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Research Article

Investigation of Functional Levels of Child with Cerebral Palsy Who Take Physiotherapy and Rehabilitation Services and Their Family Impact and Compassion Levels

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Abstract

Aim: Caring for a child with cerebral palsy (CP) can place considerable physical and emotional strain on families. Such demands often lead to heightened stress, depressive symptoms, and secondary health issues. This study aimed to explore the motor and hand functions of children receiving physiotherapy and rehabilitation and to examine how these functional outcomes relate to parental involvement and emotional closeness.

Material and Methods: Thirty-six children with CP, aged 4–12 years, and their parents participated. Gross motor function was classified according to the Gross Motor Function Classification System (GMFCS), while hand use was rated using the Manual Ability Classification System (MACS). Parental involvement and affection were measured with the Family Impact Scale (FIS) and the Affection Scale (CS).

Results: The mean age of the children was 8.3 years; 10 were girls and 26 boys. Analyses revealed a strong positive correlation between gross motor function and hand use ($p < 0.05$). Family effect scores showed a weak but statistically significant positive correlation with motor and hand functions ($p < 0.05$). In addition, a moderate negative correlation was found between hand function and affection levels ($p < 0.05$).

Conclusion: The results show that the functional abilities of children with CP are closely linked to their families' psychosocial experiences. In particular, when children's functional limitations are more severe, increased caregiving responsibilities appear to increase the family burden while decreasing perceived affection. Future studies with larger and more heterogeneous samples are needed to clarify these relationships and provide information about interventions that support both children and their families.

Keywords: Activities of daily living, Cerebral palsy, Compassion level, Rehabilitation

INTRODUCTION

Cerebral palsy (CP) represents a permanent neurodevelopmental condition that results from damage to the developing brain, most often during the prenatal or perinatal period. Cerebral palsy (CP) is usually recognized by disturbances in muscle tone, posture, and the control of voluntary movements (1). In addition to these motor difficulties, people with CP both children and adults often experience a wide range of other challenges. These may include problems with sensation, speech, or cognition, as well as epilepsy, behavioral issues, and musculoskeletal deformities that can progress over time (2). Globally, CP is estimated to affect between 1.5 and 3 per 1,000 live births. In Turkey, prevalence studies have reported rates of approximately 0.44% among children aged 2–16 years, although figures may vary depending on methodology and population studied (3). According to the Surveillance of Cerebral Palsy in Europe (SCPE), CP is commonly classified into three major subtypes: spastic, dyskinetic, and ataxic. When a child displays more than one type of motor impairment, the classification is based on the most dominant

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clinical presentation (4). Standardized tools have been developed to improve the consistency of describing motor severity and outcomes. The GMFCS is commonly used to grade gross motor abilities, ranging from sitting and ambulation to reliance on assistive devices, across five levels for children aged 2–18 years (5,6). To address limitations in assessing manual function, the MACS was introduced, providing a comparable five-level classification for hand use in everyday tasks among children aged 4–18 years (7). For families, receiving a CP diagnosis often means substantial changes in lifestyle and caregiving responsibilities. Increasing evidence indicates that the long-term care burden is not only physical but also psychosocial (8). Parents frequently describe the need for constant supervision, reduced personal time, and the challenges of managing behavioral problems, all of which can intensify stress and negatively affect overall well-being (9,10). Research consistently shows that caregivers, especially mothers, are more likely to develop anxiety, depressive symptoms, and other health concerns compared with parents of typically developing children (9,11,12). Evidence from a systematic review indicates that mothers of children with CP demonstrate higher rates of anxiety and depression, with depressive complaints being especially frequent (12). Similarly, a Turkish study showed that mothers of children with CP reported substantially higher levels of depression than mothers of children without disabilities (13).

Compassion, in this context, refers not only to an awareness of another's suffering but also to the motivation and actions aimed at alleviating it (14). Compassion fatigue has been described as a negative consequence of caring for individuals in need (15).

