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Concurrent validity between instruments of assessment of motor development in infants exposed to HIV

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ABSTRACT

Background: Exposure to HIV during pregnancy is a risks to development. Exposed child should have assessed its development since birth. Alberta Infant Motor Scale is a tool which assess gross motor skills, with easy application and low cost. Up to now, this scale had not proven its validity for the population exposed to HIV. It's necessary to compare its with a gold standard tool, Bayley scale, which assess gross and fine motor skills, has a high cost and longer application time required. Studies compare results of Alberta with Bayley's total motor score (gross + fine). However, it's also necessary to compare Alberta's result with only Bayley's gross motor result, because it's what both evaluate in common.

Aims: to verify the concurrent validity of AIMS in infants exposed to HIV; to verify the correlation of AIMS and BSITD III for this population and to compare if these coefficients differ in the central age groups and extremities of the AIMS.

Methods: 82 infants exposed to HIV evaluated in 1st, 2nd, 3rd, 4th, 8th, 12th, 15th, 16th, 17th and 18th months, with Alberta Infant Motor Scale and Bayley Scale (motor subscale). For analysis of concurrent validity, results of raw scores of the scales were compared with the correlation analysis. First analysis: Alberta's score with Bayley's total (gross + fine) motor score. Second analysis: Alberta's score with Bayley's gross motor score.

Results: In the first correlation analysis, results were: r = 0.62 in 1 st month, r = 0.64 in 2nd month, r = 0.08 in 3rd month, r = 0.45 in 4th month; r = 0.62 in 8th month, r = 0.60 in the 12th month. In the second correlation analysis, results were: r = 0.69 in 1 st month; r = 0.58 in 2nd month; r = 0.25 in 3rd month; r = 0.45 in the 4th month; r = 0.77 in 8th month; r = 0.73 in 12th month. Analyzes of the 15th, 16th, 17th and 18th months couldn't be performed because at these ages all the children had already reached the maximum score in the AIMS. Results were significant and indicate correlation between scales. Found results agree with other studies that found high correlations between the scales in premature and risk groups. However, these studies compare results of gross motor skills assessments with gross and fine motor skills assessments. Our results show that correlation only between the gross motor skills have higher coefficient values, and we believe this is the best way to compare the scales, with what both assessed in common.

Conclusions: Alberta scale has correlation with Bayley scale in assessing of children exposed to HIV, and can be a substitute to Bayley in assessing of these children. Results are stronger when comparing only what both scales assess in common.

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1. Introduction

Human immunodeficiency virus (HIV) can be transmitted vertically, sexually or parenterally. Infants born to HIV-positive women are considered HIV-exposed because there is risk of vertical transmission of the virus during pregnancy, delivery or breastfeeding (Lazzarotto, Deresz & Sprinz, 2010; Robbins, 2001).

HIV has a greater affinity for the immune system and the nervous system cells. When the infection and/or exposure to the virus occurs while the central nervous system (CNS) is immature, the infant may acquire a variety of neurological sequelae, such as neuropsychomotor developmental delay and encephalopathies (Gómez et al., 2009; Linn et al., 2015; Spudich, 2013; Walker et al., 2011). Furthermore, the exposure to antiretroviral therapy increases the risk of mitochondrial dysfunction, especially the exposure to nucleotide inhibitors of reverse transcriptase, which could induce CNS changes and consequently neuropsychomotor development (Alimenti et al., 2006; Gay et al., 1995; Herrero et al., 2013; Jelsma, Davids & Ferguson, 2011; Le Doaré, Bland & Newell, 2012; Rie, Mupuala & Dow, 2008). Still there is no consensus in literature on the real effects of using high amounts of antiretrovirals, related to virus exposure on the neurological development of infants (Sá, Lima & Carvalho, 2014; Silva, Sá & Carvalho, 2017; Williams et al., 2010).

Motor delays are one of the first signs of developmental alteration (Souza & Magalhães, 2012). Early assessment directly influences neurological development and integrity. Considering that plasticity in the first year of life is the most relevant period after the intra-uterus phase, the most favorable window of time for intervention occurs in this period, and such a long interval until diagnosis can affect the future life of these infants (Leone & Tronchin, 2001; Willrich, Azevedo & Fernandes, 2008). Some researchers have been dedicated to the development of protocols and validations of evaluations, tests and scales already standardized in order to fill the shortage of instruments for evaluation and early identification of abnormalities (Formiga & Linhares, 2011; Gontijo, Magalhães & Guerra, 2014; Saccani, Valentini & Pereira, 2016; Volpi, Rugolo, Peraçoli & Corrente, 2010).

