Infant Behavior & Development 41 (2015) 17–25

Contents lists available at ScienceDirect

Infant Behavior and Development

Comparison of Griffiths-II and Bayley-II tests for the developmental assessment of high-risk infants

Ilaria Cirelli*, Myriam Bickle Graz, Jean-François Tolsa

Department of Paediatrics, Centre Hospitalier Universitaire Vaudois, 1011 Lausanne, Switzerland

ARTICLE INFO

Article history:
Received 11 January 2015
Received in revised form 9 June 2015
Accepted 10 June 2015
Available online 11 August 2015

Keywords:
High-risk infants
Development
Griffiths Mental Development Scale
Bayley Scales of Infant Development
Concurrent validity

ABSTRACT

Introduction: Two important risk factors for abnormal neurodevelopment are preterm birth and neonatal hypoxic ischemic encephalopathy. The new revisions of Griffiths Mental Development Scale (Griffiths-II, [1996]) and the Bayley Scales of Infant Development (BSID-II, [1993]) are two of the most frequently used developmental diagnostics tests. The Griffiths-II is divided into five subscales and a global development quotient (QD), and the BSID-II is divided into two scales, the Mental scale (MDI) and the Psychomotor scale (PDI).

The main objective of this research was to establish the extent to which developmental diagnoses obtained using the new revisions of these two tests are comparable for a given child.

Material and methods: Retrospective study of 18-months-old high-risk children examined with both tests in the follow-up Unit of the Clinic of Neonatology of our tertiary care university Hospital between 2011 and 2012. To determine the concurrent validity of the two tests paired *t*-tests and Pearson product-moment correlation coefficients were computed. Using the BSID-II as a gold standard, the performance of the Griffiths-II was analyzed with receiver operating curves.

Results: 61 patients (80.3% preterm, 14.7% neonatal asphyxia) were examined. For the BSID-II the MDI mean was 96.21 (range 67–133) and the PDI mean was 87.72 (range 49–114). For the Griffiths-II, the QD mean was 96.95 (range 60–124), the locomotors subscale mean was 92.57 (range 49–119). The score of the Griffiths locomotors subscale was significantly higher than the PDI ($p < 0.001$). Between the Griffiths-II QD and the BSID-II MDI no significant difference was found, and the area under the curve was 0.93, showing good validity. All correlations were high and significant with a Pearson product-moment correlation coefficient >0.8.

Conclusions: The meaning of the results for a given child was the same for the two tests. Two scores were interchangeable, the Griffiths-II QD and the BSID-II MDI.

1. Introduction

The psychomotor development of a child includes four main areas (motor skills, language, cognition and social relationships). Different determinants, such as genetic, perinatal, and environmental factors, may affect psychomotor development,

* Corresponding author. Tel.: +41 763719511.
E-mail address: ilaria.cirelli@hotmail.com (I. Cirelli).

http://dx.doi.org/10.1016/j.infbeh.2015.06.004
0163-6383/

thus they must be investigated to evaluate the potential risk of developmental impairment and to choose the best follow-up approach.

Early identification of children at higher risk of disability is important because children may require early intervention to improve developmental issues. Researches (Brooks-Gunn et al., 1994; Anonymous, 1990; McCormick et al., 2006) has confirmed the short- and long-term efficiency of early intervention, supporting the need for developmental follow-up. To encourage and facilitate this task, in 2006 the American Academy of Paediatrics developed the following three-step algorithm: surveillance, screening and evaluation (Council on Children With Disabilities, 2006). According to this algorithm, surveillance must be applied to each paediatric visit during the first 5 years of a child's life. The algorithm consists of a questionnaire that determines parents' concerns and the child's developmental history, identifies risk factors (genetic, environment, biologic, and social) and observation of the child, including a physical examination. Chung et al. (2011) reported that parental concerns about a child's development are essential in identifying potential impairments, mainly in the field of language and motility, and should be used in conjunction with a screening questionnaire. If general developmental surveillance suggests an increased risk, or at a key developmental age if no risk is highlighted, paediatricians may administrate a standardized screening test, such as the Denver-II Developmental Screening Test, the Ages and Stages questionnaire (Klamer, Lando, Pinborg, & Greisen, 2005; Squires, Bricker, & Potter, 1997), or the Parent Report of Children's Abilities (PARCA) for preterm infants (Johnson et al., 2004). Johnson et al. (2004) demonstrated that the adapted PARCA for very preterm infants (<30 weeks gestation) is a valid tool solely for the discrimination of children with developmental delay and has good concurrent validity with the Bayley Scales of Infant Development (BSID-II). This formal screening procedure has not been so rigorously applied. Sand et al. (2005) showed that only 23% of the paediatricians included in the study commonly used a standardized developmental screening tool, although Radecki, Sand-Loud, O'Connor, Sharp, and Olson (2011) noted a significant increase in use between 2002 and 2009. Children who fail the screening step should be referred to perform a developmental diagnostic test.

