

ASSESSMENT OF TEMPERAMENT AT 13 AND 24 MONTHS USING MATERNAL REPORT: VALIDATION OF THE PORTUGUESE VERSION OF INFANT CHARACTERISTICS QUESTIONNAIRE

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Abstract

According to Bates (1989), the concept of temperament is applied when we refer to children, adolescents or adults, especially when we want to know more about a person's activity, mood or emotional responses. Thus, temperament is a set of individual traits, with biological origins, present from early childhood, showing some kind of continuity over time. Assuming that the assessment of temperament is informative of a child's functioning, it is relevant to have valid instruments to collect this kind of data. The studies presented in this paper are part of a broader research project that aims to understand the development of children aged from 0 to 60 months. More specifically, the two studies generally aim to validate the Infant Characteristics Questionnaire (ICQ1) for 13 and 24 months of age for the Portuguese population, using mothers as informants. The first sample consisted of 289 infants aged between 11 and 20 months (Study 1) and the second sample comprised 398 children aged between 21 and 32 months (Study 2). Data from the two samples was collected in nurseries and day-care services in northern Portugal (convenience samples). During data collection, in addition to completing the ICQ, mothers were asked to complete a questionnaire with demographic information about themselves, their child and their pregnancy. The specific goals of this study were to evaluate the psychometric properties - construct validity and internal consistency - of the two versions of this instrument. Results from both studies show that factorial solutions were both appropriate for these versions of ICQ for 13 months and for 24 months. In addition, levels of internal consistency of the dimensions obtained are generally adequate.

Key words: validation; temperament; infancy; assessment.

INTRODUCTION

For several decades, there has been an interest in studying the individual differences in behavior during the early childhood, in order to identify indicators of the origin of personality differences.

For Bates², temperament consists on a set of individual traces with biological origin, that are present since early childhood and continuous through time^{2,3}. Bates tried to focus on the concept of difficult

temperament and its possible connection with less adaptive life paths. This author also defends the existence of social factors that could be relevant in the evaluation of temperament, sustaining that the resulting differences are dependent on mother and child characteristics. For parental evaluation of the child's temperament, it is important to consider that it includes objective characteristics of the child (e.g. behavior style), subjective aspects of the answer (e.g. informant's personality), parental expectations and a margin of error^{4,5}.

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The ICQ¹ is presented as an auto-administration measure developed in order to evaluate the constructor of difficult temperament at 6 months of age. It consists in measuring the parental perceptions of how difficult the child's temperament is, considering four factors: crybaby/difficult, adaptability, apathy and unpredictability. Based on the work developed for the age group of 6 months, Bates and colleagues developed versions of the ICQ¹ for 13 (11-20 months) and 24 months (21-32 months)⁷. Concerning the 13 months version, Bates raises the hypothesis that this version contains psychometric characteristics similar to the 6 months version, which doesn't happen to the 24 months version. The factors identified for 13 and 24 months are similar in both versions. However, these two versions are not as developed as the 6 months version⁷.

The central factor of the 13 months version is called *Fussy/Difficult* and it evaluates negative emotions such as crying, grouchiness, negative humor and the difficulties of the child self-hailing, allowing an evaluation of the child's medium difficulty degree. The factor *Unadaptable* evaluates the way the child adapts to people, objects or new events. The third factor – *Persistent* – is related to the evaluation of the degree the child's persistence to achieve certain objectives. The last factor – *Unsociable* – evaluates the way the child interacts and socializes with others⁷.

On the other hand, the version of ICQ¹ for the 24 months is originally composed by factors and, as in the 13 months version, the factor *Difficult* is the central one. This factor is considered a measure of negative emotions, reflecting the perception of the mother about this kind of emotion, which corresponds to the construct of difficult temperament^{7,9}. The *Negative Adaptation to Change* factor is related to the negative adaptation to changes that the child may experience. The *Unstoppable* factor is associated to the child's difficulty in stopping an action even when prevented from doing it. In other hand, the *Dependent* factor is related to the excessive dependency from the child towards its reference figure. The *Irregular* factor is associated with the child's irregularity in terms of biological rhythms. The *Sober* factor contains in itself ideas related to the child's humor. Finally, the *Factor Seven* is not related to a specific dimension of temperament, as it gathers items that are not related in theoretic terms¹⁰.

