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The criterion validity and intra-rater reliability of the Japanese version of the Functional Mobility Scale in children with cerebral palsy

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ABSTRACT

Objective: The purpose of this study was to develop a Japanese version of the Functional Mobility Scale (FMS), and examine the criterion validity and intra-rater reliability of the FMS in Japan.
Methods: The translation of the FMS was performed according to international standards for the translation of measurements. For criterion validity, 111 children with cerebral palsy (mean age; 12 year 1 mo ± 3 year 7 mo; range 5–18) were rated the Japanese version of the FMS and Gross Motor Function Classification System (GMFCS). For intra-rater reliability, the Japanese version of the FMS was rated twice by 24 parents of children with cerebral palsy by interview and/or telephone with a one- to two-week interval between assessments.
Results: The criterion validity was confirmed with a strong correlation between GMFCS level and FMS scores (r^2 = −0.71 to −0.75). For intra-rater reliability, there was a substantial to excellent level of agreement (kappa = 0.72–0.87).
Conclusion: The study provides evidence of the criterion validity and intra-rater reliability of the Japanese version of the FMS as a measurement of mobility in children with cerebral palsy.

What this paper adds?

The psychometric properties of the Japanese translated version of the Functional Mobility Scale are comparable with its original, English version. The Japanese version of the FMS was used for mobility performance measure in clinical and research settings in children with cerebral palsy.

1. Introduction

Most people with cerebral palsy (CP) experience a decline in their functional mobility after reaching adulthood (Day, Wu, Strauss, Shavelle, & Reynolds, 2007; Morgan, Soh, & McGinley, 2014). Studies illustrate how the environment can influence the mobility methods used by children with CP (Palisano et al., 2003; Tieamn, Palisano, Gracely, & Rosenbaum, 2004). Furthermore, age and environmental setting can affect the mobility methods of children with CP (Palisano, Hanna, Rosenbaum, & Tieman, 2010).

The optimization of functional mobility is an important goal in physical therapy for children with CP. Therefore, the assessment of

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mobility function using valid and reliable measurement tools is vital as a guide to therapist intervention. The measurements of functional mobility should reflect changes in and consider environment setting.

The Functional Mobility Scale (FMS) is an outcome measure designed to evaluate mobility in children with CP (Graham, Harvey, Rodda, Nattrass, & Pirpiris, 2004). The FMS is used to rate walking ability based on the need for assistive devices at three specific distances; 5, 50, and 500 m. It is important to distinguish among what a person can do in a standardized, controlled environment (capacity), what a person can do in his/her daily environment (capability), and what a person actually does in his/her daily environment (performance) (Holsbeeke, Ketelaar, Schoemaker, & Gorter, 2009). The FMS captures walking performance in a child's usual environment, that is, what a child "does."

The developers of the FMS have established their own inter-rater reliability (Harvey, Morris, Graham, Wolfe, & Baker, 2010) and demonstrated good concurrent and construct validity in children and youth with CP (Graham et al., 2004; Harvey, Morris et al., 2010; Harvey, Baker et al., 2010; Pirpiris & Graham, 2004). Studies using the FMS as an outcome measure in children aged 4–18 years have shown that FMS scores are sensitive to change following multilevel surgery (Graham et al., 2004; Harvey, Graham, Morris, & Wolfe, 2007; Harvey, Rosenbaum, Hanna, Yousefi-Nooraie, & Graham, 2012; Thomason et al., 2011). Some systematic reviews have also revealed the FMS is a psychometrically strong tool with good clinical utility for the measurement of mobility in children with CP (Adair, Said, Rodda, & Morris, 2012; Ammann-Reiffer, Bastiaene, de Bie, & van Hedel, 2014; Himuro, Abe, Nishibu, Seino, & Mori, 2016).

The Gross Motor Function Classification System (GMFCS) represents the child's present abilities and limitations in motor function. (Palisano et al., 1997; Palisano, Rosenbaum, Bartlett, & Livingston, 2008). As with the FMS, the emphasis is on the child's usual performance in home, school, and community settings. However, the GMFCS is a method of classifying function and is not designed to measure changes in the child's level of function. Conversely, the FMS is designed to measure change over time. Although the FMS is expected to be used in physical therapy practice for children with CP in Japan, no Japanese version of the FMS has been developed to date. Furthermore, a review of current walking ability measures in children with CP reveals that the intra-rater reliability of the FMS is yet to be examined (Himuro et al., 2016). The purpose of this study was, therefore, to develop a Japanese version of the FMS, and examine the criterion validity and intra-rater reliability of the FMS in Japan.

2. Methods

2.1. Participants

Participants were recruited through convenience sampling at the physical therapy facilities of the Hokkaido Medical Center for Child Health and Rehabilitation, Hokkaido, Japan, and Saitama Children's Medical Center, Saitama, Japan. Participants consisted of children aged 5–18 years with a diagnosis of CP, classified as Level I to III using the Gross Motor Function Classification System (GMFCS) (Palisano et al., 1997, 2008). Exclusion criteria included current ill health, or any lower limb surgery or botulinum toxin injection within the previous 3 months. Children were excluded if their parents were unable to understand the study information or instructions because of language, cognitive, or other difficulties. Written parental and (where possible) child consent was obtained for all children. The study protocol was approved by the Ethics Committee of Hokkaido Medical Center for Child Health and Rehabilitation, Saitama Children's Medical Center, and Sapporo Medical University, and informed consent was obtained from all participants.

2.2. Procedure

For criterion validity, experienced physical therapists (n = 15) in charge of each child performed the FMS and GMFCS rating. For intra-rater reliability, the first author with no previous knowledge of the mobility status of the children performed the FMS rating twice with the parents by interview and/or telephone with a one- to two-week interval between assessments.

2.3. Instruments

2.3.1. Japanese version of the Functional Mobility Scale

The Japanese translation was made with the permission of the developer of the FMS. The translation was executed according to the international standard for translation of self-report measures (Beaton, Bombardier, Guillemin, & Ferraz, 2000). The original English FMS was translated into Japanese separately by two individuals. The consensus version was then translated back into English by a professional translator. The developer of the FMS pointed out that the back into English translated version revealed the meaning in one area had been lost somewhat in translation. After some minor adjustments, the developer of the FMS approved our Japanese version of the FMS, and authorized its usage in Japan. The content validity of the Japanese version to Japanese values was examined by a multidisciplinary group of experts. They read the Japanese version of the FMS carefully, and provided feedback on the content (particularly its utility in Japan), wording and readability of the items. Their feedback led to some changes, although it should be noted that the construct validity did not change (Table 1).

The Functional Mobility Scale (FMS) is a six-level scale that describes the level of assistance required for walking in a community setting for children with CP (Graham et al., 2004). It is administered by a clinician in a semi-structured interview using child or parent reports. The rater is asked to rate the usual walking ability of the child according to the need for assistive devices, such as walking sticks or crutches, or mobility aids, such as a wheelchair, over three different distances chosen to represent mobility inside