Two important risk factors for abnormal psychomotor development are preterm birth and neonatal hypoxic ischaemic encephalopathy, which warrant specialized neurodevelopmental follow-up with standardized diagnostic tests. The rate of preterm delivery (<37 weeks gestation), especially for moderately preterm births (32–36 weeks gestation) (Davidoff et al., 2006), has increased during the last 10 years in most industrialized countries and the rate of preterm delivery is now 5–12% in Europe (Goldenberg, Culhane, Iams, & Romero, 2008; Mader, Merialdi, & Keller, 2012). In 2011, the preterm birth rate in Switzerland was 7.3% as shown in Table 1. According to the Federal Statistical Office of Public Health, this preterm birth rate remained stable over the last 4 years (SFSO, 2013).

Although the majority of very premature infants and children with a low birth weight (<1500 g) have good neurodevelopmental outcomes, they have a higher risk of impairment compared to infants born at term (Colvin, McGuire, & Fowlie, 2004). A meta-analysis concluded that disabilities in preterm infants, at any gestational age, may affect several functions necessary for everyday life. These disabilities include cerebral palsy, developmental coordination disorders, neurosensorial impairment (hearing and visual alteration), cognitive impairment, learning difficulties, and behavioural disorders (Arpino et al., 2010). Bhutta, Cleves, Casey, Cradock, and Anand (2002) also showed that there is an inverse correlation between gestational age and birth weight and the severity of cognitive impairment.

Another major neonatal risk factor of developmental impairment is perinatal asphyxia in term infants; perinatal asphyxia may lead to hypoxic-ischaemic encephalopathy (Jacobs et al., 2013). The definition of asphyxia is not universal because of the criteria used, thus the true incidence of birth asphyxia and the amplitude of the consequences of birth asphyxia are unknown. Nevertheless, Smith, Wells, and Dodd (2000) demonstrated a significant decline in the incidence of hypoxic-ischaemic encephalopathy in term infants, and a 2007 review found of developed countries reported that the incidence of hypoxic-ischaemic encephalopathy was 2.5 of 1000 live births (1.2–7.7/1000) (Graham, Ruis, Hartman, Northington, & Fox, 2008). A review of studies that incorporated encephalopathy in the definition criteria of asphyxia demonstrated that the rate of severe developmental deficits, which includes mental retardation, cerebral palsy, and/or motor retardation, was inversely proportional to the severity of the encephalopathy (ranging from 0% for the mild stage of encephalopathy to more than 90% for the severe stage) (Dilenge, Majnemer, & Shevell, 2001).

In light of the potential severe outcomes of preterm and asphyxiated children, the use of a developmental diagnostic test at key ages of development is recommended for clinical as well as for research purposes. Many tests exist for the assessment of mental and psychomotor development in children. The new revisions of Griffiths Mental Development Scale (Griffiths-II [1996]) (Huntley, 1996) and the Bayley Scales of Infant Development (BSID-II [1993]) (Bayley, 1993) are two of the most frequently used instruments (Johnson & Marlow, 2006), although use varies depending on the country and habits. The BSID-II is an American test and the Griffiths-II is a British test.

Table 1
Preterm birth rate in Switzerland in 2011, Federal Statistical Office of Public Health.

Gestational age	Preterm rate in Switzerland in 2011 (% of total births)
Extremely premature (22–27 weeks)	0.4%
Very premature (28–31 weeks)	0.7%
Premature (32–36 weeks)	6.2%
Total preterm rate	7.5%