Brief Note

The Infant Characteristics Questionnaire: Evaluation with a New Zealand Sample

Richard J. Siegert, Claire Scannell, and Wendy V. Parr

Victoria University of Wellington

The notion of infant temperament has attracted growing interest from developmental researchers and those interested in such problems as post-natal depression. The development of the Infant Characteristics Questionnaire (ICQ) has provided a brief and psychometrically sound instrument for the measurement of this variable. The present study describes an attempt to test the psychometric properties of the ICQ with a sample of 102 mothers of infants aged between three and six months in Wellington, New Zealand. The internal reliability, test-retest reliability, factor structure and correlations with infant crying diaries are reported. It is concluded that while further validational data are desirable, the present study confirms the merits of the ICQ with a New Zealand sample.

The concept of infant temperament has attracted growing interest from researchers in recent years. It is of interest both to developmental researchers who regard it as an important topic in its own right, but also to researchers focussing on such issues as postnatal depression where infant temperament may act as a salient mediating variable (e.g. Bates, 1987; Cutrona & Troutman, 1986). While definitions of infant temperament vary, especially in relation to how strictly it is viewed as genetically determined, they share certain common strands. Bates (1987) notes that all major definitions of infant temperament include the notions that it is early appearing, involves constitutionally rooted behavioural tendencies, and is highly likely to affect personality outcomes through its impact on the social relationships that produce personality. Research on infant temperament has been greatly facilitated by the development of questionnaires which ask parents to report on a number of aspects of a child's behaviour (for reviews see Rothbart, 1981 and Bates, 1987). One questionnaire which has proved useful for research and psychometrically robust is the Infant Characteristics Questionnaire (ICQ) (Bates, Bennett Freeland & Lounsburg, 1979). The ICQ was developed as a measure of infant difficultness. The significance of infant difficultness and maternal perceptions of it has been demonstrated in longitudinal studies from infancy onwards (e.g. Sanson, Oberklaid, Pedlow & Prior, 1991). In its development the authors found that the ICQ agreed moderately well with mother and father reports of infant difficulties as measured by the Carey Survey of Temperamental Characteristics (Carey, 1973). The authors also reported acceptable internal and test-retest reliabilities. In factor analysing the scale they reported four factors which they called "Fussy-difficult", "Unadaptable", "Dull" and "Unpredictable". Thus based upon that initial evaluation with subjects from the midwestern United States, the ICQ is considered to be a valuable tool in researching infant temperament. The present study attempts to extend the psychometric evaluation of the ICQ with a sample of New Zealand mothers and their babies. In so doing it aims to further test the psycho-metric qualities of the ICQ by evaluating it with a cultural and national group independent from that with which it was developed. Specifically, the present study aimed to determine ICQ's reliability (internal, test-retest), factorial structure and validity using a New Zealand sample.

Method

Subjects

Subjects were 102 mothers of infants aged 3–6 months. Mother's age ranged from 20 to 41 with a mean of 31. Of the total 102 mothers, 39% had only one

child, 39% had two children, 13% had three children, 4% had four children, and 5% had five children in total. Of the 102 infants 49% were male and 51% were female. Of the 102 mothers, the percentage who came from each of Elley and Irving's (1976) six SES categories were (in order of declining SES): 15, 33, 36, 12, 2 and 2%.

Procedure

The present study was initiated as part of a broader research project into psychosocial aspects of postnatal depression. This study however only concerned itself with evaluating the ICQ and one other measure (a relationship questionnaire). Subjects were volunteers who responded to an advertisement in a magazine describing itself as "New Zealand's own parenting magazine". The advertisement was placed within an article on postnatal depression and asked volunteers to fill in confidential questionnaires to aid research related to that topic. Subjects responded by writing to or phoning the senior researcher (C.S.). This project was approved by the Wellington Area Health Board's Ethics Committee.

Subjects were asked to complete two booklets containing the questionnaires a week apart and then return them by stamped addressed envelope. The 28 item ICQ was used (Bates, 1986). Additionally, subjects were provided with an infant crying record which they were asked to complete during the week between filling in the questionnaires. This crying record entailed keeping a daily diary of crying frequency and duration on a hourly basis. The responses were summed to give a weekly total for both frequency of crying and duration of crying. All responses were entered on to a VAX mainframe computer and analysed with the SAS package (SAS Institute, 1985).

