

Comparison of CO-OP and goal-directed training on occupational performance and functional status in children with cerebral palsy: Three-armed randomised trial

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Abstract

Introduction: Cerebral palsy (CP) is a neurological disorder that impacts motor skills and daily functioning in children. While conventional occupational therapy aims to improve these areas, newer approaches like ‘Cognitive Orientation to Daily Occupational Performance’ (CO-OP) and ‘Goal-Directed Training’ (GDT) show promise. However, their comparative effectiveness in enhancing occupational performance and functional status in children with CP remains underexplored. This study aimed to investigate and compare the effects of the CO-OP and GDT on the occupational performance and functional status of children with CP.

Methods: Sixty children were randomly assigned to three intervention groups: CO-OP approach in addition to conventional occupational therapy (COT) (Group A; $n = 20$), GDT in addition to COT (Group B, $n = 20$), and only COT (Group C; $n = 20$). The outcomes regarding occupational performance via the Canadian Occupational Performance Measure and functional status via the Paediatric Evaluation of Disability Inventory were evaluated by the blind evaluators before and after the interventions. All participants received two sessions per week over a 12-week period.

Consumer and Community Involvement: No consumer and community involvement in these studies.

Results: All groups demonstrated statistically significant improvements in occupational performance and functional status ($p < 0.001$). Between-group comparisons revealed that Group A achieved greater improvements in occupational performance and functional status, which particularly in the areas of self-care, mobility, and total Paediatric Assessment of Disability Inventory (PEDI) scores ($p < 0.05$), compared to the other groups.

Conclusions: Although significant gains were achieved on occupational performance and functional status levels of both the CO-OP approach and GDT, it was revealed that the group receiving the CO-OP approach had superior effects.

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PLAIN LANGUAGE SUMMARY

Cerebral palsy (CP) is a condition that affects how children move and use their muscles. It can make everyday tasks like getting dressed or playing more difficult. Occupational therapy helps children with CP build their skills and become more independent in daily life.

This study looked at two types of therapy: cognitive orientation to daily occupational performance (CO-OP) and goal-directed training (GDT). The aim was to find out which approach worked better for improving everyday activities and skills in children with CP.

The results showed that the children who took part in the CO-OP program made the most progress. They improved more in both daily tasks and skills compared to the children who received GDT. Both groups showed some improvement, but CO-OP had stronger results.

These findings suggest that CO-OP could be a helpful part of therapy programs for children with CP. It may support them in doing more things on their own. More research with larger groups of children is needed to learn more about how these therapies work in the long term.

KEYWORDS

cerebral palsy, cognitive orientation, functional status, goal-directed, occupational performance

1 | INTRODUCTION

Cerebral palsy (CP) is a group of neurological disorders that affect movement, muscle tone, and posture, causing activity limitations that originate in the developing foetal or infant brain that are attributed to non-progressive disorders (Rosenbaum et al., 2007). Symptoms such as spasticity and contracture in CP cause a decrease in functional skill level with limitations in daily living activities such as learning a new skill, self-care tasks like dressing, and handwriting (Pool et al., 2015). In this condition, the simultaneous presence of sensory, cognitive, perceptual, and behavioural impairments significantly undermines the acquisition and execution of functional skills, autonomy in daily living, and active engagement in leisure activities (Rosenbaum et al., 2007). CP is primarily a condition affecting selective motor control, but functional performance is also influenced by co-occurring impairments in sensory, cognitive, perceptual, and behavioural domains. These impairments significantly hinder the development and execution of functional skills, limit independence in daily activities, and reduce participation in leisure activities (Pavão et al., 2021).

As the clinical and functional challenges associated with CP vary significantly, treatment approaches are complex and diverse. Interventions for CP aim to address functional and structural challenges in the body,

Key Points for Occupational Therapy

- CO-OP combined with a COT program significantly improved occupational performance and satisfaction compared to GDT and alone COT.
- CO-OP combined with a COT program showed greater progress in self-care and mobility, while GDT combined with a COT program was less effective.
- CO-OP, as an addition to traditional rehabilitation programs, offers a more comprehensive solution for children through cognitive strategies and goal-setting approaches. This model demonstrates the potential of occupational therapy to enhance the overall functional capacity of children.

