ISSN 1809-9246
Rev. bras. fisioter., São Carlos, v. 11, n. 3, p. 155-161, May/June 2007

DEVELOPMENT OF A QUESTIONNAIRE TO DETECT ATYPICAL BEHAVIOR IN INFANTS

HABIB ES [1] & MAGALHÃES LC [2]

[1] Centro Universitário de Belo Horizonte, School of Medical Sciences of Minas Gerais, Belo Horizonte, MG - Brazil

[2] Department of Occupational Therapy, School of Physical Education, Physical Therapy and Occupational Therapy, Federal University of Minas Gerais – UFMG, Belo Horizonte, MG – Brazil.

Correspondence to: Emily Sobreira Habib, Rua Fernandes Tourinho 700/802, CEP 30112-000, Belo Horizonte, MG – Brazil, e-mail: milysh@hotmail.com

Received: 28/11/2005 - Revised: 22/12/2006 - Accepted: 09/02/2007

ABSTRACT

Introduction: Regulatory disorders (RDs) are manifested by sensorimotor, sleep, feeding and adaptation abnormalities in the first three years of life, which seem to indicate future child development problems. There is evidence that RDs are related to attention, learning and behavioral problems that are observed at school age. Therefore, it is important to invest in resources that enable their early detection. The objective of this study was to describe the process of creating a questionnaire to detect atypical behavior suggestive of RDs, among 6 to 12-month-old infants. Method: The instrument was developed in two stages: (a) planning and constructing the test and (b) content validity examination through an expert panel consisting of researchers and professionals with recognized experience in the field. Results: The data indicated that the topic is relevant and that, according to the scores from the panel, the items in the questionnaire are easily observed (96.8%), clearly written (94.5%), assess important aspects of behavior (89.6%) and can potentially detect atypical behavior in 6 to 12-month-old infants (85.4%). Conclusion: Based on this study, the items were reviewed, resulting in a questionnaire with 50 items that will be applied experimentally in future work. It is expected that the questionnaire will be useful for early detection of problems that affect a great number of children.

Key words: child development; child behavior; regulatory disorders; content validity.

INTRODUCTION

Infants are not physiologically and psychologically equal[1,2,3]. There are individual differences and early on some children present slight signs of behavior abnormalities. Some infants are quite sensitive to sensorial stimulation, presenting irritability even when they face small environmental changes. Other infants are less reactive to stimuli and need assistance to respond to social interaction. These signs have been studied and seem to indicate future occurrence of behavioral problems[4,5]. When such signs last for more than the 6 months of age they are called "Regulatory Disorders" (RD) and are defined in the Diagnostic Classification ZERO-TO-THREE[6-8] as "infant and young child difficulty in regulating their behavior and physiologic, sensorial, attention, motor or affective processes and in organizing themselves in a calm, alert or affective positive states". The RD are manifested as sleep, food acceptance and self-consolation problems or as an infant difficulty in dealing with new situations. Moreover, atypical motor development, alterations in muscle tonus, hypo or hyper-responsiveness to sensorial stimuli and exacerbation of the affliction resultant of being away from parents can also be observed[4,5]. Such infants are considered "difficult" or irritable, have little adaptation ability, or may present hypo or hyper motor activity[3,4,7].

Throughout the years, several authors have identified RD signs in infants. Even though adopting different theoretical perspectives, such difficulties were described by Carey, Bates[1], Brazelton[9], Als[3], Porges[3], and Greenspan & DeGangi[10]. However, only after the publication of the Diagnostic Classification ZERO-TO-THREE[6], terminology and criteria were developed for using the term RD for infants and children up to three years ond. The altered behaviors observed in the RD have significant impact on the quality of life of the children and their families, resulting in limited participation at home, at school and in social activities[2,7]. These problems, in daily living, are manifested in diverse ways: from slight problems, such as the impossibility to leave the child under the care of other people, to more serious ones, such as the extreme difficulty to make the child try new food flavors and consistencies, or the impossibility for the child to enjoy a healthy out-of-home social life. At pre-school age, problems

in balance, gross and fine motor coordination and motor planning as well as delayed language acquisition, tactile hypersensitivity or accentuated lack of attention became evident[5,8]. At school, writing and reading problems, attention deficits, emotional difficulties and impaired interaction with schoolmates appear[1,4].