Concerning the validity of ICQ¹, recent authors support the utility of this instrument. In

fact, it is considered an adequate psychometric measure to research the difficult temperament of the child¹¹ since this concept has considerable external validity.

This instrument is mostly useful for researchers who want to study the parent's perception of the difficulties related to children's temperament. However, it should be remarked the fact that there are no evidences that it can be used to evaluate the quality of the relationship mother - child. Nevertheless, Bowlby¹² said that the babies temperament regulates and is regulated by the interaction held by the baby with others since it is born. For Rothbart¹³, individual differences in temperament are influent in the dyadic relationship from the first moments, just as the regulation promoted by the care provider is influenced by the expression of the child's temperament. There is also the possibility that the parent's perception regarding the child's temperament has implications in subsequent developmental stages⁹.

Consequently, the objective here is to validate the instrument *Infant Characteristics Questionnaire* using a sample of Portuguese children.

METHOD

Participants

In both studies was used a convenience sample collected in nurseries and kindergarten's in North of Portugal. To the validation of the instrument to 13 months version participated 71 nurseries and kindergarten's, 289 mothers, but to 24 months version participated 46 nurseries and kindergarten's and 398 mothers.

In study 1, the sample is 289 babies aged between 11 and 20 months (M = 15.5 months; S.D. = 3.75 months). 51.6% are male and 39.8% of mothers are aged between 30 and 36 years old, and 40.1% only have one Child. In this sample 54% of mothers are married or in facto union. 33.6% of mothers have higher education and 23.2% belongs to a upper middle class. In study 2 there are 398 children, aged between 21 and 32 months (M = 26.5 months; S.D. = 3.31 months). 51.8% are male. 36.6% of mothers are aged between 30 and 39 years old. 37.1% of mothers are married and 26.7% only have one Child. 18.6% have higher education and 14% belongs to a middle class (table 1).

Table 1: Maternal sociodemographic characteristic

Sociodemographic information		N	%
ICQ 12/18	Maternal age	18-29 years	56 19.4
		30-36 years	115 39.8
		37-47 years	35 12.1
		Missing	83 28.7
		Total	289
	Marital status	Single	37 12.8
		Married/Living together with a partner	156 54
		Divorced	12 4.2
		Missing	83 29.1
		Total	289
Maternal education	Until 9 th grade	44 15.2	
	12 th grade	63 21.8	
	Higher education	97 33.6	
	Missing	85 29.4	
	Total	289	100
Maternal profession – Graffarscale	Upper class	28 9.7	
	Upper middle class	67 23.2	
	Middle class	44 15.2	
	Lower middle class	33 11.4	
	Lower class	15 5.2	
	Missing	102 35.3	
	Total	289	100
Number of children	1	116 40.1	
	2	78 27	
	3	11 3.8	
	4	1 0.3	
	5	1 0.3	
	Missing	82 28.4	
	Total	289	100
	Maternal age	< 20 years	1 0.2
20-29 years	41 9.7		
30-39 years	178 36.6		
> 40 years	11 2.6		
Missing	167 51.9		
Total	398	100	
ICQ 24/30	Marital status	Married	156 37.1
		Single	26 6.2
		Divorced	11 2.6
		Live together with a partner	7 1.7
		Separated	1 0.2
		Missing	197 52.2
		Total	202
	Maternal education	4 th grade	3 0.7
		6 th grade	16 3.8
		9 th grade	30 7.1
12 th grade		42 10	
Technical course		2 0.5	
Bachelor		6 1.4	
Graduation		78 18.6	
Graduate students		6 1.4	
Master		12 2.9	
PhD		5 1.2	
MBA		1 1.4	
Missing		197 51	
Total		201	100
Maternal profession – Graffarscale	Upper class	42 10	
	Upper middle class	59 14	
	Middle class	44 10.5	
	Lower middle class	14 3.3	
	Lower class	25 6	
	Missing	214 56.2	
Total	398	100	
Number of children	1	112 26.7	
	2	78 18.6	
	3	11 2.6	
	4	1 0.2	
	Missing	196 51.9	
	Total	398	100

INSTRUMENTS

Infant Characteristics Questionnaire (Bates, Freeland & Lounsbury, 1979)

ICQ 12/18¹ and ICQ 24/30¹ were translated to Portuguese keeping the same number of items and the same response scale. After the translation process be completed. Using some items, already translated and validated to Portuguese population for the version to 6 months, was made the retroversion by a bilingual investigator.

