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Construct Validity of the Activities Scale for Kids Performance in Children with Cerebral Palsy: Brief Report

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ABSTRACT

Aims: This study collects evidence of construct convergent validity of the Activity Scale for Kids performance (ASKp), comparing its results with the 66-item Gross Motor Function Measure (GMFM-66) and with the Gross Motor Function Classification System (GMFCS) and testing the ASKp's ability to discriminate between individuals with different functional capabilities.

Methods: This cross-sectional study involved 60 children with spastic cerebral palsy (CP) assessed with the GMFM-66 who self-administered the Italian version of the ASKp.

Results: Children were 10.9 (± 3) years old with GMFCS Level I–III. Moderate correlations were found between GMFM and ASKp scores ($r = 0.577$; $p < .001$), and between GMFCS levels and ASKp score ($r_s = -0.541$, $p < .001$). The ASKp discriminated between children with different functional capabilities, determined by the GMFCS ($F = 18.2$, $p < .001$).

Conclusions: ASKp is valid to assess physical functioning, a crucial domain in rehabilitation of children with spastic CP.

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Introduction

In industrialized countries, cerebral palsy (CP) is the most common disease that leads to childhood disability¹; the limitations in motor capacity, a hallmark of CP, lead to restrictions in physical functioning and everyday activities.² Thus, the assessment, goal setting and treatment trajectories of CP should be framed within the International Classification of Functioning, Disability and Health (ICF) model.³ Focusing on activities and participation, the ability to perform activities is a vital outcome for children with CP and other chronic disabilities as it supports participation in life situations and contributes to the child's health, functioning and creation of personal biography.⁴ Therefore, motor capacity must clearly be preserved or restored in children with CP because it is positively associated with physical functioning and activity performance.^{5,6} In this population the 66-item Gross Motor Function Measure (GMFM-66)⁷ is universally used to measure the severity of motor disability in a standardized environment and the Gross Motor Function Classification System (GMFCS)⁸ is used to categorize children with CP based on their functional capability, but neither of these tools can fully describe a child's habitual behavior.⁹ Thus, there is a need in the rehabilitation of children with CP for tools that measure pediatric physical functioning while performing activities in the context of daily life.

One of the most widely used measures of pediatric physical functioning is the the Activities Scale for Kids (ASK),¹⁰

a copyrighted self-report measure questionnaire designed for children aged 5 to 15 years with musculoskeletal disorders, which covers seven of the nine ICF domains of activities and participation.^{11,12} There are two versions of the ASK: the performance version (ASKp), suitable to measure what children usually do in their habitual context, and the capability version (ASKc), which measures what children can do in a defined situation, apart from real life. After consulting with Italian experts in childhood rehabilitation,¹³ we chose to validate the ASKp because clinicians believed that this version best responded to the needs of their clinical practice.

In fact, rehabilitation professionals involved in the care of children with CP frequently use this feasible self-report questionnaire both in research and in clinical settings.^{14,15} However, the psychometric properties of the ASKp have never been tested on a large population of children with CP as it was originally validated on children with mixed diagnoses, such as neuromuscular diseases or dysmorphisms.^{10,16} As CP is a complex condition and its prognosis is different from that of other developmental diseases, the ASKp has recently been cross-culturally validated by our group,¹³ and its fundamental psychometric properties have been tested in a large population of children and adolescents with CP.¹⁷

This study aimed to collect evidence of construct validity of the ASKp. We tested the ASKp convergent validity with the GMFM-66 and the GMFCS in a sample of Italian children with CP, and we tested the ASKp's ability to discriminate

between individuals with different levels of functional capability. Thus, as gross motor capacity and functional capability are among the determinants of activity performance, the following *a priori* assumptions were to be verified: (1) we expected a positive correlation between the GMFM-66 and the ASKp scores; (2) we expected a negative correlation between the levels of GMFCS, where higher scores indicate more severe disability, and the ASKp score; (3) accordingly, we expected that the average ASKp score of children with different levels of functional capability would differ, demonstrating higher levels of physical performance in children with lower disability.

Materials and Methods

Design

This cross-sectional study was conducted with the formal approval of the local Ethics Committee (Province of Reggio Emilia, Protocol n. 2017/0004096). The study consisted of a single self-administration of the Italian version of the ASKp to children with CP who, for clinical reasons, were simultaneously assessed with the GMFM-66.