The relevance of the early detection of abnormal child development has been widely studied and emphasized by health and education professionals[4,5,11]. Furthermore, the increase in survival of high-risk infants, as a result of pre and perinatal care technologic evolution, led to an increase in the number of children with development disorders[5,11]. Although RD are identified in infants without biological risk history, their incidence is high in low birth weight infants, in moderate or extreme premature babies and in children with definitive diagnostics such as cerebral palsy, Down and fragile X syndromes[7,12]. Children presenting moderate or mild disabilities are rarely early diagnosed; however, they are the children which are most benefited by early intervention programs and whose prognostic can be most drastically influenced[4,5,11].

In the last years, physical therapists and occupational therapists have been more interested in developing tests to screen for development problems. With an increasing frequency, such professionals deal with the dilemma of determining which children present high risk of developing future learning and behavior problems. In the past, specific development abnormalities were assessed separately; however, the present tendency is to use a more comprehensive approach, which considers the auto-regulation problems, such as the RD, as the basis of infants motor, cognitive and affective acquisitions[12]. Even though standardized motor skills tests are already extensively used in Brazil[13], issues related to behavior, although frequently observed clinically, are still seldom evaluated, because these problems are not identified by the traditional motor tests.

Understanding the infants sensory processing development and how it is manifested, as well as having instruments which enable its assessment, are fundamental requirements for the improvement of the quality of child's health care. A review of the related literature revealed several instruments which can be used to identify the RD in infants: the Infant/Toddler Sensory Profile[14], the Infant/Toddler Symptom Checklist[15], the Test of Sensory Functions in Infants[10], the Infant Characteristics Questionnaire[1], the Infant Temperament Questionnaire[2], the Neonatal Behavioral Assessment Scale – NBAS[9], and the Infant Stress Alarm - ADBB[16]. These tests are carried out in other countries to assist interventions and preventive approaches for children at pre-school age; nevertheless, each of these tests has one or more limitations which make it difficult to use them in clinical contexts.

The application of observational tests, such as the NBAS[9], requires a great deal of training, which makes the process too onerous. Questionnaires are easier to carry out, however, some are too long[2,14], which constrains its application possibilities, mostly because a great portion of the Brazilian population present difficulty in reading and interpreting more complex questionnaires. Some questionnaires include issues which have little relevance in our culture and the majority of the above cited tests were submitted only to the initial phases of validation, presenting questionable reliability and validity. The ADBB, the sole Brazilian reference, had its validation process started[16], however, this instrument has an emotional approach focused on the pediatric consultation, which is different from the goal of the present study.

Since the existent questionnaires have not been considered appropriate to our reality and with the aim of allowing RD detection, we opted to create a specific test in the format of a questionnaire for the parents, which would be easily utilized by health professionals, intelligible and quickly carried out. The objectives of the present study are (a) to describe the phases of the development of the "Infant Behavioral Signs – SICOBE" which has the proposition of detecting RD in infants between 6 and 12 months of age, and (b) to assess its content validity.

MATERIALS AND METHODS

The present study followed the recommendations of Benson and Clark[17], who suggested a sequence of four stages to guide the process of developing and validating assessment instruments: *planning* (objective definition, target population, type of the items and format of the test); *construction* (description of the specific aims and delineation of the content, with items development based on the review of already existent tests and evaluation of the content validity by a panel of experts); *quantitative evaluation* (application of the pilot version in an appropriate experimental group and testing the reliability and validity of the items); *validation* (application of the test in a significant number of individuals in order to define norms, test its concurrent, criterion-related and construct validities).

In the present study only the stages 1 and 2 of the SICOBE development process will be discussed, and, to facilitate readers' comprehension, each stage will be described separately. The first stage, related to the development of the instrument, was mainly theoretical. In the second stage, related to content validity, the items were presented to panel of experts which evaluated the quality of the items. It is important to clarify that the objective was to develop a questionnaire to enables the screening of infants with persistent atypical behavior and which could be useful to indicate the need for follow-up or diagnostic assessment.