The ICQ¹ is a self report instrument that can be used with mothers, or other relevant informers. All versions of ICQ have 32 items, that can be classified from 1 to 7 (1 characterizes the optimum temperament, 4 a median temperament, and 7 a difficult temperament)⁶. In Study 1, was made the validation to 13 months version (children aged between 13 and 20 months) and in Study 2 to the 24 months version (children aged between 21 and 32 months). In both studies we tried to obtain a report on the perception of the mother on children temperament.

Sociodemographic questionnaire

Was made a Questionnaire to collect sociodemographic data about the mother (age, profession, education, marital status and number of children), the Child (birthdate, sibling position, health problems, household, how long attends nursery), and the pregnancy (planning, complications during pregnancy or in birth, weeks of pregnancy).

PROCEDURES

Data Collection

From December 2007 to July 2008 data were collected, with the same procedures in both studies. Directors of nurseries and kindergarten's were contacted to authorize data collection. Teachers were asked to deliver to each parent an envelope containing a letter explaining the study, the informed consent, a sociodemographic questionnaire and the ICQ¹.

Data Analysis

In both studies, were used the SPSS, 17.0 version to do statistical analysis. Firstly was made a descriptive analysis to characterize the sample. To study psychometric properties of the two versions of ICQ¹ construct validity was analyzed using Exploratory Factor Analysis of Principal Components (with Varimax rotation), and internal consistency was evaluated using Cronbach's alpha. These two types of analysis were here considered once they are additional, in other words, the conjunction of these analyses allow to determine the final structure of the scales¹¹. Pearson's correlations evaluated the association between the factors.

To perform the analysis, some criteria were used to the selection of the final structure of the scales: item saturation should be equal or major

than .30; the theoretical content should not be different from the dimension to analyze; and, the total item correlation should be major than .20. The number of factors to extract only was forced after the first factor analysis was made. Our aim was to reach factorial structures with dimensions whose Cronbach's alphas satisfactory and to ensure also the item suitability to the original factor structure and to the underlying theory.

RESULTS

Study 1 (12/18 months)

Exploratory Factor Analysis of Principal Components

The factorial structure, without forcing the factor's extraction, was composed of 11 factors, responsible for 68% of the variance.

Since this structure is significantly different from the proposal by Bates and colleagues⁷ - who indicated the presence of 4 factors and defended, from a theoretical point of view, that it was not possible to justify such a high number of dimensions - here, we analyze distributions with a smaller number of factors. In this analysis, the factor 1 was robust in all factorial solutions experienced, presenting a similar structure to that proposed by Bates and colleagues⁷ and an excellent value of Cronbach's alpha.

Thus, the initial factorial solution with 11 factors, was reduced to 4 factors, in line with the proposal of original authors. This solution, with an explained variance of 38% and to which, from a theoretical point of view, was possible to give sense in the distribution of items, didn't present robust values of Cronbach's alpha and therefore, the factorial structure was again revised.

The factorial solution that proved to be more adequate was composed by 3 factors, which were responsible for 33.1 % of the total variance (see Table 2): 1) Difficult refers to the child's negative emotionality and includes aspects such as crying and negative mood ("How easily is your baby restless or cries?"); (2) - Persistent relates to the degree in which the baby is still persisting in certain tasks ("Your baby continues to move in certain objects, even when you say not to do so?"); 3) Negative adaptation to change/not sociable relates to how the child adapts to new situations /persons/ objects and also to the social interaction with others ("How does your baby usually respond/acts towards new foods?").

In this factorial organization, it appears that the last factor comprises two dimensions proposed by Bates and collaborators⁷, which may be due to the relationship that exists between the way the child relates in interactions with others and how does the adaptation to novelty, particularly to new people, occur.

