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Introduction

As a vast and useful field of knowledge, Psychology has gained more and more importance in the sense of providing solid basis to social action in countless domains all over the world. Empirical measuring in psychology is thus fundamental to define intervention strategies in a wide universe of possible actions. In Brazil, several spheres of society have undertaken growing action based on psychological knowledge and measuring. ASQ-3-BR is one of those initiatives. It is a screening instrument that aims at detecting possible developmental problems in children between one month and five and a half years old, developed by Diane Bricker, Jane Squires and colleagues in the United States in 1980 and adapted to several countries along the last 34 years. A Brazilian version of the instrument was produced in 2010. This master thesis will present the Brazilian version of the instrument, ASQ-BR, discuss its adaptation procedures as well as its result changes along application years 2010 and 2011.

Psychological tests have been important tools for managing human resources in public and private realms everywhere in the world. In Brazil, psychological tests are present in developmental/educational evaluation, selection for job positions, information on psychological aptitude for driving, clinical work in hospitals and mental health institutions (Pasquali, 2007, 2008), among others. Studying psychological measuring to fully understand its functioning and potential, as well as its limitations, is therefore of paramount importance.

Psychometrics is the field of Psychology that studies psychological measuring (*psycho* = 'spirit' and *metria* = 'measure'). It has developed along Psychology history as a field of knowledge that aims at helping psychologists

understand the characteristics of psychological instruments and especially the rationale underneath measuring a psychological construct. Cronbach (1990) states that

“(...) a construct is some postulated attribute of people, assumed to be reflected in test performance.”

Cronbach (1990)

Therefore, to measure a psychological attribute, it is necessary to assume that human psyche is somehow measurable. The way through which human psyche becomes “measurable” is considering human behaviors as indicators of mental processes. Love, anxiety, attention, memory, etc. all entail associated behaviors, which is what is measured by tests (Cohen & Swerdlik, 2009). Hence it is possible to infer that measure extracts a numerical value from a set of behaviors. Measurements of a construct – or latent traits – are, therefore, possible. Latent traits are psychological factors that drive a person to behave somehow. The latent trait – more or less alert, in love, anxious, motivated, etc. – and the numerical result of the psychological testing should therefore vary accordingly.

Psychometrics has partly evolved in the last four decades thanks to the development of high capacity data processing in computer technology. Statistical analyses with increasing accuracy pushed test reviews and new kinds of psychological measurements were created. Unforeseen precision in psychological testing in several countries made empirical evidence of psychological constructs quite evident for psychologists and society in general. A vivid example of how the quality of a test might influence the evaluation of professionals involved in psychological assessment is the Australian program National Association for Gifted Children (NAGC, 2008). NAGC uses WISC-IV (Wechsler Intelligence Scale for Children) to help professionals find high ability children and refer them to specialized educational services to promote their latent potentials. The professionals involved in the program trust WISC-IV based on the quality and care in the validation and standardization of the instrument for the Australian population. Similar processes of assessing children latent cognitive traits to promote interventions by educational psychologists or educators with training in

neuropsychology have taken place in several countries – USA (Ross, Moiduddin, Meagher, & Carlson, 2008), England (Melhuish, 2006), France (Hurless, 2004), etc.

Nevertheless, psychometrics is not limited to studies of psychological tests. Various instruments in psychiatry undergo psychometric analyses, as Mini Mental State Examination (MMSE), a classical tool used to detect cognitive impairment and widely used in patients with mental disorders (Folstein, Folstein, & McHugh, 1975). MMSE's psychometric properties have had adaptations for numerous countries, *e.g.*, Australia (Galea & Woodward, 2005), Spain (Blesa et al., 2001) and Turkey (Küçükdeveci, Kutlay, Elhan, & Tennant, 2005). Sociology is another field of study that adopts scales to assess social indicators, such as income and education. Results of tests like the Sociometric Measure for Preschool Children – SMPC (Asher, Singleton, Tinsley, & Hymel, 1979) are studied psychometrically. That also happens in education. For example, the Program for International Student Assessment, PISA (OECD, 2000), a test of proficiency in reading and writing used in 65 countries, has had its characteristics analyzed psychometrically. From the beginning, PISA's developer committee were concerned about the preliminary statistical results. Such careful interest led to the maintenance of the psychometric properties of the instrument in several countries – Germany (Goldhammer, Naumann, & Kessel, 2013), Ethiopia, India, Peru and Vietnam (Cueto & Leon, 2012). In fact, Lee's study presented similar psychometric characteristics for PISA results in the 41 countries assessed (Lee, 2009). The participation of psychometrics in psychiatry, sociology, education, even economics (Kahneman, 2003) reveals the extent to which it has gone beyond the boundaries of psychology.

ASQ-3 is a screening instrument that aims at evaluating the development of children between 1 to 66 months old. It is a questionnaire filled by parents – or based on information provided by them – to assess their own children's development. ASQ-3's structure comprises 21 questionnaires that correspond to age intervals based on the Piaget and Gesell's development theories. Ages and Stages Questionnaire's history started at the end of the 1970's at University of Oregon, USA. Diane Bricker, Jane Squires and colleagues reviewed the literature on tests for children and created Infant Monitoring Questionnaire – IFMQ – based

on the data found. IFMQ was first published in 1980 and had 24 items to assess four dimensions of children behavior from zero six and a half years of age. In 1995, six questions were added to the questionnaire in order to form the first version of ASQ and in 1997 Squires et al. modified a few items of the original ASQ in order to produce its second version – ASQ-2. ASQ got its final version in 1999 when the 2-month scale was added. It was then named Ages e Stages Questionnaire Third Edition – ASQ-3 (Squires et al., 2009).