minimise restrictions in activity, improve functional skills, and support the child's participation in age-appropriate environments (Balci, 2016). It is crucial for interventions to foster active participation and motivation throughout the rehabilitation process, with evidence suggesting that combining different approaches yields the

most effective results (Bain et al., 2023; Novak et al., 2013). Occupational therapy plays a crucial role in the management and treatment of individuals with CP by addressing their functional limitations and promoting their independence in daily living activities (McCoy et al., 2020). Assessing the functional abilities and skill levels of a child with CP in daily living activities is crucial for setting personalised and achievable rehabilitation goals. Additionally, goals should not be determined solely by limitations but also by the child's personal aspirations and meaningful tasks they aim to achieve (Pool et al., 2015).

In rehabilitation, assessing functional abilities is crucial as it enables therapists to focus on enhancing a patient's capacity to engage in meaningful activities and daily life. Assessments into the goal-setting process ensure that rehabilitation goals are personalised to everyone, which significantly increases the likelihood of successful outcomes (Kang et al., 2022). Furthermore, occupational therapy is highlighted to play a pivotal role by utilising personalised interventions, shaped by a thorough understanding of the patient's functional status and activity performance, to foster improved rehabilitation results (Sarsak, 2019).

In the studies carried out, there is clear evidence of a shift towards more ecological, occupation-based approaches in current interventions for CP (Anaby et al., 2017; Novak et al., 2013). The research shows that interventions that focus on meaningful and functional activities in natural and real-world contexts have a positive effect on functional performance outcomes (Kilgour et al., 2022). The effectiveness of task-specific training interventions focussing on engaging, meaningful, and challenging tasks, which have been reported to maximise motor learning and neural plasticity has been reported (Te Velde et al., 2022). The cognitive orientation to daily occupational performance (CO-OP) approach and goal-directed training (GDT) are both task-specific intervention strategies used in occupational therapy for children with CP. These approaches aim to improve the child's occupational performance and functional status (Novak & Honan, 2019).

The CO-OP approach and GDT demonstrate both similarities and differences in their practices within the field of occupational therapy for enhancing functional outcomes. Both approaches share a common objective of promoting active engagement and meaningful participation in activities, emphasising client-centred interventions and individualised goal-setting to improve independent functioning. Also, both approaches emphasise achieving real-life task goals through repeated practice. Nevertheless, CO-OP and GDT diverge in their theoretical foundations and intervention strategies

(Jackman et al., 2022; Roostaei et al., 2022). CO-OP focusses on cultivating cognitive strategies and problem-solving skills, facilitating self-awareness and self-regulation through guided discovery and dynamic performance analysis. It aims to foster the transferability of acquired skills across various tasks, enhancing independent problem-solving abilities. The most important feature of CO-OP is that this approach uses collaborative goal-setting, dynamic performance analysis, global and domain-specific cognitive strategies, guided discovery, and enabling principles (Anderson et al., 2018). On the other hand, GDT is a task-based approach to achieving meaningful functional goals. GDT involves the systematic breakdown of activities into sequential steps, followed by a progressive increment in difficulty. Another difference of GDT is that it adapts the person-task-environment relationship to support goal achievement and allows the use of adaptive equipment when appropriate (Löwing et al., 2010). Through repetitive practice and skill development, GDT strives to optimise motor learning. In addition, the incorporation of adaptive equipment or assistive devices can be utilised to reinforce and expedite the advancement of functional skills (Robert et al., 2013).

The preference for the most appropriate intervention for optimising occupational performance and functional outcomes in individuals receiving occupational therapy services necessitates an evidence-based and client-centred approach (Case-Smith, 2014). Clinical decision-making should consider factors such as the individual's cognitive abilities, motor impairments, and specific functional goals (Buehler et al., 2019).

The choice between CO-OP and GDT depends on individual needs, preferences, and the therapist's expertise. Insights into CO-OP and GDT benefits and limitations can assist occupational therapists in providing evidence-based recommendations tailored to individual patient needs, thus promoting personalised therapy plans (Jeffery et al., 2021). As seen in the structuring of rehabilitation services highlighted by Kim et al., integrated approaches that consider functionality and context-specific requirements enhance overall treatment effectiveness (Kim et al., 2019). Furthermore, understanding these therapies' relative strengths could encourage the incorporation of diverse methodologies in multidisciplinary teams, thereby enriching therapeutic approaches offered to children with CP (D'Arrigo et al., 2020). In conclusion, comparing CO-OP and GDT is crucial due to existing gaps in therapy applications for CP, specifically regarding their functional outcomes and efficacy in clinical practice. Such comparative analysis will not only enhance the existing body of knowledge but also inform evidence-based practice and lead to improved quality of

life outcomes for children experiencing the multifaceted challenges of CP.

