Comparison of the psychometric properties of two balance scales in children with cerebral palsy

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Abstract. [Purpose] The purpose of this study was to compare the item difficulty degree between the Pediatric Balance Scale and Fullerton Advanced Balance scale for children with cerebral palsy. [Subjects and Methods] Forty children with cerebral palsy (male=17, female=23) voluntarily participated in the study. Item difficulty was expressed in the Rasch analysis using a logit value, with a higher value indicative of increasing item difficulty. [Results] Among the 24 items of the combined Pediatric Balance Scale and Fullerton Advanced Balance scale, the most difficult item was “Walk with head turns”, whereas, the easiest item was “Sitting with back unsupported and feet supported on the floor”. Among the 14 items of the Pediatric Balance Scale, 9 items (item 1, 2, 3, 4, 5, 6, 7, 11, and 12) had negative logit values, whereas for the Fullerton Advanced Balance scale, only 1 item (item 1) had a negative logit value. [Conclusion] The Fullerton Advanced Balance scale is a more appropriate tool to assess balance ability than the Pediatric Balance Scale in a group of higher functioning children with cerebral palsy.

Key words: Balance, Cerebral palsy, Rasch analysis

INTRODUCTION

Cerebral palsy (CP) is defined as a permanent neurological disorder caused by a non-progressive brain injury or damage to the brain1). CP primarily affects muscle tone, coordination, control movement, and balance1, 2). Many children with CP have neuromuscular deficits, including the lack of motor control, abnormal muscle tone, impaired coordination, sensory problems, and impaired balance control. Balance control is imperative to all movements, and a major factor restricting functional ability is poor balance control3). Thus, a reliable and valid assessment is vital in balance function evaluation. In addition, this helps to demonstrate that an improved balance ability results from the interventions performed in the clinical setting3, 4). Several clinical balance assessments have been developed and used; however, few of balance tools for children exist3).

The Pediatric Balance Scale (PBS), modified by based on Berg Balance Scale (BBS) has been used in several studies to assess balance ability in children, especially those with balance problem4, 5). However, it is suitable for assessing balance ability in a group of lower-functioning children ages ≤6 because of its propensity to display ceiling effects6). To assess balance function in a group of higher-functioning individuals, the Fullerton Advanced Balance (FAB) scale is recommended7). Although the FAB is more suitable for higher-functioning individuals compared to the PBS, the study does not report on the item difficulty between the PBS and the FAB in children with CP. The purpose of this study is to compare the level of difficulty of the PBS with that of the FAB scale in children with CP using Rasch analysis.
The purpose of this study is to compare the item difficulty between the PBS and FAB scales using Rasch analysis, which has recently been widely used for the evaluation of the construction and validation of functional assessment tools in various fields. Item difficulty is expressed by logit value in Rasch analysis, with a higher value indicating a higher item difficulty level. The PBS and FAB scales were combined to compare the relative item difficulty. The results show that among the 24 items of the combined PBS and FAB scale, the most difficult item was “Walk with head turns”, and the easiest item was “Sitting with back unsupported and feet supported on the floor”.

Item difficulty estimates are presented in logits, where a logit value of 0 is the average of the item difficulty measures. In this study, the “Turning to look behind left and right shoulders while standing still” item of the FAB is of approximately average difficulty. The items with higher positive logit values are most difficult than those with lower positive or negative logit values. Of the 14 PBS items, five items (item 8, 9, 10, 13, and 14) presented positive logit values, and nine items (item 1, 2, 3, 4, 5, 6, 7, 11, and 12) presented negative logit values. These findings are consistent with previous research and similar to developmental skill acquisitions in children. In addition, of the 10 FAB scale items, only one (item 1) showed a negative logit value, and the rest showed positive logit values. Therefore, PBS has relatively easier items than the FBA scale. The lack of items assessing higher function is the primary weakness of the PBS; thus, the assessment of higher-functioning individuals is limited. Furthermore, the PBS is not enough to distinguish the difference of function in children with cerebral palsy.

In conclusion, the FAB scale is a more appropriate tool for assessing balance ability in a group of higher-functioning individuals than the PBS. This study has several limitations. First, the participants were not selected from a representative population, and data were obtained only one hospital; thus, the generalization of our results is limited. Second, other psycho-
metric properties, such as, age, cognition, fear of falling, and CP classification that may affect balance function in children with CP were not considered. Further study is required for incorporate data of children with CP in various regions, and other psychometric properties affecting balance function should be considered.

**REFERENCES**