Correlation among tools for the assessment of functional independence and physical activity levels in infants

Correlação entre instrumentos para se avaliar independência funcional e nível de atividade física em crianças

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ABSTRACT

Assessment tools to quantify functional independence and physical activity levels are particularly useful for making decisions and monitoring rehabilitation programs. There are many tools available to assess independence in children. However, such tools can be more or less responsive to independence conditions. The aim of this study was to verify the correlation between functional independence parameters and physical activity levels quantified by different assessment tools in 4 and 5 year-old children. For this, 20 children whose motor development was appropriate for their age were assessed by the following tools: (1) Pediatric Evaluation Disability Inventory (PEDI), (2) Evaluation Questionnaire of Independence Level for Daily Life Activities in 4 to 8 year-old children (Questionnaire), and (3) Physical Activity Questionnaire for Children (PAQ-C). Delineation of a Cross-sectional study was utilized, with the measurements taken at just one moment describing the variables and their distribution and association patterns. For that age group, only for the self-care functional skills assessed by PEDI, significant correlation was observed with the age indicating higher independence values for the older children. For all other PEDI categories and for the other tools utilized in this study, that independence-age correlation was not significant. Despite the independence-age correlation having not been found in infants assessed by the Questionnaire, other significant correlations were observed between the Questionnaire values obtained and some PEDI values. No significant correlations were observed between the PAQ-C values obtained and the other tools. In conclusion, some categories quantified by PEDI are not correlated with functional independence changes detected by other categories by the same tool. Still, the correlation between Questionnaire values and PEDI values was observed in just some categories assessed by PEDI. Finally, PAQ-C did not correlate with the other two tools, suggesting the need for a better investigation into the responsiveness of the measurements from psychometric studies.

Keywords: Instrumentation, Pediatrics, Physical Therapy, Aptitude, Outcome, and Process Assessment

RESUMO

Instrumentos de avaliação para quantificar a independência funcional e o nível de atividade física são particularmente úteis para a tomada de decisões e monitoramento em programas de reabilitação. Existem muitos instrumentos disponíveis para se avaliar independência em crianças. Contudo, tais instrumentos podem ser mais ou menos responsivos às condições de independência. Assim, o objetivo deste estudo foi verificar a correlação entre parâmetros de independência funcional e nível de atividade física quantificados por diferentes instrumentos de avaliação em crianças de 4 e 5 anos de idade. Para isso 20 crianças com desenvolvimento motor compatível com sua idade foram avaliadas pelos instrumentos: (1) Inventário da Avaliação Pediátrica da Incapacidade (PEDI), (2) Catálogo de Avaliação do Nível de Independência de Crianças de 4 a 8 anos nas Atividades de Vida Diária (Catálogo) e (3) Questionário sobre atividade física regular (PAQ-C). Utilizou-se delineamento de estudo transversal, sendo as medições feitas em um único momento descrevendo as variáveis e seu padrão de distribuição e associação. Nesta faixa etária, somente nas habilidades funcionais para o autocuidado avaliado pelo PEDI foi observada correlação significativa com a idade indicando que os valores de maior independência eram obtidos pelas crianças mais velhas. Em todas as demais categorias do PEDI e nos outros instrumentos utilizados neste estudo, essa correlação entre independência e idade não foi significativa. Apesar de não ter sido encontrada correlações entre independência e idade nas crianças mais independentes avaliadas pelo Catálogo, correlações significativas foram observadas entre os valores obtidos pelo Catálogo e os valores de algumas das categorias quantificadas pelo PEDI. Nenhuma correlação significativa foi observada entre valores do PAQ-C com os demais instrumentos. Conclui-se que algumas categorias quantificadas pelo PEDI não se correlacionam com alterações da independência funcional detectadas por outras categorias da mesma avaliação. Ainda, correlações com o Catálogo foram observadas somente com algumas categorias do PEDI. Finalmente, o PAC-Q não se correlacionou com qualquer um dos outros dois instrumentos, sugerindo a necessidade de uma melhor investigação da responsividade das medidas em estudos psicométricos.