In the light of this valuable information, no study has been found comparing the effects of CO-OP and GDT methods on occupational performance and functional status in children with CP. Therefore, this study was planned to investigate and compare the impact of CO-OP and GDT on the occupational performance and functional status of children with CP.

2 | METHOD

2.1 | Design

This study was designed as a three-arm, single-blind, randomised, controlled trial to examine the effectiveness of CO-OP and GDT interventions as an adjunct to a conventional occupational therapy (COT) program on occupational performance and functional status in children with CP compared with their usual care. The study was performed according to the Consolidated Standards of Reporting Trials (CONSORT) checklist and with parallel group assignment using a 1:1:1 allocation ratio. This study was approved by the Ethics Committee of Hacettepe University. The study was carried out at Hacettepe University, Department of Occupational Therapy. Its protocol was approved by the appropriate ethical committee and was administered in accordance with the Declaration of Helsinki (approval no: GO 18/624). It was also registered with the clinical trial registry (Trial registration number: NCT06231901). Written informed consent for participation in the study was obtained from the participants and their legal representatives.

2.2 | Participants

A preliminary power analysis was performed prior to data collection using the G*Power (Version 3.1) software. The sample size was calculated because of the power analysis performed with 80% power and 5% error rate. A group-sample of 20 participants was obtained for each of the three groups. Seventy-five children were screened for eligibility as potential participants. The study inclusion criteria were as follows: (a) being between 5 and 10 years of age; (b) being diagnosed with CP; and (c) having sufficient language abilities to communicate effectively with the therapist and fully understand the information provided during the intervention, which was assessed through clinical observation. Participants were regarded as ineligible if (a) they were receiving any other rehabilitation interventions; (b) they had been diagnosed with

intellectual disability; (c) they had serious vision or hearing problems; (d) they were classified as GMFCS level V; and (e) they had additional comorbidities such as epilepsy or autism.

2.3 | Procedure

A total of 15 participants were excluded based on inclusion and exclusion criteria. The remaining 60 participants were divided into three equal groups of 20 children each: study group A, study group B, and control group C (Figure 1). The sample groups were randomly assigned using a simple randomisation method. The randomisation method was performed by an independent researcher, a biostatistician. The random assignment sequence was generated using a computer-based random number generator. Assignment confidentiality was ensured by having a third party prepare the envelopes and distribute the envelopes without involving them in the treatment process. The random assignment sequence was applied using pre-prepared, consecutively numbered, sealed envelopes by an independent statistician who was not involved in the enrolment of participants or the assignment of interventions. Assignment confidentiality was ensured using sealed, opaque envelopes. Each envelope contained the assigned group assignment and was opened only after a participant was enrolled and consented to. Participants were enrolled by a trained researcher (third author) who was unaware of the assignment sequence. The intervention assignment was performed by the same researcher who opened the sealed envelopes. The researcher who performed the pre-test and post-test was blinded to the group assignment. All included in the study were evaluated by a single evaluator (second author) at pre-test and post-test. Interventions were carried out by a single researcher with sufficient experience and equipment in the field (first author).

2.4 | Positionality statement

First author and second author are occupational therapists and clinical academics with experience and expertise in implementation research. Third author is a physical therapist and academics with experience and expertise in implementation research.

