

Original Article

Relationship between activity limitations and participation restriction in school-aged children with cerebral palsy

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Abstract. [Purpose] This study investigated the relationship between activity limitation and participation restriction in school-aged children with cerebral palsy. [Subjects and Methods] Data were collected from 109 children with cerebral palsy aged 6–12 years. Activity limitations were assessed by using functional classification systems including the Korean-Gross Motor Function Classification System, the Korean-Manual Ability Classification System, and the Korean-Communication Function Classification System. Participation restriction was measured using the Korean-Frequency of Participation Questionnaire. Physical or occupational therapists and parents collected the data. [Results] All levels of the functional classification systems were significantly negatively correlated with Korean-Frequency of Participation Questionnaire ratings ($r = -0.382$ to -0.477). The Korean-Frequency of Participation Questionnaire ratings differed significantly with respect to the functional classification systems; in particular, the differences in the ratings of levels I and V were significant. The Korean-Communication Function Classification System and Korean-Gross Motor Function Classification System were significant predictors of participation, explaining 26.5% of the variance. [Conclusion] Intervention programs are required to promote communication skills and gross motor ability in order to improve the participation of children with cerebral palsy.

Key words: Cerebral palsy, Functional classification system, Participation

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INTRODUCTION

Children with cerebral palsy (CP) experience motor impairments such as spasticity, dystonia, contracture, abnormal bone growth, poor balance, loss of selective motor control, and weakness¹⁾ as well as deficits in other domains that impact their ability to move, solve problems, communicate, and socialize²⁾. These problems limit activities and restrict participation^{3, 4)}. The transition from the use of the term “handicap” to “participation” according to the International Classification of Functioning, Disability and Health (ICF)⁵⁾ provides a more comprehensive understanding of the impact of health condition on an individual’s life⁶⁾ and has spurred research on participation and measurement approaches.

Because of the increasing awareness of activities and participation from enablement models such as the ICF, the concept of societal participation is becoming increasingly important and thus represents a key goal of many research-

ers, disability advocacy organizations, rehabilitation providers, community organizations, and policymakers⁷⁾. The ICF encourages data collection on activity limitations and impairments as well as the study of the correlations between activity limitations and impairments. A criterion of the current definition of CP is a change in the perception of activity restriction and disability⁸⁾. Thus, the functional levels and abilities of children with CP have become more important. Although ICF-based activities and participation domains are now major concepts in rehabilitation, few studies have addressed the nature and significance of restrictions in the performance of daily activities and participation in children with CP⁹⁾.

Participation can be broadly defined as involvement in life situations, including physical, social, and self-engagement in activities⁵⁾. For people with disabilities, participation in meaningful and intrinsically motivated leisure activities fosters mental and physical health as well as social relationships and can thus improve quality of life¹⁰⁾. The determinants of participation in children are age, gross motor function, family preferences, and environmental resources¹¹⁾. Palisano et al.¹²⁾ report that children’s activity limitations and behaviors in life situations are important for participation.

Functional classification systems are frequently used to measure activity limitations. The Gross Motor Classification System (GMFCS)¹³⁾, Manual Ability Classification

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System (MACS)¹⁴), and Communication Function Classification System (CFCS)¹⁵) are currently used to assess function of children with CP; these function classification systems can be used to describe the gross motor, manual, and communication abilities of children with CP according to the ICF levels of activity limitation and can enhance the interactions among team members related to CP treatment. Beckung et al.⁶) suggest this functional classification system of children with CP at these levels is useful for evaluating post-intervention outcomes and determining the healthcare needs of patients with CP. The GMFCS, which was the first classification system developed, describes the activities of mobility in terms of self-initiated movement and is widely used in clinical settings¹⁶). The relationships of these classification system with other clinical measurements including the Gross Motor Function Measure (GMFM)¹⁷), WeeFIM¹⁸), and Pediatric Evaluation of Disability Inventory (PEDI) functional skills¹⁹) have been investigated. The GMFCS level is important in participation restriction^{6, 11, 12}). However, studies comparing the MACS with GMFCS do not report clear relationships with activity limitations or participation restrictions. Furthermore, the most recently developed classification system, the CFCS, has not been investigated in relation to the ICF.

Because each function classification system provides different information about children with CP, understanding the relationship between each classification system and participation restriction is important for clinicians and rehabilitation settings, although this has not been investigated. Thus, fully understanding the relationships between activity limitations and participation restriction, mobility, manual ability, and functional communication should be examined simultaneously. Therefore, the present study determined the relationship between activity limitation and participation restriction in school-aged children with CP.