In children with cerebral palsy, limitations in gross motor and manual functions play a central role in shaping daily caregiving demands, including assistance with mobility, self-care activities, and continuous supervision. As functional dependency increases, parents are required to invest greater physical effort and emotional energy, often resulting in reduced personal time, restricted social participation, and increased psychological strain (8,9).

Previous research has consistently demonstrated that greater functional impairment in children with cerebral palsy is associated with higher levels of caregiver burden, elevated stress, and an increased prevalence of anxiety and depressive symptoms among parents (10–12).

Over time, the cumulative physical and emotional demands of intensive caregiving may erode caregivers' emotional resources, causing compassionate involvement to evolve into emotional exhaustion and compassion fatigue (15).

From a relational perspective, this sustained emotional fatigue may also influence parents' perceived affection and emotional closeness toward their child, as caregiving becomes increasingly task-oriented rather than emotionally reciprocal. Despite this theoretically plausible pathway, empirical studies directly examining the relationship between children's functional levels and families' compassion or affection levels remain limited. Moreover, existing studies have largely focused on caregiver burden and psychological distress, without integrating objective functional classifications such as GMFCS and MACS with emotional caregiving dimensions.

Therefore, a critical gap exists in the literature regarding how children's functional motor abilities relate simultaneously to family impact and parental compassion. Addressing this gap is essential for advancing family-centered rehabilitation approaches that consider both physical function and psychosocial well-being. Accordingly, this study aims to investigate the gross motor and manual functional levels of children with cerebral palsy receiving physiotherapy and rehabilitation services and to examine their associations with family impact and parental compassion levels.

Based on the existing literature and the proposed theoretical framework, it was hypothesized that poorer gross motor and manual functional levels in children with cerebral palsy would be associated with greater negative family impact. In addition, it was hypothesized that greater functional limitations would be associated with lower parental compassion and affection levels.

MATERİAL AND METHODS

Study Design

This study was designed as a cross-sectional, observational study. No therapeutic intervention was administered, no pre- or post-test assessments were conducted, and no comparison between intervention or control groups was performed. The study aimed solely to examine the relationships between children's functional levels and family-related psychosocial outcomes at a single time point.

Individuals

Participants were enrolled from a private special education center in Istanbul and a special education and rehabilitation center in Kocaeli between March 18 and May 18, 2022. Children who met the prespecified inclusion criteria, together with their parents/guardians, were invited to participate. All families who volunteered for the study were informed verbally and in writing about the research procedures, and written consent was obtained prior to participation. The study protocol was

reviewed and approved by the Scientific Research Ethics Committee of Çanakkale Onsekiz Mart University and was conducted in accordance with the principles of the Declaration of Helsinki (March 17, 2022, 06/05).

The study population comprised children aged 4–12 years diagnosed with cerebral palsy (CP) and receiving education and rehabilitation services at two special education centers, together with their families. Participants were included if they did not present with intellectual disability, sensory impairments (visual or hearing), or epilepsy, and if both the child and family provided voluntary consent. Children below four or above twelve years of age, those diagnosed with conditions other than CP, and families unwilling to participate were excluded from the study.

Sample size estimation for the study was carried out using the G*Power 3.1 program (16). Referring to effect sizes reported in earlier studies, the required number of participants was calculated as 28 (17). The computation was based on between-group comparisons of balance outcomes, with parameters set at a statistical power of 95%, a two-tailed significance level of 0.05, and an expected effect size of 0.091. Initially, 36 children with CP and their families were recruited for the study. No participants were withdrawn or excluded after enrollment, and all recruited individuals completed the assessments and were included in the final analysis. The inclusion of a sample size exceeding the calculated minimum was intended to enhance the statistical robustness of the analyses and improve the external validity of the findings.

Assessment Methods

Parents who agreed to take part in the study were asked to complete a structured questionnaire that collected demographic and clinical information regarding their children, including age, sex, anthropometric measurements, and cerebral palsy subtype. Motor performance was classified with the Gross Motor Function Classification System (GMFCS), whereas manual ability in everyday tasks was evaluated using the Manual Ability Classification System (MACS). To explore the broader consequences of the child's condition on family dynamics, the Family Impact Scale (FIS) was administered. In addition, parental compassion was assessed through the Compassion Scale (CS).