2.5 | Outcome measures

To accurately record the baseline characteristics of participants meeting the inclusion criteria and avoid any

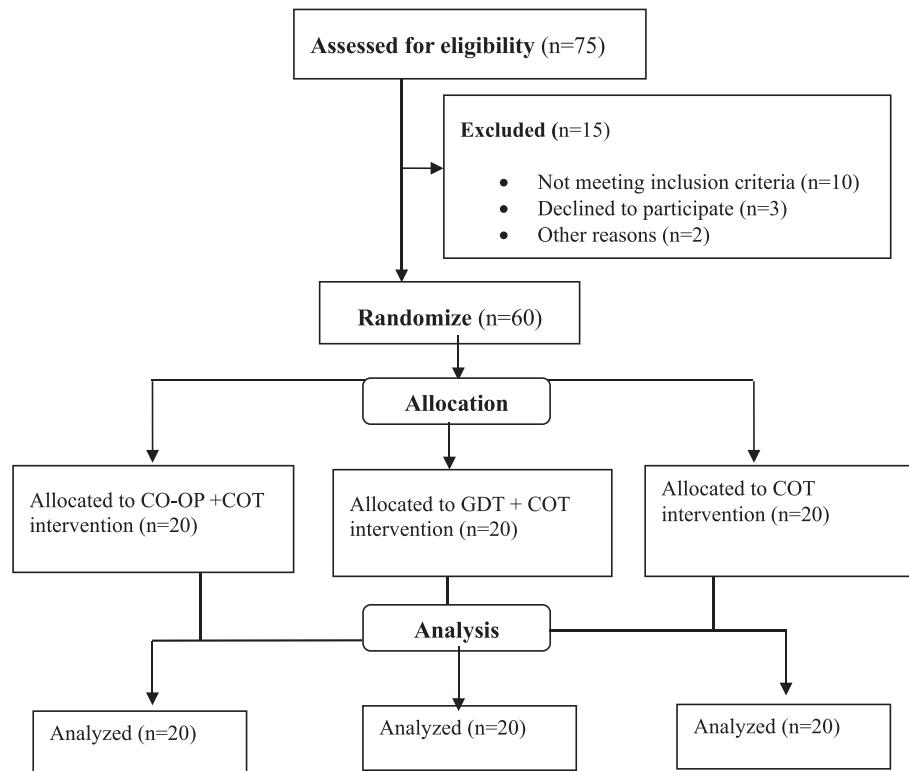


FIGURE 1 Flow chart.

bias in the assessment process, demographic information and baseline assessments, including Canadian Occupational Performance Measurement (COPM) and Paediatric Assessment of Disability Inventory (PEDI), were collected before randomisation. At the first evaluation, the demographic data of the children were recorded. Demographic information regarding age (years), gender, years of schooling, body mass index (BMI) (kg/m^2), and age of diagnosis (months) were collected. Participants also completed the COPM and PEDI, which are outcome measures. COPM was used to evaluate occupational performance and satisfaction. PEDI was employed to assess functional status. Outcome measurements were performed again after the intervention. Before and after the intervention assessments were conducted on different days than the first and last therapy sessions.

The PEDI complements the COPM by providing an objective measure of functional skills and capabilities, covering essential developmental domains such as mobility, self-care, and social function (Kurklinsky et al., 2016; Page et al., 2013). It serves to quantify the abilities of young children, vital in understanding the overall functional performance spectrum across various disabilities. Such evaluations are instrumental in developing evidence-based intervention strategies tailored to each child's unique needs (O'Donoghue et al., 2023; Yang

et al., 2017). The integration of both the COPM and PEDI in outcome measurement guarantees a holistic perspective, capturing not just subjective satisfaction and performance perceptions but also objective functional skills reflecting a child's capacities in everyday life (Eyssen et al., 2011; IJspeert et al., 2013).

2.5.1 | COPM

COPM is used to help individuals describe occupational performance problems and precedence in the areas of self-care, productivity, and leisure, in which they have difficulty performing (Law et al., 1998). The COPM was used to elicit child-set goals before treatment and then measure change from treatment. In the study, participants chose 'treatment goals' by rating on a 10-point Likert scale, which show their goals with regard to performance and satisfaction. Each child was asked to determine three targets. They assessed both performance and satisfaction on a 10-point scale for each goal. Performance and satisfaction scores were specified by dividing the total scores of performances and satisfaction by the number of activities that the children regard as target. In the Turkish population, the internal consistency coefficient of COPM was found to be between 0.9 and 1 (Torpil et al., 2021).

2.5.2 | PEDI

PEDI is a measurement tool used to evaluate the functional status of children. While it is especially used to determine the functions of young children, it can also be used for children over the age of 7 whose functional abilities are lower than that of a normally developing child (Haley et al., 1991). PEDI consists of three main parts: functional skills, caregiver assistance, and modifications. Each section evaluates the areas of self-care, mobility, and social function. Both Cronbach's α coefficients (≥ 0.98) and ICC values (≥ 0.96) were found to be high in the Turkish population (Erkin et al., 2007).