Study Sample

Children with CP referred to the Children Rehabilitation Unit for Severe Developmental Disabilities of the Azienda Unità Sanitaria Locale – IRCCS of Reggio Emilia (Italy) from 2017 to 2019 were screened for eligibility in this study. Inclusion criteria were:

- confirmed diagnosis of spastic CP based on diagnostic criteria (MRI and clinical history)
- age 5–15 years
- in need of clinical assessment of gross motor function using the GMFM-66.

We excluded children with moderate or severe intellectual deficit based on their documented regular attendance of and appropriate scholastic performance in a mainstream primary school, on their lack of need for a learning support teacher and on the clinical judgment of the physician and the physiotherapist as reported in the patient's chart. This clinical judgment is based on the child's consistent capability to provide reliable answers during the history taking, to appropriately follow directions during the assessments and to interact appropriately during therapeutic education.

Children and their parents gave their informed consent for participation in this study.

Procedures

During a routine appointment, the research aim and procedure were illustrated to parents of eligible children, and written informed consent was collected from families who agreed to participate. As part of the clinical evaluation, participating children were assessed by a trained physiotherapist with dimensions D and E of the GMFM-66 following precise

guidelines,¹⁸ and categorized based on their functional capability using the GMFCS.

Whenever possible, the cross-culturally adapted Italian version of the ASKp¹³ was self-administered right away in a quiet room, with assistance provided by a physiotherapist to those children who requested it. The presence of a parent was allowed for children under age 9, provided that they did not intervene in any way so as not to influence the child's answers. If self-administration was unfeasible during the appointment, parents were asked to provide for a reliable self-administration of the ASKp at home (i.e. a quiet room with no distractions, so as not to influence the answer) and to send it back to the researchers as soon as possible. In these cases, if the ASKp was returned more than three months after GMFM-66 administration, they were excluded.

The ASKp inquiries about a child's performance during the previous week of 30 usual activities that refer to seven subdomains of physical functioning (standing skills, personal care, dressing, locomotion, mobility, play, other skills). A sample of the items of the ASKp is reported online in Supplementary Table 1.

Results are summarized in a single score from 0 to 100, with higher scores indicating the perception of full physical function. Three further items that do not contribute to the final score inquire about the degree of assistance needed to complete the questionnaire and the assistive devices used for indoor and outdoor mobility.

Data Analysis

Descriptive statistics were used to summarize clinical and demographic data. Mean and standard deviation (SD) were used to summarize continuous variables, whereas counts and frequencies were used to summarize categorical variables. The strength and direction of associations were analyzed using parametric and nonparametric correlation coefficients¹⁹ (the Pearson r and the Spearman r_s , respectively). The ASKp scores were compared with functional capability levels of GMFCS using ANCOVA, correcting for the influence of age, performing Tukey test for post-hoc comparisons and using the Bonferroni correction for multiple comparisons.

The tests performed were considered statistically significant if the p values were < 0.05 . Statistical analyses were performed using Excel 16.0 and Jamovi 1.0.7.0.

Results and Discussion

Seventy-six children were included in the study. However, the data of 16 of these children were not included in the analysis because: a) two children did not answer at least 23 questions from the ASKp, which represents the minimum number of answers to compute the overall score; b) in twelve cases it was not possible to test all the items of the D and E dimensions of the GMFM-66, making it impossible to calculate the overall score; c) in two cases the ASKp was self-administered at home and returned later than three months after the GMFM-66 assessment.

The study sample included 60 children (52% males) aged 10.9 years (min.5 – max 15) with bilateral or unilateral spastic diplegia (70% and 30%, respectively), classified in the Levels I (37%), II (45%) and III (18%) of the GMFCS. The average

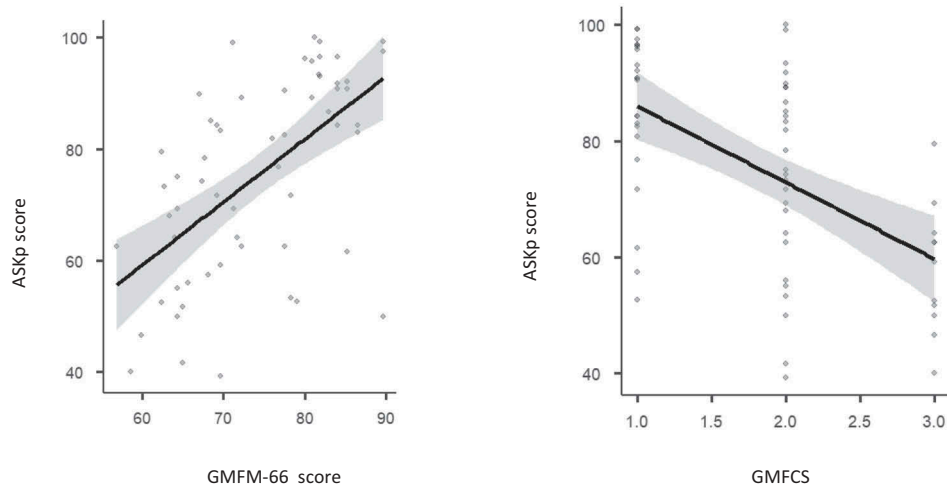


Figure 1. Correlation between the GMFM-66 score and GMFCS levels and the ASKp score.