Gross Motor Function Classification System

The Gross Motor Function Classification System (GMFCS) has become the most commonly adopted tool for evaluating motor performance in children with cerebral palsy. It provides a standardized framework for describing gross motor abilities, which facilitates consistent communication among health professionals and enables meaningful comparisons across clinical settings and research studies. Numerous investigations have confirmed its reliability and validity, supporting its integration into both routine practice and scientific research (18). The GMFCS categorizes motor performance into five distinct levels. Children at Level I display near full independence in mobility, whereas those at Level V have profound limitations in movement. The system is suitable for use from early childhood up to 18 years, with adjustments based on typical developmental milestones.

- Level I: Children at this level can walk independently and are also capable of running and jumping, but their speed, balance, and coordination may be somewhat less developed than that of their peers.
- Level II: Gait is independent, but limitations in speed, balance, or coordination are evident.
- Level III: Children at this level can ambulate on their own; however, they rely on assistive equipment such as walkers, crutches, or orthoses when moving in community environments.
- Level IV: Independent mobility is markedly restricted; children at this level often need to be transported for participation in community activities, and their capacity for mobility is severely limited.
- Level V: Head and trunk control are severely impaired; sitting without support is impossible, and the child cannot move independently.

Manual Ability Classification System

MACS was designed to evaluate how children perform in daily activities that involve grasping and handling objects. It reflects their usual hand use rather than their best possible capacity. The system comprises five levels (19).

Level I: Children can easily grasp and manipulate objects effectively. Limitations are observed only in tasks that demand fine manual dexterity, speed, or a high degree of concentration. Although present, these difficulties do not hinder functional independence in activities of daily life.

- Level II: The child can handle and manipulate most objects, but their performance is limited in terms of speed and/or quality. They may avoid some activities or perform them with difficulty. Alternative methods may be necessary, but this does not significantly impact independence.
- Level III: The child has significant difficulties grasping and manipulating objects; they require assistance in preparing or adapting activities. Task execution is slow and has limited success. However, with prior adaptations, they can perform some activities independently.

• Level IV: They are able to handle only a small number of simple objects, provided that the activity takes place under adapted conditions. They can perform activities only with intense effort and at a low level of success. They require constant assistance, support, or an adapted environment to perform even a partial activity.

• Level V: The child cannot grasp and manipulate objects; their ability to perform even the simplest activities is severely limited. They require complete external assistance to maintain activities of daily living.

Family Impact Scale

The level of impact on families was determined using the FIS. The FIS assesses the difficulties experienced by families across four main dimensions: financial burden, impact on family and social life, individual strains, and coping strategies. The scale is a Likert-type structure rated from 1 to 4. Higher scores indicate higher levels of difficulties experienced by families and the level of impact. This study utilized the Turkish version, which has been validated and shown to be reliable (20).

Compassion Scale

Parental compassion was measured using the Compassion Scale (CS), which consists of 24 items covering six dimensions. Each item is rated on a five-point Likert scale, producing a total score between 24 and 120; higher scores denote greater compassion. The Turkish adaptation and validation were performed by Akdeniz et al. (21).

Statistical Analysis

Data analysis was carried out using SPSS version 21.0 (IBM Corp., Armonk, NY, USA). Normality of the data distribution was assessed using the Shapiro–Wilk test. Descriptive statistics are presented as mean ± standard deviation or frequency and percentage, as appropriate. Given the ordinal nature of the classification systems and scale scores, associations between GMFCS, MACS, FIS, and parental compassion levels were analyzed using Spearman's rank correlation coefficients. A p value of <0.05 was considered statistically significant.

RESULTS

The sample consisted of children with cerebral palsy with a mean age of 8.33 ± 2.51 years. Among them, 10 were female and 26 male. An overview of their demographic and functional characteristics is displayed in Table 1. Family characteristics, FIS and CS scores are presented in Table 2. Furthermore, the relationships between GMFCS, MACS, FIS, CS and the children's ages are presented in Table 3.