SUBJECTS AND METHODS

The participants were 109 children (58 boys, 51 girls) aged 6–12 years with a clinical diagnosis of CP. They attended elementary schools for children with physical disabilities or received rehabilitation therapy in hospitals. Their mean age (SD) was 8 years, 1 month (1.5 years). Informed consent was obtained from the parents of all children. Regarding the types of CP, 81.3%, 7.3%, 6.3%, and 5.2% of the children had spastic, dyskinetic/athetotic, ataxic, and mixed types, respectively. According to the Korean GMFCS (K-GMFCS), 25 (22.9%), 17 (15.6%), 16 (14.7%), 20 (18.3%), and 31 (28.4%) children were classified as levels I–V, respectively. Meanwhile, according to the Korean MACS (K-MACS), 10 (9.2%), 47 (43.1%), 16 (14.7%), 15 (13.8%), and 21 (19.3%) children were at levels I–V, respectively. Regarding the Korean CFCS (K-CFCS), 33 (30.3%), 23 (21.1%), 14 (12.8%), 11 (10.1%), and 28 (25.7%) children were level I–V, respectively. Ethical approval for this study was granted by the Ethics Committee of Jeonju University.

The activity limitations of children with CP were assessed by physical or occupation therapists using the above-mentioned functional classification systems. Gross motor function was classified according to the K-GMFCS. The

GMFCS comprises five ordinal levels of gross motor function based on self-initiated movement in a clinical setting¹³). The intraclass correlation coefficient of agreement ranges from 0.993–0.996²⁰). The K-MACS was used to classify how children with CP use their hands when handling objects in daily activities. Level I children handle objects easily and successfully, and their manual abilities do not restrict their independence in daily activities; meanwhile, level V children do not handle objects and are severely limited in their ability to perform even simple actions. The intraclass correlation coefficients of the MACS between therapists and between parents and therapists are reported to be 0.97 and 0.96, respectively¹⁴). The K-CFCS was used to classify the everyday communication of children with CP. Level I children are effective senders and receivers with both unfamiliar and familiar partners, while level V children are seldom effective senders or receivers even with familiar partners. The interrater reliability of the CFCS between professionals and between parents and professionals is 0.66 and 0.49, respectively; the test-retest reliability in the development and validation of the CFCS was 0.82¹⁵).

The Korean Frequency of Participation Questionnaire (K-FPQ) data were used to measure of the degree of participation. The FPQ consists of 14 questions on the following items, each with 6 responses of different frequencies (from never to a few times a week): eating, relaxing pursuits, using a computer, housework, riding a bicycle or wheelchair, shopping, community groups, school pursuits, sports, non-sporting games, watching sports, craft pursuits, watching cultural events, and tourist pursuits. The K-FPQ was translated into Korean according to international guidelines. Park²¹) reports the psychometric properties based on item response theory. The 6-point rating scale was deemed appropriate for the K-FPQ. The person and item separation indices were 0.83 and 0.97, respectively. Parents completed the questionnaire.

Descriptive statistics were used to examine the general characteristics of children with CP. Spearman rank correlations were used to analyze the correlations between the functional classification systems and participation. The mean difference in participation according to functional classification system level was analyzed by one-way ANOVA. Stepwise multiple regression analysis was applied to investigate the effects of the functional classification system on participation. The level of significance was set at $p < 0.05$.

RESULTS

The correlations between the K-FPQ and K-GMFCS, K-MACS, and K-CFCS are presented in Table 1. All coefficients were significant ($p < 0.001$). Correlation coefficients ranged from -0.382 to -0.477 .

The mean K-FPQ values of children with K-GMFCS levels I–V were 42.57, 34.73, 31.54, 37.38, and 28.33, respectively ($p < 0.05$). Furthermore, Scheffé post hoc analysis showed significant differences between K-GMFCS levels I and V. The mean K-FPQ values in children with K-MACS levels I–V were 39.00, 36.25, 38.09, 29.17, and 25.31, respectively. Post hoc analysis showed a significant difference between K-MACS levels II and V. The mean K-FPQ values

Table 1. Correlations between the K-FPQ and functional classification systems

	K-GMFCS	K-MACS	K-CFCS
K-FPQ	-0.382*	-0.398*	-0.477*

* $p < 0.001$.

K-GMFCS: Korean-Gross Motor Function Classification System; K-MACS: Korean-Manual Ability Classification System; K-CFCS: Korean-Communication Function Classification System; K-FPQ: Korean-Frequency of Participation Questionnaire

of children with K-CFCS levels I–V were 41.61, 37.05, 38.00, 25.10, and 27.92, respectively. Post hoc analysis showed level I differed significantly from levels IV and V.