2.6 | Interventions

The control group C received the COT program. The study group A received the same program as Group C, plus CO-OP approach. The study group B received the same program as Group C and, in addition, received GDT. Each of the three groups received a session program for a total of 12 weeks, 2 days a week, one session a day for an average of 45–60 minutes (Das & Ganesh, 2019). Over the 12-week period, each participant received a total of 24 sessions of therapy. In Group A, participants received 60 minutes of CO-OP intervention followed by 60 minutes of COT intervention per session, twice a week, over the 12-week period. Similarly, in the Group B, participants received 60 minutes of GDT intervention followed by 60 minutes of COT intervention per session, twice a week, for 12 weeks. The Group C received 60 minutes of COT intervention per session, twice a week, for 12 weeks as well.

2.6.1 | CO-OP approach

With a task-specific and goal-focussed CO-OP approach; it is aimed to increase one's skills, to teach to use self-generated cognitive strategies, and to encourage generalisation and transfer to new situations and activities (Mandich & Polatajko, 2004). Initially, the therapist taught the children to use the global strategy to achieve their goals throughout the intervention. In all sessions, steps, including analysing the performance breakdown, developing strategies to increase performance, testing these strategies, and evaluating their success, were carried out. Within the framework of the intervention, children were guided to review the use and success of plans/strategies, to work on specific goals using the general strategy, to apply them, and to generalise the learned strategies to other life situations. Sessions were held

individually with all participants. In accordance with the CO-OP format, a single target was first worked on, then gradually the second and third targets were included (Gimeno et al., 2021).

2.6.2 | Goal directed training

GDT included the active implementation of task-specific activities related to the child's functional goals. Focussing on motor learning, GDT is an activity-based approach to therapy that uses meaningful, self-selected goals to provide opportunities for problem-solving and indirectly guide the movements necessary to successfully meet task demands (Mastos et al., 2007). By providing opportunities for problem-solving, the actions necessary to successfully meet the task demands were carried out on an activity-based basis. For this reason, while planning goal-oriented activities, internal motivation, internal control, and the freedom of the child to make a choice regardless of reality were taken into consideration. Motor learning principles are essential in the acquisition of functional skills in GDT. Practice, transfer of learning, increasing, difficulty, feedback, and repetition strategies were used in the sessions. The progression of difficulty was determined by specific performance benchmarks. These benchmarks included task completion time, success rate, the participant's level of independence, physical endurance, dual-task abilities, and movement speed. The difficulty level was gradually increased based on each participant's individual performance (Gabbett & Abernethy, 2012). Individual goals have been transformed into play activities that increase occupational participation according to the child's abilities, needs and learning potential. Positive, active experiences facilitated the adaptation of learned skills to daily life. In the GDT sessions, it focussed on maintaining the natural playfulness of child-centred activities. Instead, tasks were structured to foster intrinsic motivation by ensuring relevance and engagement, while adhering to the core principles of repetitive, goal-oriented practice within real-life contexts. Activity analysis was conducted to identify the factors that prevent or support the child's achievement of his goals (Graham et al., 2018).

2.6.3 | Conventional occupational therapy

The COT program included functional one-handed and two-handed training and consisted of advice and treatment aimed at reducing spasticity, improving hand function and activities of daily living, and providing appropriate orthoses. The COT program aims to improve

impairments (e.g., through stretching and sensory stimulation) and strengthen activities (e.g., motor training, environmental modification, and performing specific target activities) to help participants achieve their individual goals. Stretching exercises and sensory stimulation techniques were used to manage muscle tone and enhance the functional use of the affected extremities. Motor training methods were applied to improve both fine and gross motor skills. Additionally, strengthening activities and environmental modifications were implemented to promote functional independence. Through these motor activities, real-life scenarios that children encounter in their daily lives were simulated to enhance the effectiveness of the therapeutic process. The COT program included simulated daily tasks such as feeding, dressing, and personal care to help children develop essential life skills. Additionally, assistive devices such as orthoses were used. These devices provided biomechanical support, enabling children to perform motor tasks more effectively and efficiently (Park & Park, 2023; Pashmdarfard et al., 2021; Sathish et al., 2020).