Palavras-chave: *Instrumentação, Pediatria, Fsioterapia, Aptidão, Avaliação de Processos e Resultados*

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INTRODUCTION

The evaluation of the functional performance in daily activities is generally utilized as an instrument of analysis of the motor development of children and with application for the children's families.[2] Made by different instruments,[1-8] the evaluation of functional performance is described in the literature for many purposes such as: to evaluate the impact of premature birth and the socio-economic level;[9] to compare the development of children with some pathological condition in relation to normal motor development,[10] and to monitor therapeutic evolutions, among others. In addition, the search for functionality in daily life activities (DLA) has been the objective of rehabilitation programs for children with neurological injuries whose information about functional development is very important in therapeutic management and decision-making.[6,11]

The Pediatric Evaluation of Disability Inventory (PEDI)[5,12] is a standardized American instrument that quantitatively documents the functional capacity of a child by independently evaluating their abilities during self-care, mobility, and social functioning. This evaluation was developed to document the functional independence of children between six months and seven years of age, being translated into Portuguese and adapted to the Brazilian socio-cultural characteristics, with the authorization of the authors.[12]

Another instrument, the Evaluation Questionnaire of Independence Level for DLAs in Children 4 to 8 years of age is a standardized Brazilian tool, created in 2001, also utilized in the evaluation of the functional independence level of a child, through the following categories of observation: feeding, hygiene, dressing, and communication abilities.[7]

Since environmental stimulation is an important factor in motor development and, consequently, in the functionality of the individual, it is also relevant to verify whether the level of physical activity practiced by the child exerts any influence in their functional abilities. Kowalski et al[13] refer to that as a great challenge: to determine the contribution of physical activity to the health of children. In addition, one notices a scarcity of validated instruments in the scientific literature for measuring the level of physical activity in children, especially in younger children[9] and those that exist have not been analyzed in association with the functional variables obtained by other instruments. Besides the scarcity of validated instruments that have been evaluated in their associations, when they are studied they are directed toward specific populations with some disability.[14]

The Physical Activity Questionnaire for Children (PAQ-C) is a Canadian checklist that verifies the physical activity of children within the last seven days before the application of the questionnaire, which has been validated for 8 to 14 year-old children and adapted to Brazilian socio-cultural characteristics.[3,8,13] Even though such tools are already available for clinical evaluation in Brazil, studies showing the validity of this instrument for younger children, in addition to the correlations and agreements between the measurements, are scarce in the international as much as in the Brazilian scientific literature.

OBJECTIVE

The present study sought to correlate the values for functional independence obtained in the PEDI and in the Questionnaire with the level of physical activity in children between 4 and 5 years of age.

METHODOLOGY

Participants

Twenty children with motor development compatible with their age participated in this study; they were sampled by convenience, with ages varying between 4 and 5 years, and 50% were boys and 50% girls. Delineation of a cross-sectional study was utilized, with the measurements all taken at one time describing the variables and their distribution and association patterns. The parents or responsible parties were submitted to a clinical standardized interview utilizing the PEDI, the Questionnaire, and the PAQ-C. All the participants signed a Free and Clarified Consent Form approved by the Committee for Ethics in Research from UFSCar, in agreement with what is stipulated in protocol number 265/2009.

Analysis Instruments Utilized

Pediatric Evaluation of Disability Inventory (PEDI): This is composed of a structured questionnaire that documents the functional profile of children between 6 months and 7 and one half years of age. This profile reveals the performance of the child's functional abilities (Part I) and the independence or amount of help supplied by the care taker (Part II), in addition to giving information about the modifications in the domestic physical environment that are utilized in the daily routine of the child (Part III). Each part of the test yields information about functionality areas: self-care, mobility, and social function.[5,12] In this study only the gross score was used from the first two parts of the PEDI. Part I shows the functional abilities of the child to carry out daily life activities and tasks, in three function areas: self-care (73 items), mobility (59 items), and social function (65 items). For each item in Part I one point is awarded if the child is capable of executing the functional activity, and zero if the child is not capable. The grand total score of this part is the result of the sum of the scores achieved by the child in the activities for each function area.[5,12] Thus, the higher the sum of scores, the higher the functional independence that is characterized. In Part II the information characterizes the child's independence, which is inversely documented by the quantity of help supplied by the named care-giver in the same areas of self-care (8 items), mobility (7 items), and social functioning (5 items). In this way, the more help the child receives from the care-giver, the less will be his or her independence in those areas. Each item in this part is scored on a sliding scale, which varies from a score of 5, if the child performs the task independently, without any help from the care-giver, to zero, if the child needs total assistance from the care-giver, being completely dependent for the performance of the functional task. Intermediate scores describe varied amounts of help supplied by the care-giver, such as supervision (score 4), minimal assistance (score 3), moderate assistance (score 2), and maximum assistance (score 1). The raw score for this part is the sum of the scores from all the items in the three function areas.[5,12] In the same way as the scoring in Part I, a higher score represents higher functional independence.