When a questionnaire is developed, it is indispensable to test its content validity. Content validity consists in a systematic evaluation of the test content in order to ensure that the items actually represent the construct of interest and

that all fundamental aspects of the area or behavior to be appraised are represented appropriately by the items of the test[18,19]. Usually the content validity is assessed in a subjective manner, qualitatively, by a panel of judges, composed by researchers or professionals with a recognized knowledge in the specific field. The results of the panel of experts helps to determine which items will be maintained, revised or eliminated from the test.

1st stage: Instrument development – Phase I: Planning

In this phase, the objective and target population were determined, the types of the items and the test format. Initially a literature review was carried out in order to evaluate the theme relevance and to locate the assessment instruments used in the specific area. It was observed that the theme was so popular that there are web sites of serious entities, such as the Erickson Foundation, discussing issues such as excessive crying and infant irritability, presenting orientations to parents and research projects proposals[20].

The parents-focused questionnaire format was chosen because, generally, the parents are the first to observe the behavior alterations of their children and, in usual conditions, their information is highly reliable[1,10,21].

Although it is important to detect behavioral signs in the newborn, it was considered more appropriate to focus the initial instrument development process on the ages between 6 and 12 months. During the normal infant development, the period between 0 and 6 months of age present a great deal of variability, as it is necessary great physiologic and sensorimotor adaptations in order to maintain homeostasis[1,4]. After this period, the infant behavior becomes more stable, what enables more reliable observations.

Phase II: Questionnaire development

A literature review identified the instruments which evaluated constructs that were similar to the theme of interest[1,2,8,9,13-15]. The application protocol of each test was found in the library or mailed by its authors. After that the items that could be useful for the SICOBE elaboration were selected. Therefore, it was created a 125 items bank which also included new items formulated based on the clinical experience of the present study authors. After the first screening, which has eliminated items with similar contents, 92 remained in the selection. These items were then grouped into domains (tactile, motor, auditory, vestibular, affective/behavioral) in order to verify the prevalence or absence of these domains, to assess the balance among domains and evaluations of infants hipo or hyper-reactivity. After this second selection 59 items remained in the test.

Afterwards, each item was carefuly revised in order to improve the comprehensiveness of the headings, avoid ambiguities and warrant that the headings would not suggest or induce to any answer. As a criterion to score each question, a four-point scale was used to register the frequency of appearance of a specific behavior: 1= rarely; 2= occasionally; 3= frequently; 4= most part of the time. The four-point scale was polarized into two extremes (i.e., rarely and constantly), without an excessive number of options which could lead to confusion, consequent to the poor familiarization of the Brazilian population with the use of tests. After the instrument was created, the next step was started: the assessment of the content validity.

2nd stage: Assessment of the SICOBE content validity.

Subjects

Twenty professionals, with recognized experience in treating and detecting development disorders and/or with scientific knowledge of this area and with some experience in applying and interpreting standardized tests and questionnaires, were invited to take part in the study. The calculation of the number of participants was carried out based on similar studies on instrument development[10,11,19,21]. The inclusion criteria for the components of the panel of experts were: to be clinicians or researchers, from different professions and different work and/or research centers.

Instruments

A protocol to evaluate the quality of the SICOBE 59 items was developed. It was based on the following criteria: *clarity* (if the item was well written, if the question was intelligible for the parents); *relevance* (if the item was relevant and if it represented an important infant behavioral aspect to be appraised); *discrimination* (if the item had potential to discriminate infants with and without RD); *easiness of observation* (if the item represented frequent behaviors, easily observed by the parents).

The participants scored each item of the SICOBE in each criterion. A four-point scale was used to indicated the degree of agreement of the participant with the quality being assessed: 4= I totally agree; 3= I partially agree; 2= I partially disagree; 1= I totally disagree. The participants were asked to make comments about the questionnaire and its clinical utility and to suggest revisions.

According to the established inclusion criteria, many professionals were contacted and invited to participate in the study. Twenty judges were selected and received the items' assessment protocol and an instructions package which included information about the study objectives, written participation consent, and the definition of RD, explaining how they are manifested in infants. The instructions emphasized that giving a sincere opinion about the items was extremely important for the study. The study procedures as well as the informed consent were approved by the Ethics in Research Committee of the Federal University of Minas Gerais (Etic – 400/04).