ASKp = Activities Scale for Kids performance; GMFM-66 = 66-item Gross Motor Function Measure; GMFCS = Gross Motor Function Classification System.

GMFM-66 score in the whole sample was 73.3 (± 8.9) and the average ASKp score was 75.3 (± 17.5). Most children used an assistive device for indoor and/or outdoor mobility (50% indoor and outdoor, 20% outdoor), and only a few manifested mild intellectual deficit (13%).

As hypothesized, a moderate positive correlation between the GMFM-66 and the ASKp scores and a moderate negative correlation between the levels of GMFCS and the ASKp score were found ($r = 0.577$; $p < .001$ and $r_s = -0.541$, $p < .001$, respectively), confirming that the ASKp is a valid measure of physical functioning, a construct related to gross motor capacity (Figure 1).

Further, the average level of physical performance measured by the ASKp differed based on the GMFCS level ($F = 10.1$, $p < .001$), confirming the hypothesis that the ASKp can discriminate between children with different levels of functional capability (Table 1). The post hoc comparisons showed a statistically significant difference between the average ASKp score of both children in GMFCS Level I and Level II compared to children in Level III ($p < .001$ and $p = .013$, respectively).

Taken together, these results add evidence to confirming the construct validity of the ASKp, and support its use in the assessment of the physical performance and limitations in activities of children and adolescents with CP. This is clinically relevant, given that the ASKp is, to our knowledge, one of the few scales that capture the child's perception of his/her abilities to carry out usual activities.

Table 1. Distribution of sample characteristics per GMFCS Level.

	I	II	III
n.	22	27	11
Age (SD)	11.7 (3.1)	10.6 (3.1)	9.9 (2.4)
ASKp score (SD)	85.1 (13.6)	74.3 (17)	58.0 (11.2)
GMFM-66 score (SD)	81.5 (5.5)	72.6 (7.4)	63.6 (4.5)
Bilateral/Unilateral CP	9/13	22/5	11/0
Intellectual deficit Yes/No	1/22	3/24	4/7
Assistive device Yes/No*	13/9	19/8	10/1

*as self-reported by children participating in this study

Legend: GMFCS = Gross Motor Function Classification System; SD = Standard deviation; ASKp = Activities Scale for Kids performance; GMFM-66 = Gross Motor Function Measure 66 items

CP = Cerebral Palsy;

A limitation of the study is certainly the absence of an outcome measure that can be considered a criterion for the measurement of physical performance in this population. However, the construct assessed by the GMFM is a determinant of physical performance and the GMFM-66 is a valid and reliable tool used worldwide to assess it.²⁰ Although not perfect, the strength of the association between these two variables confirms the construct validity of the ASKp.

One limitation is certainly the fact that only children with spastic CP were included. Another is that children with severe motor disabilities due to CP, namely those classified as Level IV or V of the GMFCS, were not represented in the sample because the clinical routine in the context in which the research was carried out foresees the frequent administration of sections D and E of the GMFM-66 only to ambulant children with CP. Thus, children with more severe motor disabilities were not sampled. This limit, dictated by feasibility considerations of the study, is also present in previous studies.²¹ Future research should thus verify whether the demonstrated correlations are confirmed in children with CP other than the spastic type, as well as in children with lower functional capability.

To conclude, the ASKp represents a reliable contribution to the clinical assessment and rehabilitation of patients with CP, highlighting relevant aspects of their function in life.

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Declaration of interests

The authors report no conflict of interest.