Evaluation Questionnaire of Independence Level for DLAs in children aged 4 to 8 years: This instrument is utilized in the evaluation of the functional independence level of the child in four categories: feeding, hygiene, dressing, and communication abilities. The person responsible has four options to answer the Questionnaire, taking into consideration whether the child performs the activity under the following conditions: a) without physical or verbal assistance; b) with verbal assistance; c) with demonstration; d) with physical assistance; e) does not perform. At the end of the questions, in case the child does not communicate in the form of verbal language, some questions are presented to the person responsible to be filled in.[7] The application of scoring

criteria allows the independence level of the child to be established classifying it as independent, semi-dependent or dependent in relation to the normal development expected for its age bracket.[12] In this instrument, unlike the scoring established in the PEDI, higher values scored here represent lower functional independence, which means that here, the amount of dependence is what is quantified.

Physical Activity Questionnaire for Children (PAQ-C): This refers to a checklist of aerobic physical activities and sports performed by the child during the last seven days prior to the application of the questionnaire.[13] The instrument is composed of nine items, and each item represents a five-point scale. The first question presents a list of activities which are common in childhood such as sports, leisure, and school activities. The six following items address the activities exerted by the children in physical education classes, during the school break, at lunch time, immediately after school, at night, and on weekends. Information about the description of the level of physical activity within the last week and the frequency the child practices physical activity each day of the week is also investigated.[8] Higher scores indicate higher physical activity levels. The final score is calculated through the average obtained in the nine items varying from one to five points.[8]

Statistical Analysis

All the variables utilized were submitted to descriptive statistical analysis and to the D'Agostine & Person Normalcy test which determined the utilization of non-parametric tests for this analysis. Differences between the average scores obtained in the PEDI were detected by a single ANOVA factor and by Dunn's multiple comparisons post-test. To determine the correlation index between the variables, the Spearman Correlation Test was utilized. For all the tests the statistical significance level was considered to be $p<0.05$ and with a correlation index (r).

RESULTS

Descriptive Analysis

Children aged between 4 and 5 years who varied from 50 to 70 months (59.7 ± 5.5) did not present a normal distribution of the variables detected by the D'Agostine & Person Normalcy test for this sample of 20 children.

The points scored for part I of the PEDI indicated scores of 64.4 ± 5.5; 56.5 ± 2.6 and 51.1 ± 6.0 for the evaluations of functional abilities of self-care, mobility, and social functions, as shown in table 1. In the same way, but for part II of the PEDI, scores of 34.1 ± 4.3; 34.0 ± 1.6 and 22.7 ± 3.0 were registered for the evaluations of the caregiver's assistance (table 1).

No significant difference was detected in the multiple comparisons, after ANOVA, among the scores obtained in part I. Similarly, the averages of the scores obtained in part II showed no differences among its categories.

The values obtained in the Questionnaire and in the PAC-Q were, respectively, 1.2 ± 0.2 and 2.7 ± 0.5 (table 1).

Table 1 - Descriptive statistics of the variables scored by different evaluation instruments studied.

Sample (n=20)	Mean	±	DP SD
PEDI Functional Abilities			
self-care	64,40	±	5,60
mobility	56,50	±	2,67
social functions	51,15	±	6,09
Caregiver's Assistance			
self-care	34,15	±	4,38
mobility	34,05	±	1,67
social functions	22,75	±	3,02
QUESTIONNAIRE	**1,28**	**±**	**0,28**
PAQ-C	**2,71**	**±**	**0,58**

Association between age and the instruments

A significant positive correlation with the ages ($p<0.05$) was only detected with the scores obtained in the functionality area referring to self-care in the functional abilities showing a correlation index of 0.8724. The remaining PEDI scores as well as the values obtained in the Questionnaire and in the PAQ-C did not correlate with the age in months (figure 2 A).

Associations between PEDI scores

Only two significant associations ($p<0.05$) were detected among the scores obtained in the different functionality areas of the PEDI. Significant positive correlations ($p<0.05$) were detected in the scores obtained in the functional abilities for self-care when associated with the scores obtained in the functional abilities for social function and with the scores obtained in the caregiver's assistance for self-care with correlation indices of 0.4998 and 0.7380 respectively (figure 2 B).

