 (Effortful Control)	.18 (.97)	–.17 (.84)	9.46	.002
Factor 2 (Negative Affectivity)	.05 (.89)	–.03 (.92)	.52	.47
Factor 3 (Surgency/Extraversion)	.06 (.87)	–.04 (.91)	.79	.37