In this factorial structure, it was necessary to make some changes in the distribution of items and there was also the necessity to perform a

qualitative analysis of the same in order to include them in certain factors, mostly in cases where factors proposed by Bates were not saturated. This is the case of item 20 ("How does your baby responds to changes in day-to-day routines, such as, for example, going for a walk, a feast, going for a trip, etc.?"), that despite presenting a saturation factor in Difficult, must be included in Negative adaptation to change/not sociable factor, since its content refers to the way the baby responds to changes in day-to-day routine. Therefore, in theory, it would be more appropriate that it would be included with items such as the 7 ("How does your baby usually responds/acts to new toys?"), 8 ("How does your baby usually responds/acts to new food?") and 9 ("How does your baby, generally, responds/acts to unknown people?"), in which we find a reference to the response to novelty.

In the authors proposals, the 24 and 31 items ("Does your baby play well when it is alone? "; "Until what point your baby insists on calling your attention when you're busy? ") were not included in Persistent factor; however, in the case of item 24, there was the possibility of being included in this category, because if the child is not able to play alone it's possible that it persists calling the attention of others to play with it. In the same sense, in item 31, the fact that the baby insists or not to call for the attention of the mother when she is busy may be related to persistence.

In accordance with the structure proposed by Bates and collaborators, item 13 ("when your baby is whining or crying, does he do it with force, mourns high?") is included in Difficult factor and therefore, also in this factorial solution, this item includes itself in the same factor, although it presents more intense saturation in Persistent factor. The same happens with item 20 which was included in Negative adaptation to change/not sociable factor of this factorial solution - which is built by Bates in factor Negative adaptation to change, and by its content relates to adaptations to changes in day-to-day - despite it has a more intense saturation in Difficult factor.

Three of the thirty two items - 14 ("How does your baby reacts when you're dressing him?"), 19 ("Does your baby likes to held?") and 23 ("Generally, does your baby call for more attention, in addition to the routine care, such as the bath, food, etc.??") - were not included in the final factorial solution, by not being saturated in any of the presented factors in this analysis.

Internal Consistency

The Cronbach's alpha values obtained for this factorial structure can be considered robust, once the first factor's alpha (.81) is excellent and the other factors alphas (.73 and .72) are extensive (see Table 2). We can conclude that the identified factors have a good internal consistency.

Table 2: Factorial structure, explained variance, Cronbach's alpha, mean and standard deviation (ICQ 12/18)

Itens	F 1 Difficult	F 2 Persistent	F 3 Negative adaptation to change/non sociable
1	.496		
2	.481		
3	.578		
5	.570		
6	.626		
12	.606	(.325)	
13	.315	(.407)	
17	.359		
21	.697		
27	.420		
32	.614		
15		.476	
24		.357	
25		.570	
28		.741	
29		.737	
30		.608	
31		.585	
4			.310
7			.418
8			.422
9			.686
10			.737
11			.724
16	(.322)		.377
18			.334
20	(.448)		.331
22			.464
26			.465
Mean	29.13	33.59	27.63
S.D.	7.40	6.27	7.12
% explained variance	18.1%	9.51%	5.48 %
α	.81	.73	.72

Factor intercorrelation

Pearson correlations (see Table 3) show positive associations between the Difficult factor and the Persistent factor, what translates the idea that mothers who perceive the babies as more difficult, also consider

them more persistent; and between the Difficult factor and the Negative adaptation to change/not sociable factor, what may indicate that the babies perceived as more difficult are also those who have more difficulty in sociability and adaptation to novelty.

Tabela 3: Pearson Correlation Matrix (ICQ 12/18)

	Dificult	Persistent	Negative adaptation to change/non sociable
Dificult	1	.41**	.43**
Persistent		1	.06
Negative adaptation to change/non sociable			1

** p ≤ 0.01 (2 tailed)

* p ≤ 0.05 (2 tailed)

**Study 2 (ICQ 24/30 months)
Exploratory Factor Analysis (Principal Component Analysis)**

The Exploratory factor analysis (Principal Component Analysis) resulted in a 9 factors structure explaining 57.7% of the variance. However, this factor organization presented more dimensions, containing only two items each, than the original structure. Theoretically, the grouping of these items wouldn't be appropriate. In the original structure, the factor *Sober* only includes items related to mood and in this structure includes items related to general activity level, response to changes and quality of the interaction with others. Consequently, a new factor analysis, forcing the extraction of 8 factors, was carried out, trying to reach larger proximity to the original structure. This new structure is responsible for 54.4% of the variance. The factor related to difficult temperament seems to be robust, maintaining the same items and an excellent Cronbach's alpha value (≥ 0.80).