2.7 | Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 22. The normality of the data distribution was examined by visual

and analytical methods. Group properties and outcome measures were defined using mean and standard deviations for continuous variables, while frequencies and ratios were used for categorical variables. One-Way-ANOVA was applied to compare the differences of normally distributed values such as age, school, BMI, and duration of diagnosis. Chi-square test was used to compare the differences of gender among the three groups. Cases where the *p*-value was below 0.05 were considered statistically significant (Greenland et al., 2016). Kruskal–Wallis test was applied to compare the differences of baseline data on the COPM and PEDI. Pairwise differences were compared using the Mann–Whitney *U* test and evaluated using Bonferroni correction. An overall 5% type-I error level was used to infer statistical significance.

3 | RESULTS

The demographic and clinical characteristics of the participants are shown in Table 1. There were no significant between-group differences with respect to age, schooling, BMI, duration of diagnosis, gender, and CP types (*p* > 0.05), supporting post-randomisation homogeneity among the groups.

The results of the data obtained from the outcome measures regarding the differences between the groups are shown in Table 2. While no significant difference

TABLE 1 The baseline demographic and clinical characteristics.

	Group A (<i>n</i> = 20) Mean ± SD	Group B (<i>n</i> = 20) Mean ± SD	Group C (<i>n</i> = 20) Mean ± SD	<i>p</i>
Age (year)	9.26 ± 2.15	7.46 ± 2.23	8.00 ± 1.88	0.06 ^a
Schooling (year)	3.66 ± 2.16	2.06 ± 2.05	2.13 ± 1.99	0.06 ^a
BMI (kg/m ²)	18.00 ± 3.82	17.17 ± 2.56	16.11 ± 3.68	0.32 ^a
Age of diagnosis (months)	17.93 ± 13.56	16.00 ± 12.80	9.00 ± 8.65	0.10 ^a
<i>n</i> (%)				
Gender				
Girl	11 (55)	8 (40)	9 (45)	0.53 ^b
Boy	9 (45)	12 (60)	11 (55)	
CP types				
Spastic CP	12 (%60)	11(%55)	13 (%65)	0.96 ^b
Dyskinetic CP	5 (%25)	6 (%30)	4 (%20)	
Ataxic CP	3 (%15)	3 (%15)	3 (%15)	

Note: *p*-values of <0.05 were considered significant.

Abbreviations: BMI, body mass index; CP, cerebral palsy; SD, standard deviation.

^aOne-way analysis of variance.

^bThe chi-square test.

TABLE 2 Comparison of intergroup values of Canadian occupational performance measurement and paediatric evaluation of disability inventory.

Variable	Baseline	End of treatment					p
	Group A (n = 20) mean ± SD	Group B (n = 20) mean ± SD	Group C (n = 20) mean ± SD	Group A (n = 20) mean ± SD	Group B (n = 20) mean ± SD	Group C (n = 20) mean ± SD	
COPM							
Occupational performance	2.27 ± 1.07	2.50 ± 1.03	2.51 ± 1.13	8.12 ± 1.44	5.70 ± 1.17	3.06 ± 1.03	<0.001
Occupational satisfaction	2.76 ± 1.21	2.68 ± 1.20	2.68 ± 1.20	8.90 ± 1.25	6.25 ± 1.53	2.68 ± 1.20	<0.001
PEDI							
Functional skills							
Self-care	56.0 ± 11.42	47.53 ± 14.97	47.73 ± 15.24	64.53 ± 10.09	48.40 ± 14.6	48.40 ± 15.08	0.001
Mobility	45.26 ± 12.91	37.20 ± 11.90	36.20 ± 14.54	51.86 ± 10.30	41.60 ± 12.61	36.60 ± 14.36	0.006
Social function	56.06 ± 6.16	45.80 ± 14.14	51.26 ± 10.66	59.13 ± 4.45	51.93 ± 12.74	51.53 ± 10.40	0.079
Total	157.40 ± 19.17	138.20 ± 37.38	134.86 ± 36.88	175.53 ± 20.01	142.06 ± 36.65	136.20 ± 36.34	0.003
Caregiver assistance							
Self-care	25.93 ± 7.56	18.06 ± 9.00	20.33 ± 9.57	32.13 ± 5.51	23.06 ± 9.30	20.73 ± 9.58	0.002
Mobility	27.20 ± 7.55	20.66 ± 9.91	19.93 ± 9.32	29.86 ± 7.79	24.06 ± 9.25	19.40 ± 10.15	0.006
Social function	21.20 ± 3.82	18.33 ± 5.78	21.40 ± 4.06	23.13 ± 2.58	21.66 ± 4.02	21.53 ± 3.79	0.363
Total	74.66 ± 14.43	57.06 ± 22.44	61.66 ± 21.49	85.13 ± 12.31	68.66 ± 20.02	61.66 ± 21.73	0.005