Data Analysis

The data were analyzed in accordance with the procedures described in the literature[17-19,21]. The score of each item was registered and the number of answers for each criterion was calculated, allowing for the calculation of the percent of agreement related to the positive or negative features of each item. The scores 1 and 2 were accounted as negative or indicative of a poor quality item, and the scores 3 and 4 were considered as positive or indicative of a good quality item. The percents of the scores 3 and 4 for each criterion were summed in order to calculate the final averaged percent for the item[17,19]. Items which obtained lesser than 80% positive scores in two or more of the four criteria were discarded from the test; items which achieved lesser than 80% positive score in one of the four criteria were revised. The judges' commentaries and suggestions about the items readability and recommendations to include new items were catalogued and taken into account during the revision process of the SICOBE.

RESULTADOS

Of a total of 20 sent formularies, 10 evaluations were returned by the professionals, who composed the total number of the panel participants. As indicated in Table 1, the panel was interdisciplinary, with representatives of research and clinical areas, proceeding from different work and research centers.

Table 1. Participants of the expert panel.

Judge	Profession	Title	Work place
1	Physical therapist	Specialist	Private clinic
2	Speech therapist	Specialist	Private clinic
3	Infant Neurologist	PhD	Public university
4	Pediatrician	Masters	Public Service
5	Pediatrician	Specialist	Private clinic
6	Infant Psychiatrist	PhD	Public university
7	Occupational therapist	Masters	Public Service
8	Occupational therapist	Masters	Public university
9	Occupational therapist	Specialist	Public Service
10	Occupational therapist	Specialist	Private clinic

The average percent of agreement among the judges concerning the quality of the SICOBE items indicated good quality (scores 3 and 4), and the items were considered *easy to be observed* (96,8%); *clearly* written (94,5%); to evaluate *relevant behavior aspects* (89,6%) and to have potential to *discriminate atypical behaviors* of infants between 6 and 12 months of age (85,4%).

It can be observed that the items were positively evaluated, since most of them received the scores 3 or 4, indicating agreement relative to clearness, relevance, discrimination and easiness of observation. The judges comments showed an unanimous agreement in relation to the importance of the SICOBE and the necessity of having an instrument which enables early detection of suspect behaviors in infants.

Based on the evaluation of the panel of experts and the judges comments, some items were discarded, amalgamated or revised (Table 2). They were organized according to the different domains and 2 items related to the behavior domain were included – the item 49 "the baby is adorable, everyone likes to be around him/her" and the item 50 "I avoid leaving the baby with other people due to his/her bad behavior".

After the modifications were made, the test was examined by a Portuguese reviewer, resulting in the Pilot Version 1 of the SICOBE, a questionnaire composed by 50 items, whose answers comprised 4 score options, as anticipated in the original version. A copy of the questionnaire, which is under test, may be requested from the first author.

DISCUSSION

The process of developing tests is time consuming and meticulous. Diverse stages must be accomplished in order to, at the end of the work, count on a clinically useful instrument, which can be reliably used by the professional community. The present study described aspects of the rigor needed to develop a questionnaire, in accordance with the related literature[10,17,19]. A comprehensive literature review was combined with informal interviews and judges assessment in order to refine the SICOBE and improve its potential to be clinically used. The result of the panel of experts confirmed the prospects, since it was favorable to the instrument's qualities and provided elements which afforded revision and improvement of the items.

With an initial number of 125 items, the SICOBE was submitted to successive stages, resulting in a total of 50 items, whose content validity was confirmed by professionals and researchers which work in the child development area. The participation of the judges was important to reduce the number of items. Their comments and critical evaluation of the content contributed to achieve a stronger instrument, in accordance with the demands of the area's professionals.

Considering the scores for the evaluation of the quality of the items, the criteria "easiness of observation" and "clearness" obtained the highest scores. It can be observed that 96,8% and 94,5% of these items scores, respectively, were 3 or 4. These high scores in these criteria indicate a practical, eminently clinical, questionnaire in accordance with the initial goal of the instrument. The criterion "discrimination",

Table 2. Modified SICOBE items.