Some changes were needed in this factorial structure in order to achieve a final solution: 1) item 22 was removed ("How excited does your child become when people play with or talk to him/her?"), once that it presented a total-item correlation lower than .20 (.19) -excluding this item, Cronbach's alpha value increased from .66 to .73; 2) items 20 ("How does your child respond to disruptions and changes in everyday routine, such as when you go to church or meeting, on trips, etc.?") and 14 ("How does your child react when you are

dressing him/her?") were excluded because they were statistically included in factors where they didn't fit, from a theoretical point of view.

After all changes, the factorial structure of the Portuguese version of ICQ 24/30 is the following (see table 4): 1) Difficult - related to perception of difficult temperament ("How easy is it for you to calm or soothe your child when he/she is upset?"); 2) Unstoppable - describes children that continue to take certain action or insist in some action even when is prevented ("Does your child persist in playing with objects when he/she is told to leave them alone?"); 3) Negative Adaptation to Change - is associated to negative reaction to new people, places or situations ("How does your child typically respond to a new person?"); 4) Dependent - relates to more exigency in daily care and intense activity ("On the average, how much attention does your child require, other than for caregiving (feeding, diaper changes, etc.)?"); 5) Sober - meets items that are related to mood and availability of the child to be with others ("How much does your child smile and make happy sounds?"); and, 6) Irregular - relates to the regularity of biological rhythms ("How consistent is your child in sticking to his/her eating routine?").

Internal Consistency

Cronbach's alpha values are excellent for factor Difficult (0.82), extensive for factor Unstoppable (0.79) and Negative Adaptation to Change (0.73) and minimum for Dependent (0.58), Irregular (0.62) and Sober (0.49) (see table 4).

Tabela 4: Factorial structure, explained variance, Cronbach's alpha, mean and standard deviation (ICQ 24/30)

Itens	F1 Difficult	F2 Unstoppable	F3 Neg. Adapt. to Chang.	F4 Dependent	F5 Sober	F6 Irregular
1	.628					
4	.370					
5	.671					
6	.721					
12	.796					
13	.585					
21	.692			(.342)		
26	.375					
32	.497					
28		.850				

	Itens	F1	F2	F3	F4	F5 F6
	Difficult	Unstoppable	Neg. Adapt. to Chang.	Dependent	Sober	Irregular
29		.855				
30	(.431)	.607				
31		.550		(.390)		
9			.881			
10			.786			
11			.582			
15		(.306)		.576		
23				.669		
24				.639		
25				.548		
16			(.359)		.364	
17	(.401)				.576	
18					.698	
20					.568	
27					(.347)	
2						.806
3						.800
14						(.361)
Mean	26.59	18.75	9.72	18.54	5.01	4.86
S.D.	6.97	4.47	3.30	4.02	1.80	2.06
% Explained variance	18.941	9.125	6.038	4.773	4.420	4.11
∞	.82	.79	.73	.58	.49	.62

FACTOR CORRELATION

It is observed a positive correlation between *Difficult* and the other factores (table 5). When a mother perceive a difficult temperamento in child, usually notice that the child is more active, with difficulties in adaptation to change, more dependente or more exigent in daily care, with a negative humor and with more irregular biological rythms.

There is a positive correlation between *Negative adaptatation to change* and the other factors. So, mothers thar evalutes their child as

having a negative adaptation to changes, also can assess as having a difficult temperamento, negative humor, biological patterns less regular, more difficult in staying quiet and more dependent.

Can be verified that there is a moderated correlation between the *Unstoppable* and the *Dependent*, what measn that a child that is perceived by the mothar as being dependente, can also be more restless.

Finally, there is a positive, but weak, correlation between *Sober* and *Irregular*, wich implies that wehan the child has a negative emotionality will have irregular biological patterns.