ASQ-3 has been translated into over 20 languages and its viability as an international tool for screening children development has been supported by researchers worldwide (Charafeddine et al., 2013; Dionne, Squires, Leclerc, Péloquin, & McKinnon, 2006; Filgueiras, Pires, Maissonette, & Landeira-Fernandez, 2013; Heo, Squires, & Yovanoff, 2008; Janson & Squires, 2007; Juneja, Mohanty, Jain, & Ramji, 2011; Kerstjens et al., 2009; Tsai, McClelland, Pratt, & Squires, 2006). It is the screening instrument mostly chosen in the United States, by 70 % of the pediatricians (Squires, 2009). The city of Los Angeles adopted in its schools as part of LAUP – Los Angeles Universal Preschool from 2010 on (Xue, Atkins-Burnett, Caronongan, & Moiduddin, 2010).

In Canada, Québec has adopted it for its schools and well as Ontario, in the Mohawk Program (Dionne, McKinnon, Squires, & Clifford, 2014). In Europe, France (Troude, Squires, L'Hélias, Bouyer & La Rochebrochard, 2011), Denmark, Norway and Spain (Pomés, Squires & Yovanoff, 2014) have versions of ASQ-3 in action in several public policies for children. In South America, besides the initiative in Brazil, also Equador, Chile (Schonhaut, Armijo, Schönstedt, Alvarez, & Cordero, 2013) and Peru have adopted ASQ-3 in public policies for children. In Africa, Kenya (Omedo, Matey, Awiti, Ogutu, & Alaii, 2012) and Zambia have developed programs including ASQ-3 as well as Thailand, China (Bian, Yao, Squires, Hoselton, & Chen, 2012) and Korea in Asia. Besides the national initiatives above-mentioned, MAGPIE (Kvestad, Taneja, Kumar, Bhandari, & Strand, 2013), an international program joining 125 centers in 19 countries in Latin America, Africa and Asia, has been using ASQ-3 to follow up the development of children of mothers who received magnesium sulfate 24 hours before and after their child's birth.

In Brazil, there was a recommendation of the Strategic Issues Secretariat – Secretaria de Assuntos Estratégicos – in 2011 for the use of indicators for the development of children that were similar to the one adopted in Rio de Janeiro by the Municipal Secretary of Education – SME. The recommendation is in line with the international tendency to foster indicators of the development of children, as recommended by UNESCO and UNICEF (Humphrey, Wigelsworth, Barlow & Squires, 2013).

In Brazil, ASQ-BR was first used as a research tool by Filgueiras in 2010. Among the 21 scales, 19 had its psychometric properties analyzed by Filgueiras (2011, 2013), except for questionnaires 2 and 4 months of age. ASQ-BR's validity has not been established though it is necessary so that the instrument is considered adapted to Brazil. However, fundamental steps have been taken in order to reach that, taking into consideration the massive amount of data presented in this study. With respect to dimensionality, only three in ninety five scales showed bidimensionality (10, 54 and 60 months of domain Personal/Social). Likewise, a few scales in ASQ-BR showed unreliable data based on Cronbach's alpha. For example, 67% of the scales in Personal/Social domain had alphas below 0.65. Despite the classical standard for Cronbach's alpha is 0.70 (Cohen & Swerdlik, 2009; Pasquali, 2008), 0.65 was accepted by Filgueiras et al. (2013) due to the small number of items per scale: 6 (Dukes, 2005). Similar phenomenon was observed in three scales of domain Problem Solving as well as in two scales in both Gross and Fine Motor Coordination domains. Only Communication had all its alphas above 0.65. Other psychometric studies were conducted, but the present work will be limited to those data, since they will be the basis for the comparison between Filgueiras's and the new version proposed in this dissertation.

Based on those results, there is evidence that ASQ-BR can be improved in terms of internal consistency and dimensionality. For that, all the items with psychometric problems or issues of adaptation to the target audience were modified – according to this study's methodology. Validity studies should be performed in future studies, with the special recommendation of clinical validity, since ASQ-BR is a screening instrument.

This study will investigate the psychometric characteristics of screening instrument Ages & Stages Questionnaire – Third Edition (ASQ-3) regarding

comparison of its two adaptations to Brazilian Portuguese – (ASQ-BR and ASQ-BR-2011) in the context of municipal public daycare and preschools of Rio de Janeiro, Brazil, conducted by Filgueiras (2011) and published by Filgueiras, Pires, Maisonette and Landeira-Fernandez (2013). Two chapters were planned to help understand the theoretical basis of ASQ-3 and ASQ-BR: chapter 2 assesses the types of psychological tests, their validity, precision and standards; and chapter 3 briefly describes Piaget's and Gesell's theories since they provide the foundations of the constructs in ASQ-3 and ASQ-BR. ASQ-BR will be presented in detail in chapter 4 as well as its translation, adaptation and application in 2011. Chapter 5 will show the objectives of this thesis. Methodology will be discussed in chapter 6. Chapter 7 brings our conclusions and Chapter 8 will present the results of this study. Chapters 9 and 10 consist of the bibliographical references and the annex, respectively.