Initial item	Fusion	Elimination	Revision	Final item
Gets irritable or restless many times a day.	x			Gets irritable many times a day or for long periods of time.
Gets irritable for long periods of time.	x			
Is very nervous.	x			Is very nervous/irritable; cries more often than other babies.
Cries for no reason more often than for a reason.	x			
Gets distressed when stepping on or crawling on certain textured surfaces.	x			Avoids touching or gets distressed when touching toys, objects or food of different textures (sand, grass, cuddly toys, baby food).
Avoids touching toys or food of different textures.	x			
Does not accept change of bottle tops or pacifiers.		x		
Only plays with objects that produce sound.		x		
Eats well.		x		
Fells uncomfortable when lying on his/her back.		x		
Regurgitates or vomits frequently.		x		
Enjoys having his/her clothes changed.		x		
Seems to be afraid of falling.			x	Demonstrates excessive fear of falling even when not in any danger.
Gets very frightened with any sounds.			x	Gets very frightened with unexpected noise.

in contrast, obtained a smaller percent (85,4%) of scores 3 and 4, which poses questions on the potential of the group of items to discriminate children with or without RD. These questions are possibly consequent to the newness of the RD concept, since many of the professionals got familiarized with the Diagnostic Classification ZERO-TO-THREE[6] during the study.

Although, in a general, the questionnaire was well evaluated, some items received low scores in one or more criteria and, as showed in Table 2, these items were discarded from the questionnaire or combined with other items. This procedure allowed reducing the number of items in the SICOBE. Six of all items obtained less than 80% of scores 3 and 4 in two or more criteria. These items were discarded since the panel of experts indicated that they were not relevant and had little potential to discriminate atypical behaviors. A negative score for 1 criterion, in addition to the comments and opinions of the judges, identified the items that could be amalgamated or revised, which contributed to the global of revising the instrument. Even though critiques and suggestions were raised, all judges commented about the feasibility and necessity of having an instrument like the SICOBE. This information supports the continuity of the questionnaire development, which should include reliability and validity testing as well as the definition of norms.

Despite the great contribution given to the refinement of the questionnaire, this study has some limitations. There Brazilian literature related to the development of tests in the physical therapy and occupational therapy fields is scarce and there are few standardized instruments to assess young infants' behavior. Consequently, the SICOBE authors had to use their clinical experience to create and select the items to compose the questionnaire.

Another limitation was that only 50% of the professionals which had manifested verbal interest in taking part in the study concluded the analysis of the items, limiting the possibility to make a more comprehensive evaluation of the SICOBE. Brazilian professionals have little experience in participating in studies which aim at developing tests, which could have discouraged them. Furthermore, health care professionals are currently overloaded, resulting in insufficient time to analyze the items carefully, as required in the present study. We believe that the ideal method is a meeting including all participants, such as a focal group. This procedure, however, would also be difficult to carry out because, in order to avoid biases and unilateral perspectives, the panel was composed by professionals proceeding from diverse work settings and states.

Although the panel of experts had a limited number of participants, it was considered valid, as it included professionals from diverse areas, both clinicians and researchers. The specific literature presents variability related to the composition of the panels of experts, thus, there are published studies whose tests were appreciated by eight judges[10] and others which included even 20 participants[11]. Therefore, it is possible to conclude that the composition of the present study's panel

accords with the literature, confirming the validity of the presented work.

Despite the presented limitations, it is noteworthy that this is a pioneer study in the areas of physical and occupational therapy in Brazil; hence, it is important to stimulate professionals to contribute to the development of instruments that are focused in our reality. The data provided by the panel were relevant and the contribution of different areas enriched the instrument. The RD and their consequences are still little discussed in our professional environment; however their early detection is necessary due to the insidious characteristic of the problems that may arise[5]. To accomplish that effectively, practical instruments with an easy application are necessary[21,22]. The SICOBE is being created in order to fulfill this gap and it is expected that the involvement of professionals that are active in the field of child development has made the questionnaire more clinically useful.