Table 5: Pearson Correlation Matrix (ICQ 24/30)

	Difficult	Unstoppable	Neg. Adapt to Chang.	Dependent	Sober	Irregular
Difficult	-					
Unstoppable		.45**				
Neg. Adapt to Chang.			.27**			
Dependent				.13*		
Sober					.38**	
Irregular						.36**
						.03
						.23**
						.05
						.10
						.13*
						-

** p ≤ 0.01 (2 tailed)

* p ≤ 0.05 (2 tailed)

DISCUSSION

The main objectives of these studies were to evaluate the psychometric qualities (construct validity and internal consistency) of Portuguese versions of ICQ for the 13 and 24 months, and examine correlations between the different questionnaire factors.

Concerning the factorial structure of ICQ¹ 12/ 18 months, the factorial solution found, although different from the proposal by Bates and colleagues (1979), covers the same dimensions, even if the *Unadaptable* and *Unsociable* factors constitute themselves as a single factor, which may be due to

the fact that mothers do not dissociate the difficulty of the baby in adapting to new situations with the difficulty in relating with others. Concerning the fidelity study, in version 12/18, it was possible to verify a robust and high internal consistency.

The factorial structure proposed to version 24/30 is similar to the original proposal of the authors, however, the items distribution by factors is distinct. This discrepancy may occur due to various reasons, highlighting the fact that the original version’s study has been undertaken with a sample of 128 children and the present study has a wider sample (398 children). Another fact to be remarked is the social and cultural differentiation

between the two countries; although we are facing a western culture in both, there are cultural traits specific to each one of them. In 1981, Thomas and Chess reported that the children temperament varies according to life period, culture, social class and gender. We must also take into account the fact that the culture and the values of each society regulate the emotional response that each subject has to different stimuli, i.e. modulates the expression of behavioral temperament¹⁴. In the version 24/30 we verify the existence of values with internal consistency suitable for all the factors, with the exception of factor *Sober* (0.49), which was maintained on the basis of his conceptual suitability.

To version 12/18, there was an association in some dimensions: children seen as more difficult are seen also as having more difficulty in sociability and adaptation to change, although they are more persistent. This translates into the idea that the difficulty of temperament is something that cannot be separated from other dimensions, i.e. children considered difficult will have less facility in interaction with others and adapt to change - something that is supported by the definition of difficult temperament¹³ - however, they may be persistent, in the sense of requiring attention or to perform certain tasks, even when they know that they must not do it.

In what concerns the correlation between factors of the factorial structure of version 24/30, it appears that the *Difficult* factor correlates itself with all the other factors of the factorial structure, which indicates that the difficult temperament dimension includes aspects that comprise the level of activity, the negative adaptation to change, the sober, and, in the case of mothers, the dependency. Although there isn't a theoretical reference that supports this, it is expected that all the other factors correlate themselves with the *Difficult*, since they all end up being dimensions that translate the more or less difficult temperament. Therefore, a child with a difficult temperament tends, similarly, to have a greater level of activity, a less positive adaptation

to change, a greater dependency on the adult reference, less positive emotionality and greater irregularity in biological patterns. Being sure that, all the factors relate (in)directly to the difficult temperament concept, it's expected that they correlate themselves statistically.

One cannot forget the idea that there are no certainties concerning the stability or instability of temperament, so, we cannot define as difficult a child who may have temperamental characteristics more difficult at a certain stage of its development, because this would have implications in its subsequent development¹⁴. The possibility of modulation of temperament is higher in younger ages, therefore, the present characteristics of a child's temperament will have influence in its development but will not fully define it¹⁵.

These studies have some methodological limitations, which are verified in the fact that a convenience sample was used. Therefore, this fact does not allow the results generalization to the national population.

Despite these limitations, this study emphasizes the importance of ICQ in evaluating the child's temperament, since it enables an understanding of the characteristics of children through maternal report. It is confirmed by several authors that there should be a recognition of the change of approach to the concept of health and disease, which leads to the fact that children's health should be seen in an ecological way. Thus, multiple factors can lead to the onset of difficulties, the evaluation must be done using an understanding process and use different sources of information, involving the family, always considering the development of the child¹⁶.

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