Statistical Analyses

The following statistical analyses were completed: Item-total correlations were calculated. The internal consistency of the ICQ was calculated according to the Kuder-Richardson (KR20) formula. Test-retest reliability at one week interval was calculated using the Pearson correlation. The principal components analysis with Varimax rotation of four factors was undertaken. The decision to rotate four factors was based upon Walkey's (1983) argument that interpretable structures are more likely to result when the number of factors is determined by the test developer's theoretical framework or previously established structures, than arbitrary mathematical structures such as the number of eigenvalues greater than one. This approach to factor analysis has repeatedly proved to be successful in revealing robust and interpretable factor structures (e.g. Siegert, McCormick, Taylor & Walkey, 1987; Siegert, Patten & Taylor, 1988). Consequently four factors were rotated based upon the structure reported by Bates et al. (1979) for their sample of 322 infants around 6 months of age. The internal consist-

ency and test-retest reliability of each of the four factors were also calculated. Lastly, correlations of total score on the ICQ with infant crying records of frequency and duration were calculated.

Results

The item-total correlations were positive for all 28 items. They ranged from a minimum of 0.28 (p<.01) for item 23 to a maximum of 0.75 (p<.0001) for item 6. The impression of high internal consistency suggested by the item-total correlations were confirmed by a KR20 of 0.88. The test-retest correlation of the ICQ at one week's test-retest interval was 0.91 (p<.0001). The principal components analysis revealed a large general factor. Only four of the twenty-eight items loaded below 0.40 on the first unrotated factor. There were no items loading below 0.24. The results of the four factor Varimax rotated solution are presented in Table 1. The eigenvalues of the first four factors were 8.89, 2.38, 1.74 and 1.39 respectively. Item 8 ("how did your baby respond to his/her first solid food?") was not included in the factor analysis as only 66 mothers answered this item—reflecting we believe the relative youth of their babies and the frequency of breastfeeding in New Zealand.

Inspection of Table 1 provides clear evidence of a robust and readily interpretable four factor structure. Only four of the twenty-eight items loaded above 0.35 on more than one item. The general picture is one of a structure that satisfies both the criteria of simple structure and that of interpretability. Factor 1 in the present research is easily identified as Bates' factor called Fussy-difficult. Factor 2 corresponds closely to the factor Bates' called Dull, although we prefer to call it sociability. The third factor in Table 1 is highly similar to that Bates' called Unadaptable. Lastly, Factor 4 in the present study corresponds with that Bates named Unpredictable. The coefficient α's for Factors 1 to 4 were 0.88, 0.69, 0.82 and 0.63 respectively. The corresponding test-retest reliabilities were 0.92, 0.81, 0.82 and 0.82. Finally the total score on the ICQ was found to correlate at 0.28 (p<.01) with frequency of crying and at 0.46 (p<.0001) with duration of crying.

Discussion

The present research provides initial and promising evidence for the reliability and valid-

Table 1: *Item-Factor Loadings of ICQ after Four-Factor Analysis with Varimax Rotation (n=102)*

ITEM	CONTENT	ROTATED FACTOR PATTERN			
		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
1	calm or soothe when upset	68			
4	know what's bothering when cries	66			
5	get fussy and irritable	57		36	
6	cry and fuss in general	75			
12	easily get upset	69			
13	how vigorously cry and fuss	59			
14	react when dressing him/her	50			
15	how active in general	48			
19	want to be held	50			
22	changeable is baby's mood	65			
24	overall difficulty	74			
25	how much attention require	74			
26	plays well by him/herself	62			
27	react to being confined	53			
16	smile and make happy sounds		69		
17	mood is baby generally in	44	57		
18	enjoy playing games with you		74		
23	excited when people play with		75		
28	cuddle and snuggle when held		51		
9	respond to a new person			82	
10	respond to a new place			88	
11	adapt to things			80	
20	respond to disruption			54	
2	predict when sleep/wake up	40			68
3	predict when become hungry				66
21	predict need nappy change				70