Two of the most cited scales to assessment of motor development are Alberta Infant Motor Scale (AIMS) and the Bayley Scales of Infant and Toddler Development III (BSITDIII). The AIMS used for screening abnormalities and it was designed to follow the development of normal infants from 0 to 18 months (Piper, Pinnell, Darrah, Maguire & Byrne, 1992). It demonstrates to be a good tools in the development follow-up of infants, enabling early intervention, when necessary. This tool is easy to apply and low cost. The AIMS was validated for the Brazilian population (Valentini & Saccani, 2012), and the percentile curve for Brazilian infants was built (Saccani & Valentini, 2012; Saccani et al., 2016). The percentile curve for Brazilian infants exposed to HIV too was built (Siegle, Carvalho & Sá, 2015). Studies have reported that it has low sensitive power to evaluate the performance of infants with ages at the extremities of the percentile curve, due to the low number of items evaluated in these age groups: from 0 to 3 months and from 15 to 18 months (Liao & Campbell, 2004; Saccani & Valentini, 2013; Valentini & Saccani, 2012). The other tool is BSITDIII, that to identify, measure and evaluate children's development aged from 16 days to 42 months, consisting of different scales which examine five key-areas of development: motor, cognition, language, adaptive behavior and social-emotional. The BSITDIII is gold standard of evaluation. However this tool has a high cost, its application requires more training and time of application (Almeida, Dutra, Mello, Reis, & Martins, 2008; Bayley, 2006).

Concurrent validity is a psychometric property that relates a measure studied to another one “gold standard”. It is done when it is desired to replace a tool for a simpler, faster, cheaper and less invasive tool (Almeida et al., 2008). AIMS had concurrent validity checked for other risk groups for development (Almeida et al., 2008; Jeng, Yau, Chen & Hsiao, 2000; Yıldırım, Aydınlı, Ekici, Tatlı & Çalişkan, 2012). However, for the population exposed to HIV, the tool has not yet had its concurrent validity verified.

These studies correlated AIMS and BSITD, comparing AIMS’s raw score, which evaluates only the gross motor function with BSITD's total raw motor score, its gross motor score added to the fine motor score (Almeida et al., 2008; Jeng et al., 2000; Yıldırım et al., 2012). It is also necessary to compare the raw result of AIMS only with the BSITD’s gross motor raw score, because it is the one that both evaluate in common. Thus, one can have a more reliable correlation between the scales (Albuquerque, Lemos, Guerra, & Eickmann, 2015). Properties of a scale are not guaranteed for non-original groups of the same, being important to analyze its psychometric properties whenever it is used with a population different from the one that was constructale are not guaranteed for non-original groups of the same, being important to analyze its psychometric properties whenever it is used with a population different from the one that was constructed (Saccani & Valentini, 2012).

This study verified the concurrent validity of AIMS in infants exposed to HIV; verified the correlation of AIMS and BSITDIII for this population and compared if these coefficients differ in the central age groups and extremities of the AIMS.

2. Material and methods

This cross-sectional, prospective and descriptive study included a non-probabilistic convenience infants exposed to HIV from both genders and aged 0–18 months. HIV-positive mothers attended the care program for pregnant women in the referral center of AIDS in the city of Santos/SP-Brazil. All EG’s mothers followed the Guidelines for HIV-infected mothers; antiretroviral therapy since the 14th week of pregnancy and during delivery, and their infants for the first four weeks after birth.

Inclusion criteria consisted of infants whose mothers are HIV-positive and who attended a monitoring program of children born to HIV-positive mothers. Infants had to be born at full-term, did not have malformations, genetic syndromes, congenital abnormalities, postural deformities, related diseases could jeopardize neuropsychomotor development or that, for further reasons, have not completed the evaluation protocol. Premature infants were excluded because they already had biological risks to development.

Infants were evaluated by the use of the BSITDIII and AIMS at 1–4, 8,12,15–18 months of age. These ages were chosen due to their motor milestones and to contemplate the objective of comparing the values of the concurrent analysis between the central and