Table 1. Demographic characteristics of the children

		X±SS	Min-Max
Age		8.33 ± 2.51	4-12
Height		119.64 ± 13.63	95-145
Weight		23.92 ± 8.57	13-45
Gestational age		33.53 ± 4.90	24-41
NICU stay duration		41.17±69.38	0-365
Therapy days/week		3.06±1.56	1-7
		N	%
Mode of delivery	Vaginal delivery	14	38.9
	Cesarean delivery	22	61.1
Type of cerebral palsy	Spastic type	30	83.3
	Dyskinetic type	2	5.6
	Ataxic type	1	2.8
	Hypotonic type	2	5.6
	Mixed type	1	2.8
GMFCS	Level I	6	16.7
	Level II	7	19.4
	Level III	7	19.4
	Level IV	3	8.3
	Level V	13	36.1
MACS	Level I	7	19.4
	Level II	11	30.6
	Level III	5	13.9
	Level IV	4	11.1
	Level V	9	25

Max: Maximum; Min: Minimum; X: Arithmetic Mean; SD: Standard deviation, NICU: Neonatal Intensive Care Unit, GMFCS: Gross Motor Function Classification System, MACS: Manual Ability Classification System.

Table 2. Demographic characteristics of the families

		X±SS	Min-Max
FIS		74.50±12.38	41-96
CS		91.19±13.71	72-113
		N	%
Caregiver's educational status	Illiterate	4	11,1
	Primary school graduate	11	30.6
	Secondary school graduate	11	30.6
	High school graduate	7	19.4
	University degree and above	3	8.3

Max: Maximum; Min: Minimum; X: Arithmetic Mean; SD: Standard deviation, FIS: The Family Impact Scale, CS: Compassion Scale.

Tablo 3. The relationship between age, GMFCS, MACS, CS, and FIS findings.

	GMFCS p(r)	MACS p(r)	FIS p(r)	CS p(r)
Age	0.798 (-0.44)	0.675 (0.72)	0.712 (0.64)	0.489 (-0.119)
GMFCS	-	0.00 (0.795)	0.005 (0.457)	0.090 (-0.287)
MACS	0.00 (0.795)	-	0.006 (0.450)	0.015 (-0.403)

MACS: Manual Skills Classification System, GMFCS: Gross Motor Function Classification System, FIS: Family Impact Scale, CS: Compassion Scale, CI: Confidence Interval: 95%, p<0.05.

A positive and moderate correlation was identified between age and FIS scores; however, this was not statistically significant (r = 0.64, p = 0.712). FIS scores showed weak but statistically significant positive correlations with both GMFCS

(r = 0.45, p = 0.005) and MACS (r = 0.45, p = 0.006). A strong positive association was observed between GMFCS and MACS (r = 0.79, p < 0.001). Although GMFCS was negatively and weakly correlated with age, this result did not reach statistical significance (r = –0.44, p = 0.798). Similarly, a strong positive relationship was found between MACS and age, but it was not statistically significant (r = 0.72, p = 0.675). Age was also negatively and very weakly associated with CS, without statistical significance (r = –0.119, p = 0.489). The correlation between GMFCS and CS was weak and negative, yet not statistically significant (r = –0.287, p = 0.090). In contrast, MACS demonstrated a moderate and statistically significant negative correlation with CS (r = –0.403, p = 0.015).

DISCUSSION

CP is a neurodevelopmental disorder that compromises a child's motor skills and functional independence, thereby exerting a direct impact on the psychosocial well-being of caregiving families. The present study examined the relationships between children's functional levels, family impact, and parental compassion in a cohort of children with cerebral palsy receiving physiotherapy and rehabilitation services.

The main findings of this study can be summarized as follows: (i) higher levels of gross motor and manual functional impairment were associated with greater family impact; (ii) manual functional limitations were moderately and significantly associated with lower parental compassion levels; and (iii) children's age was not significantly related to compassion but showed a weak, non-significant association with family impact. These findings provide novel insight into how functional disability severity relates not only to family burden but also to the emotional dimensions of caregiving.