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References

1. Reddihough DS, Collins KJ. The epidemiology and causes of cerebral palsy. *Aust J Physiother.* 2003;49(1):7–12. doi:10.1016/S0004-9514(14)60183-5.
2. Shevell MI, Dagenais L, Hall N; Repacq Consortium*. The relationship of cerebral palsy subtype and functional motor impairment: a population-based study. *Dev Med Child Neurol.* 2009;51(11):872–77. doi:10.1111/j.1469-8749.2009.03269.x.
3. World Health Organization. International classification of functioning, disability and health: ICF. Geneva (Switzerland): World Health Organization; 2001.
4. World Health Organization. International classification of functioning, disability and health: - Children and youth version. ICF-CY. Geneva (Switzerland): World Health Organization; 2007.
5. van Eck M, Dallmeijer AJ, Voorman JM, Becher JG. Longitudinal study of motor performance and its relation to motor capacity in children with cerebral palsy. *Dev Med Child Neurol.* 2009;51(4):303–10. doi:10.1111/j.1469-8749.2008.03263.x.
6. Smits D-W, Gorter JW, Ketelaar M, Van Schie PE, Dallmeijer AJ, Lindeman E, Jongmans MJ. Relationship between gross motor capacity and daily-life mobility in children with cerebral palsy. *Dev Med Child Neurol.* 2010 Mar;52(3):e60. doi:10.1111/j.1469-8749.2009.03525.x.
7. Russell DJ, Rosenbaum PL, Cadman DT, Gowland C, Hardy S, Jarvis S. The gross motor function measure: a means to evaluate the effects of physical therapy. *Dev Med Child Neurol.* 1989;31(3):341–52. doi:10.1111/j.1469-8749.1989.tb04003.x.
8. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Dev Med Child Neurol.* 1997;39(4):214–23. doi:10.1111/j.1469-8749.1997.tb07414.x.
9. Tieman BL, Palisano RJ, Gracely EJ, Rosenbaum PL. Gross motor capability and performance of mobility in children with cerebral palsy: a comparison across home, school, and outdoors/community settings. *Phys Ther.* 2004;84(5):419–29. doi:10.1093/ptj/84.5.419.
10. Young NL. Measurement properties of the activities scale for kids. *J Clin Epidemiol.* 2000;53(2):125–37. doi:10.1016/S0895-4356(99)00113-4.
11. McConachie H, Colver AF, Forsyth RJ, Jarvis SN, Parkinson KN. Participation of disabled children: how should it be characterised and measured? *Disabil Rehabil.* 2006;28(18):1157–64. doi:10.1080/09638280500534507.
12. Chien CW, Rodger S, Copley J, Skorka K. Comparative content review of children's participation measures using the international classification of functioning, disability and health-children and youth. *Arch Phys Med Rehabil.* 2014;95(1):141–52. doi:10.1016/j.apmr.2013.06.027.
13. Harvey A, Robin J, Morris ME, Graham HK, Baker R. A systematic review of measures of activity limitation for children with cerebral palsy. *Dev Med Child Neurol.* 2008;50(3):190–98. doi:10.1111/j.1469-8749.2008.02027.x.
14. Capio CM, Sit CH, Abernethy B, Rotor ER. Physical activity measurement instruments for children with cerebral palsy: a systematic review. *Dev Med Child Neurol.* 2010;52(10):908–16. doi:10.1111/j.1469-8749.2010.03737.x.
15. Pencharz J, Young NL, Owen JL, Wright JG. Comparison of three outcomes instruments in children. *J Pediatr Orthop.* 2001;21(4):425–32. doi:10.1097/01241398-200107000-00002.
16. Fabbri L, Neviani R, Festini F, Costi S. Transcultural validation of activities scale for kids (ASK): translation and pilot test. *Acta Biomed.* 2016;87:70–79.
17. Costi S, Bressi B, Cavuto S, Braglia L, Ferrari APelosin E. Cross-cultural validation of Activities Scale for Kids: The performance of healthy Italian children. *J Sports Med Phys Fitness.* 2020. doi:10.23736/S0022-4707.20.10466-3
18. Russell DJ, Stefanoni G. Linee guida per la somministrazione e l'attribuzione del punteggio alla GMFM-88 e alla GMFM-66. In: Armando E, editor. *Gross motor function measure (GMFM-66 e GMFM-88): manuale dell'utente.* Roma (Italy): Armando Editore; 2006.
19. Dawson-Saunders B, Trapp R. *Basic and clinical biostatistics.* Norwalk (CT): Lange Medical Book. Norwalk (CT): Practice-Hall International Inc; 1994.
20. Russell DJ, Avery LM, Rosenbaum PL, Raina PS, Walter SD, Palisano RJ. Improved scaling of the gross motor function measure for children with cerebral palsy: evidence of reliability and validity. *Phys Ther.* 2000;80(9):873–85. doi:10.1093/ptj/80.9.873.
21. Keawutan P, Bell K, Davies PS, Boyd RN. Systematic review of the relationship between habitual physical activity and motor capacity in children with cerebral palsy. *Res Dev Disabil.* 2014;35(6):1301–09. doi:10.1016/j.ridd.2014.03.028.