Association with different instruments

The values obtained in the Questionnaire correlated significantly in three associations with the scores obtained by the PEDI. In those associations the correlations were negative, since the higher values from PEDI correspond to the lower values in the Questionnaire in characterizing the functional independence level.

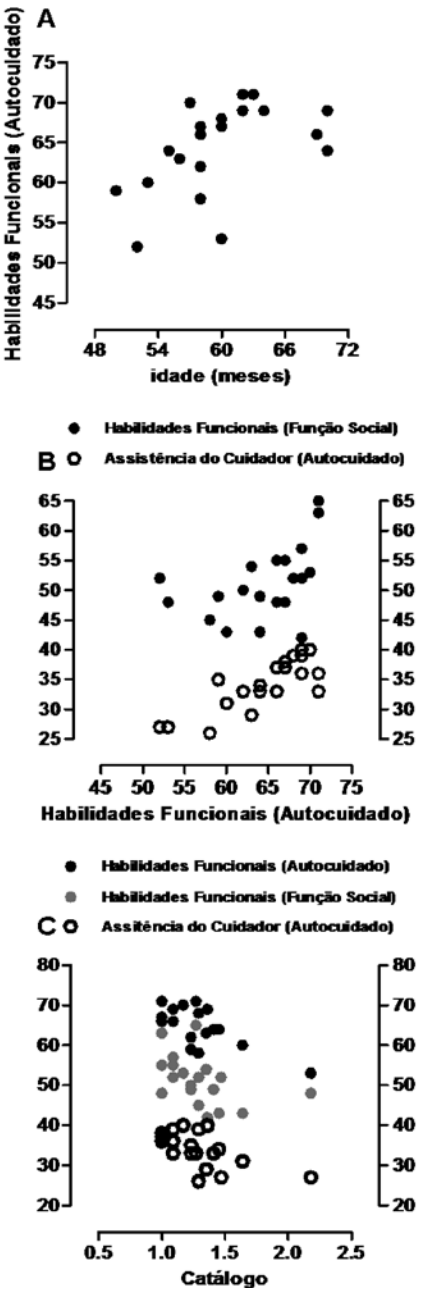
Significant negative correlations ($p<0.05$) were detected in the values obtained in the Questionnaire when associated with the scores obtained in the PEDI and in the functional abilities for self-care and social function, as well as with the scores obtained in the caregiver's assistance for self-care, showing correlation indices of -0.5690, -0.4747, and -0.5512 respectively (figure 2 C).

In contrast, the PAQ-C did not present any significant correlation between the associations of values obtained by itself and the scores obtained by the other instruments (PEDI and Questionnaire).

DISCUSSION

The children evaluated in this study obtained the sum of 50 to 60 points in the scores registered by PEDI for the items present in part I, which evaluates functional abilities. For the items in part II, which evaluates assistance supplied by the caregiver, the children obtained the sum of 20 to 35 points. The differences between the scores evaluated in part I and in part II cannot be compared, since they present a distinct value scale for each part. Thus, it does not mean that this sample presents more independence for functional abilities than in the assistance supplied by the caregiver.[5,12,15]

We did not find any research in the literature that has utilized the PEDI to evaluate the functional independence of children with no impairments. Therefore, it was not possible to compare our data with other studies. When we compare the scores obtained in our study with the values presented by a research that has utilized the same instrument in children with cerebral palsy we can verify that, despite the children being older than those observed in our study, they have less independence evaluated by that instrument.[11] The fact of their being children with disabilities contributes to lower scores registered in the PEDI, even though those children were older than those observed in our study.[1,14,16]



Graphic A: showing the significant positive correlation ($p<0.05$ and $r=0.8724$) among the scores obtained in the functional abilities for self-care and the age in months.

Graphic B: showing positive correlations ($p<0.05$) among the scores obtained in the evaluation of functional abilities for self-care with the scores obtained in the abilities for social functions (black circles, $r=0.4998$), as well as with the scores obtained in the caregiver's assistance for self-care (white circles, $r=0.7380$).