The Impact of the Child's Age and Functional Level on Family Impact

Our results demonstrated weak but statistically significant positive correlations between both GMFCS and MACS levels and Family Impact Scale scores, indicating that greater functional dependency in children with cerebral palsy is associated with increased family burden. This finding aligns with previous research showing that reduced functional independence leads to increased caregiving demands, physical strain, and psychosocial stress among parents (23,24).

In Türkiye, caregiving responsibilities for children with cerebral palsy are predominantly assumed by mothers, who often prioritize their child's needs over their own social participation and psychological well-being (22). As functional limitations increase, daily caregiving tasks such as mobility assistance, self-care support, and supervision become more intensive, which may explain the observed increase in perceived family impact. Consistent with our findings, Akçay et al. reported that higher GMFCS levels were associated with increased maternal anxiety and depressive symptoms (23). Similarly, Yığman et al. demonstrated that caregiver burden rises in parallel with worsening motor and manual function in children with CP (24). Together, these findings support the notion that objective functional classifications such as GMFCS and MACS are meaningful indicators of family burden.

Functional Level and Parental Compassion

One of the most important and novel findings of this study is the moderate and statistically significant negative association between MACS levels and parental compassion scores. Specifically, greater impairment in manual abilities was associated with lower levels of parental compassion. In contrast, the relationship between GMFCS and compassion was weak and did not reach statistical significance.

This differential finding suggests that limitations in manual function may impose a more emotionally demanding caregiving burden than gross motor impairments. Manual dysfunction directly affects activities of daily living such as feeding, dressing, and hygiene, which require close, repetitive, and prolonged parent–child interaction. Over time, these emotionally intensive caregiving demands may lead to emotional fatigue, reducing caregivers' capacity for compassionate engagement.

Previous studies have primarily focused on caregiver burden and psychological distress, rather than compassion itself. However, Emir et al. reported that increased caregiving burden was associated with higher levels of compassion fatigue among mothers of children with special needs (25). Furthermore, Tarakcı et al. emphasized that a multidisciplinary rehabilitation approach plays a critical role in addressing the psychosocial well-being of families of children with cerebral palsy by supporting both the child's functional abilities and the emotional needs of caregivers (26).

The Role of Socio-Demographic Factors on Family Impact

In the present study, the child's age was not significantly associated with parental compassion and showed only a weak, non-significant relationship with family impact. These findings suggest that functional severity, rather than chronological age, is the primary determinant of family burden and emotional caregiving responses.

Previous research has yielded mixed results regarding the influence of age on caregiver outcomes. Khanna et al. reported that families of children with cerebral palsy experience per-

sistent social, psychological, and financial challenges regardless of the child's age (27). Similarly, Sarman et al. found that mothers of children with CP consistently report elevated anxiety and depression levels across different age groups (28). Our findings support these observations by indicating that caregiving challenges are more closely linked to functional dependency than to age alone.

Limitation of the Study

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design does not allow causal inferences regarding the relationships between children's functional levels, family impact, and parental compassion. The relatively small sample size and recruitment from two rehabilitation centers may limit the generalizability of the results. In addition, family impact and compassion were assessed using self-reported measures, which may be influenced by response bias. Potential confounding factors such as parental mental health, socioeconomic status, and social support were not controlled for and may have affected the observed associations. Despite these limitations, the integration of objective functional classifications with emotional caregiving outcomes represents a novel contribution to the literature.

CONCLUSION

This study demonstrates that greater functional impairment in children with cerebral palsy particularly in manual abilities is associated with increased family impact and reduced parental compassion. While children's age showed no significant relationship with parental compassion, functional dependency, as reflected by GMFCS and MACS levels, emerged as a key determinant of family burden.

Notably, the significant negative association between manual functional limitations and parental compassion highlights an important emotional dimension of caregiving that has been largely overlooked in previous research. These findings emphasize the need for rehabilitation programs that not only target children's functional abilities but also incorporate psychosocial support strategies aimed at sustaining parental compassion and emotional well-being.

Future studies with larger, multicenter, and longitudinal designs are warranted to further clarify the causal pathways between functional severity, family impact, and emotional caregiving outcomes in families of children with cerebral palsy.

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