Note: Kruskal–Wallis test statistics were used to compare the baseline and end of treatment values among the groups without normal distribution. Significant *p*-value <0.05.

Abbreviations: COPM, Canadian Occupational Performance Measure; PEDI, Paediatric Evaluation of Disability Inventory.

was found in social function areas, which are subdomains of PEDI, statistically significant differences emerged in other areas ($p < 0.05$). The p -value was below the respectable critical threshold of 0.05, so post hoc pairwise multiple comparison tests were conducted to discern which of the pairs had significant differences.

Post hoc pairwise comparisons using Bonferroni-adjusted Mann–Whitney U tests ($\alpha = 0.0167$) showed in the Table 3. As shown in Table 3, significant differences were found in the pairwise comparison groups of the end-of-treatment COPM values ($p < 0.0167$). Group A has the highest average occupational performance and satisfaction values among the groups, with mean ranks of

21.57 for occupational performance and 21.70 for occupational satisfaction, as shown in Table 3. In contrast, Group C has the lowest mean ranks, with values of 9.43 for occupational performance and 9.30 for occupational satisfaction. Statistical comparisons indicate that these differences are significant ($p < 0.001$ for both occupational performance and satisfaction), confirming that Group A outperforms Groups B and C in both areas. As it regards PEDI values, the results suggest that Group A registered the most significant differences compared to Groups B and C ($p < 0.0167$). However, no statistically significant differences were found in the self-care, mobility, and total scores when comparing Groups B and C ($p > 0.0167$).

TABLE 3 Post hoc pairwise comparison for independent Kruskal–Wallis.

Variable	Pairwise comparison	Mean ranks	p
COPM			
Occupational performance	Group A > Group B	21.57/9.43	<0.001
	Group A > Group C	22.93/8.07	<0.001
	Group B > Group C	22.13/8.87	<0.001
Occupational satisfaction	Group A > Group B	21.70/9.30	<0.001
	Group A > Group C	22.97/8.03	<0.001
	Group B > Group C	22.50/8.50	<0.001
PEDI			
Functional skills			
Self-care	Group A > Group B	21.07/9.93	0.001
	Group A > Group C	20.60/10.40	0.001
	Group B > Group C	15.60/15.40	0.950
Mobility	Group A > Group B	19.80/11.20	0.007
	Group A > Group C	19.83/11.17	0.007
	Group B > group C	16.93/14.07	0.372
Total	Group A > Group B	20.07/10.93	0.004
	Group A > Group C	20.37/10.63	0.002
	Group B > Group C	16.20/14.80	0.663
Caregiver assistance			
Self-care	Group A > Group B	19.70/11.30	0.009
	Group A > Group C	20.70/10.30	0.001
	Group B > Group C	16.77/14.23	0.429
Mobility	Group A > Group B	18.53/12.47	0.056
	Group A > Group C	20.37/10.63	0.002
	Group B > group C	17.87/13.13	0.140
Total	Group A > Group B	19.17/11.83	0.022
	Group A > Group C	20.43/10.57	0.002
	Group B > Group C	17.23/13.77	0.280

Note: Post hoc Mann–Whitney test. Significant p -value < 0.0167 (Bonferroni correction).

Abbreviations: COPM, Canadian Occupational Performance Measure; PEDI, Paediatric Evaluation of Disability Inventory.

4 | DISCUSSION

This study aimed to investigate and compare the effects of CO-OP and GDT on the occupational performance and functional status of children with CP receiving COT. The findings showed that the CO-OP and GDT approach along with COT improved children's occupational performance and satisfaction scores. Additionally, in terms of functional status, positive improvements were seen in all areas except social function. In the intergroup comparison, it was detected that the group receiving the CO-OP approach along with COT had a greater effect on the levels of occupational performance and functional status than the group receiving the GDT approach along with COT.