Graphic C: showing significant negative correlations ($p<0.05$) among the values obtained in the Questionnaire with the scores obtained in the functional abilities for self-care (black circles, $r=-0.5690$), for the social functions (gray circles, $r=-0.4747$), and in the caregiver's assistance for self-care (white circles, $r=-0.5512$)

Figure 1 - Dispersion graphics of the variables obtained in this study.

We registered a significant positive correlation between the age variable and the score obtained in the self-care item for the PEDI functional abilities, even with an age variation less than 24 months among the participants in the sample. This means that children a few months older have more independence for their self-care ability.. Such evidence is expected and confirmed by studies that show that the chronological development of the child's behavior is accompanied by motor, cognitive, and language acquisitions which make the child progressively more independent.[17,19] However, such correlation was only observed for the self-care item and not for the remaining items of the PEDI. The remaining evaluation instruments also did not indicate any significant correlation between higher functional independence and age. Such evidence can suggest that in that age bracket with differences smaller than 24 months (4 to 5 years), only the independence related to self-care for functional abilities would be responsive to the point of being detected by tests.

Observing the correlations among the scores obtained in this sample, one can see that not all the items evaluated in the PEDI correlate among themselves. Significant positive correlations were only observed in the association between the self-care and social function items from part I (functional abilities) and between the self-care item from part I with self-care item from part II (caregiver's assistance) as demonstrated in figure 2B.

The correlation between the self-care items from parts I and II was expected, since the more independent children need less assistance from their caregivers. In this way, the higher scores in one item correlated with the higher scores of the other item. It was interesting to observe that the most independent children for self-care in the functional abilities were those who obtained the highest values in the item that indicates independence in the social function, as well as for functional abilities. Such a result suggests that children with functional abilities for self-care show a better performance in their social functions.

The mobility item for functional abilities, as much in part I as in II of the PEDI, did not show any correlations with the items that indicate independence for self-care and social function, showing that, in this sample, the more independent children for self-care did not necessarily have more independence in motor abilities.

A significant negative correlation was registered among the values obtained in the Questionnaire and the same items that correlated themselves in the PEDI. As the evaluation made by the Questionnaire scores lower values for the more independent children, this correlation indicates that the more independent children evaluated by the PEDI were also scored as more independent by the Questionnaire evaluation. This result suggests that both tools are in agreement while evaluating independence for self-care and for social functions.

Similar to what was observed in the associations between the PEDI items, no significant correlation of the values obtained in the Questionnaire was observed with the mobility item from the evaluation made by PEDI, reinforcing the suggestion that children in that age bracket, who are more independent for self-care, do not show higher independence for mobility evaluated by the PEDI.

In contrast, the PAQ-C did not correlate with any one of the scores obtained by the other instruments here studied. This may have happened due to the nature of the functional performance that is evaluated by the PAQ-C: level of physical activity, suggesting that children with higher level of physical activity, when evaluated by this instrument, are not necessarily more independent when evaluated by other instruments. A limitation that could have contribute to the non-correlation with the values obtained by the PAQ-C would be that this instrument was validated for evaluation in children aged from 8 to 14 years.[2,3,8,13,20]

However, studies with children of 5,6, and 7 years indicated that more active children present higher motor performance.[21,22] By the results of the authors, it was expected that children with lower levels of physical and/or playful activity showed higher functional independence, exactly due to the influence of the environment and daily life habits, which did not happen in our study.

At odds with the results observed in our study, for children with disabilities, Grilli et al[14] observed a correlation between self-care, mobility, and physical activity by utilizing a version adapted for children of the Functional Independence Measurement created to evaluate adults and the Pediatric Quality of Life Inventory. These authors state that their sample presented a great heterogeneity of functional status and quality of life different from our sample which evaluated children without disabilities. This fact may have contributed to the correlations observed by the research group that were not observed in our sample of healthy children.

The non-correlation among different instruments for the evaluation of functional independence may be due to these different instruments not involving all the domains of

human functionality as described in the International Classification for Functionality, Disability, and Health,[23] being restricted to specific domains of functionality related to either the structure and function of the body, or to activity and participation, or even to the contextual factors in an isolated manner.

CONCLUSION

We conclude that independence in the functional abilities for self-care evaluated by the PEDI is in agreement in different items of this instrument and is correlated to the values obtained by the evaluation made with the Questionnaire, however, the independence in these items is not correlated with higher independence in the mobility item of the PEDI. Still, the PAQ-C did not correlate to either of the other two instruments.

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