Regression analysis showed the K-CFCS and K-GMFCS were significantly associated with the K-FPQ ($p < 0.05$). The model explained 26.5% of the variance; the K-MACS and CP type were excluded from this model.

DISCUSSION

The first key change in the ICF model was a change of terminology. Negative terms such as impairment, disability, and handicap were replaced with neutral terms such as body function and structure, activity, and participation respectively; this change in terminology aims to promote participation as an important health outcome²². After announcing the ICF framework, activity limitations and participation restrictions became key concepts in pediatric rehabilitation. However, the aspects to be addressed in physical therapy to promote participation are debatable. Therefore, we investigated the relationship between limitations in activity and participation limitation.

Activity limitation was significantly correlated with participation ($r = -0.382$ to -0.477) and most strongly with the K-CFCS. However, this correlation is weaker than that reported previously; Beckung et al.⁶ report correlation coefficients of the GMFCS with education participation and social relations of 0.76 and 0.77, respectively, and 0.64 and 0.66 with manual ability (measured by bimanual fine motor function), respectively. Although they also studied the relationship between limitations in activity and participation, they did not assess participation limitations; rather, the data of participation restriction were collected from chart reviews by rehabilitation team members. The differences in the correlation strength might be because of the data collection methods.

The correlations between functional classification and participation were weaker than those between functional classification and other functional outcome measurements such as the GMFM, WeeFIM, and PEDI. Ross et al.¹⁷ report that the GMFCS is strongly correlated with the GMFM ($r = -0.77$) in patients with CP. Meanwhile, the MACS is reported to be correlated with the WeeFIM ($r = -0.780$) and the GMFCS ($r = -0.846$)²³. Kim et al.¹⁹ report a strong significant correlation between the functional classification system and PEDI functional skills. The GMFM, WeeFIM, and PEDI are used to assess the activity levels of children with CP; the strong correlations of the functional classification systems

with these instruments might be due to measurement of the same domain in the ICF.

The mean values of participation differed significantly among functional classification systems. In particular, participation differed significantly between levels I and V in the GMFCS and CFCS. In the MACS, participation differed significantly between levels II and V. Lee et al.²⁴ report the participation of school-aged children with CP depends on their MACS level. Although the mean participation values in children with levels I and II were higher than those in children with level V, there were no differences between the other levels. These results are similar to those of a previous study²⁵, suggesting that only knowing the level of the functional classification system makes it difficult to predict the degree of participation.

Because the difference in participation according to CFCS level has not yet been examined, the present K-CFCS results cannot be compared with other studies. However, the levels of participation according to the K-CFCS level resemble those of the K-GMFCS and K-MACS. Children with the most severe forms of CP (i.e., level V) had the lowest participation, consistent with previous findings^{24, 26}.

Multiple regression analysis was employed to investigate the effect of activity limitation on participation restriction. The K-MACS and CP type were excluded from this model. Although the K-CFCS and K-GMFCS scores were significantly affected participation, the explained variance was small. The factors that affect participation in children with CP vary depending on environmental factors and context. These results suggest physical capacity and other factors such as environment, family preferences, and individual interest affect participation. Therefore, future studies should consider context and individual factors in order to enhance our understating of activity limitations.

The lack of differences in the degree of participation in children with CP according to GMFCS level other than that between levels I and V suggests severe motor activity limitations are not a restrictive factor. Although there were differences among several K-MACS levels, the K-MACS did not significantly affect participation in multiple regression analysis. The K-CFCS score explained a large portion of participation. The present results support those of Hammal et al.²⁷, who report the participation of children with CP is influenced by where they live; moreover, they state walking ability, communication, and feeding difficulties are taken into account in the extended model and that upper-limb function no longer significantly influences participation.

Because of increasing interest in quality of life²⁸ and the ICF model, participation has become a critical goal of rehabilitation. However, there is a gap between the goals of parents and pediatric physical therapy in clinical settings. Investigations of the relationship between functional classification systems that assess activity limitations and participation restriction could connect professionals and families, because this system is widely used and easily applied.

The main limitation of this study is the lack of generalizability of the results, because this study involved a small convenience sample. However, the distribution of functional classification levels was adequate despite the small sample size. The intensity and satisfaction of participation are

important to children with CP and their families²⁵). The relationship between functional level and various aspects of participation, such as satisfaction and intensity, will be examined in a future study.

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