ity of the ICQ with a different national and cultural group of mothers and babies than previously reported. Given the increasing weight accorded to cultural and ethnic differences in psychological research generally, these findings are important. Reliability, as measured by internal consistency or temporal stability, was very high. This is clearly some underlying construct, presumably infant temperament, that the ICQ is tapping into. However, at the same time, four specific factors were found bearing a strong resemblance to those described by Bates (1986). The relatively small differences in factorial structure were most likely due to three influences: Firstly, the present study used the latest 28-item ICQ whereas the factors described by Bates are drawn from analyses of the earlier 24-item ICQ. Secondly, the present study involved an admittedly modest sample size of 102 subjects for a 28-item measure. Thirdly, there may

be real differences in infant temperament or maternal perception thereof between New Zealand and the United States. Given these three differences between the two studies, the similarities in the factor structures are to the credit of the ICQ. Factor 1 in the present research comprised 15 items. Disregarding the items added since Bates' original evaluation (i.e., items 25-28) this would leave 12 items comprising Factor 1 in our research. Nine of these items are those contained in Bates' original Fussy/difficult factor. For Factor 2 the corresponding figure would be 3 items out of 4. For Factor 3, four out of five of Bates' items are included. Our Factor 4 includes three out of the five items in Bates' factor of Unpredictable. This replicability of the factor structure internationally provides strong support for the construct validity of the measure.

Lastly, some support for the criterion valid-

ity of the ICQ was found. Correlations were small (with frequency of crying) and moderate (with duration), positive and significant. This is encouraging as Bates (1987, p.1121) has argued that "amount of crying is central to the ICQ definition of difficult temperament".

It is of interest to note moreover that duration of crying is more strongly related to temperament as perceived by mothers than simply the frequency. This suggests that a baby who cries frequently but is readily soothed is considered less "temperamental" than one who cries less often but for longer periods.

Although these findings are encouraging the present study has certain limitations. Subjects were volunteers who responded to an advertisement. Demographic information sought was kept to a minimum also, so as to enhance return rate. Consequently, it cannot be argued that these are necessarily a representative group of New Zealand mothers. Certainly, they overwhelmingly came from higher socioeconomic levels. There is also a need for further validational data as the present research only provides two, albeit salient, correlations. Indeed we are currently involved in some further such work on the ICQ.

Notwithstanding these caveats it is concluded that the findings in the present study provide further evidence of the reliability and validity of the ICQ. In addition the results extend such findings to mothers and infants in western style cultures outside of North America. This greatly enhances the utility of the ICQ.

References

Bates, J. E. (1986). Information on the Infant Characteristics Questionnaire. Unpublished manuscript. Indiana University.

Bates, J. E. (1987). Temperament in infancy. In Osofsky, J. D. (Ed.), *Handbook of Infant Development*, 2nd ed., New York: Wiley.

Bates, J. E., Bennett Freeland, C. A. & Lounsbury, M. L. (1979). Measurement of infant difficultness. *Child Development, 50*, 749-803.

Carey, W. B. (1973). Measurement of infant temperament in pediatric practice. In J. C. Westman (Ed.), *Individual differences in children*. New York: Wiley.

Cutrona, C. F., & Troutman, B. R. (1986). Social support, infant temperament, and parent self-efficacy: A mediational model of post-partum depression. *Child Development, 57*, 1507-1518.

Elley, W. B., & Irving, J. C. (1976). Revised socio-economic index for New Zealand. *New Zealand Journal of Educational Studies, 11*, 25-36.

Rothbart, M. K. (1981). Measurement of temperament in infancy. *Child Development, 52*, 569-578.

Sanson, A., Oberklaid, F., Pedlow, R. & Prior, M. (1991). Risk indicators: Assessment of infancy predictors of pre-school behavioural maladjustment. *Journal of Child Psychology and Psychiatry, 32*, 609-626.

SAS Institute Inc., (1985). *SAS Users Guide*. Cary, N. C., SAS Institute Inc.

Siegert, R. J., McCormick, I. A., Taylor, A. J. W., & Walkey, F. H. (1987). An examination of reported factor structures of the General Health Questionnaire and the identification of a stable replicable structure. *Australian Journal of Psychology, 39*, 89-100.

Siegert, R. J., Patten, M. D., & Taylor, A. J. W. (1988). Factor analysis of the WAIS-R using the factor replication procedure, FACTOREP. *Multivariate Behavioral Research, 18*, 401-421.

Walkey, F. H. (1983). Simple versus complex factor analyses of responses to multiple scale questionnaires. *Multivariate Behavioral Research, 18*, 401-421.