CONCLUSION

The need for evidence based practice makes extremely relevant to count on appropriate evaluation instruments, focused on our population. The development of tests and scales for clinical use demands work, not only by the researcher, but also by the health care professionals, which will use the instrument in the future. It is expected that the present study will contribute to illustrate the process of creation of a questionnaire for clinical use and that the SICOBE becomes an instrument useful for early screening of developmental problems, indicating when it is necessary a more careful follow-up of the child. The next step of the SICOBE creation process is the experimental application of the pilot questionnaire in order to verify the reliability and validity of its items, which will be reported in future works.

Support: CNPq.

Acknowledgements: To the judges, professionals and researchers, which have collaborated with great dedication in the panel of experts.

REFERENCES

1. Bates J. Information on the infant characteristics questionnaire. Bloomington: Indiana University; 1980.
2. Gomez C, Baird S, Jung, L. Regulatory disorder identification, diagnosis and intervention planning. Infants Young Child. 2004;17(4):327-39.
3. Porges S, Doussard-Roosevelt J, Portales A, Greenspan S. Infant regulation of the vagal "brake" predicts child behavior problems: a psychobiological model of social behavior. Dev Psychobiol. 1996;29(8):697-712.
4. DeGangi G, Sickel R, Wiener A, Kaplan E. Fussy babies: do treat or not do treat? British Journal of Occupational Therapy. 1996;59(10):457-64.
5. Wiener A, Long T, DeGangi G, Battaille B. Sensory processing of infants born prematurely or with regulatory disorders. Phys Occup Ther Pediatr. 1996;16(4):1-17.
6. ZERO-A-TRÊS: Classificação diagnóstica de saúde mental e transtornos do desenvolvimento do bebê e da criança pequena. Porto Alegre: Artes Médicas; 1997.
7. Schaaf R, Miller L, Seawell D, O'Keefe S. Children with disturbances in sensory processing: a pilot study examining the role of the parasympathetic nervous system. Am J Occup Ther. 2003;57(4):442-9.
8. Cordeiro M, Silva P, Goldschmidt T. Diagnostic classification: results from a clinical experience of 3 years with DC: 0-3. Infant Ment Health J. 2003;24:349-64.
9. Brazelton T. Neonatal behavioral assessment scale. 2ª ed. Philadelphia: J.B. Lippincott; 1995.
10. DeGangi G, Greenspan S. Test of sensory functions in infants (TSFI). Los Angeles: Western Psychological Services; 1989.
11. Harris S, Daniels L. Content validity of the Harris Infant Neuromotor Test. Phys Ther. 1996;76(7):727-37.
12. Davis D, Burnis B. Problems of self-regulation: a new way to view deficits in children born prematurely. Issues Ment Health Nurs. 2001;22:305-23.
13. Chagas P, Mancini M. Testes padronizados utilizados na avaliação da criança portadora de paralisia cerebral. In: Lima C, Fonseca LF. Paralisia cerebral. Rio de Janeiro: Editora Guanabara Koogan; 2004. p. 335-54.
14. Dunn W. Infant/toddler sensory profile. San Antonio: Psychological Corporation; 2002.
15. DeGangi G, Poisson S, Sickel R, Wiener A. Infant/toddler symptom checklist. Tucson: Therapy Skill Builders; 1995.
16. Lopes S. Alarme de estresse do bebê (ADBB): avaliação de um instrumento para detecção de sinais precoces de problemas emocionais na criança pequena [dissertação]. Belo Horizonte (MG); 2003.
17. Benson J, Clark F. A guide to instrument development and validation. Am J Occup Ther. 1982;36(12):789-800.
18. Guenia B, Cavas C. Sob medida. São Paulo: Vetor Editora; 2002.
19. Thorn D, Deitz J. Examining content validity through the use of content experts. The Occupational Therapy Journal of Research. 1989;9(6):334-45.
20. Erickson Foundation. The Fussy Baby. Disponível em: <htpp://www.erickson-foundation.org>. Acesso em 17 jun 2003.
21. Campbell SK, Kolobe TH, Osten E, Lenke M, Girolami G. Construct validity of the Test of Infant Motor Performance. Phys Ther. 1995;75(7):585-95.
22. Magalhães L, Nascimento V, Resende M. Avaliação da coordenação e da destreza motora - ACOORDEM: etapas de criação e perspectivas de validação. Rev Ter Ocup. 2003;14(3): 104-9.