Several studies have investigated the effectiveness of the CO-OP approach on occupational performance in children and young adults with various diagnoses such as CP, brain injury, and spina bifida (Jackman et al., 2018; Kolit & Ekici, 2022; Peny-Dahlstrand et al., 2020). The findings of these studies showed positive effects on occupational performance. In a study examining changes in physical activity participation from a targeted, family-centred intervention in children with disabilities, significant improvements in academic performance and satisfaction were observed (Willis et al., 2018). In the study examining whether constraint-induced movement therapy was more effective than GDT to improve occupational performance and participation in children with congenital hemiplegia, it was determined that significant gains were achieved on occupational performance in both groups (Sakzewski et al., 2011). In the systematic review, goal-directed occupational therapy has been shown to lead to significant improvements in occupational performance and/or self-care in children with unilateral CP (Novak et al., 2013). One of the important limitations of these studies comparing intervention methods in the literature was the lack of control groups. In a case study, positive effects of GDT on occupational performance and daily living activities were determined in two children with spastic CP (Lee & Kwon, 2020). The COPM was suggested to be clinically useful when a difference of more than 2 points was detected (Law et al., 1998). It was revealed that Group A and Group B showed an increase of more than 2 points in performance and satisfaction. As a result, when the values of the two groups were compared with the control group, a statistically significant and clinically effective increase was found in the performance and satisfaction of the treatment goals. However, when the effect levels are examined, it is seen that the group receiving CO-OP approach along with COT is more effective. The results of this study support the existing literature by suggesting that

the CO-OP approach along with COT is a clinically effective intervention in enhancing occupational performance in this population. Thus, we think that it would be valuable to add the CO-OP approach to routine therapy as an important complement to traditional rehabilitation services.

In a study examining the effects of the CO-OP approach on functional status in children with CP, it was observed that significant and positive gains were achieved in children receiving the CO-OP approach plus neurodevelopmental therapy (Kolit & Ekici, 2022). To our knowledge, there is no other study other than this study examining the effect of CO-OP on functional status in children with CP. The results of this study, which support the findings of our previous study, also point to positive effects on functional status. In a study comparing the effects of activity-focussed therapy and GDT on functional status in young children with CP, it was found that GDT provided better gains in terms of functional status other than social function (Löwing et al., 2009). A study involving six children with CP between the ages of 3 and 11 was conducted to define and evaluate a program containing intensive goal-directed motor skills training, and positive gains were achieved on functional status, especially in the subdomains of self-care and mobility (Knight & Feters, 2010). Based on the literature review, GDT appears to be effective in developing basic motor skills, increasing independence in self-care, and achieving goals in children with CP (Robert et al., 2013; Türker et al., 2015). In general, GDT is effective in improving hand function and self-care skills (Novak et al., 2013). According to the results of our study, only in the social function domain of PEDI, no significant differences were observed between the three groups. It was revealed that Group A had statistically significant differences and was more effective compared to other groups in terms of other subdomains of functional skills. No significant difference was observed between Groups B and C. In terms of the caregiver category, Group A was seen to be significantly more effective in the self-care sub-domain, while no difference was observed between Groups B and C. While there was no significant difference between Groups A and B in terms of mobility and total scores of the caregiver category, A was found to be more effective than Group C. Based on this information, we can say that the CO-OP approach along with COT is more effective than the GDT approach along with COT and alone COT in terms of functional skills. However, we can underline that the CO-OP approach along with COT is more effective than alone the COT in caregiver assistance, excluding self-care.

A possible explanation for the superior outcomes observed with the CO-OP approach combined with COT,

compared to the GDT approach with COT, can be found in the unique elements embedded within the CO-OP approach. The CO-OP method is characterised by its emphasis on cognitive engagement through a global problem-solving strategy that facilitates client self-reflection and the active development of personalised strategies (Wong et al., 2024). This cognitive orientation encourages individuals not only to perform tasks but also to analyse their performance dynamically, thereby fostering a greater transfer of learning and the development of self-management skills (Houldin et al., 2018). In contrast, the GDT approach along with COT emphasises more direct task training with less focus on explicit cognitive problem-solving processes, which may account for its relatively lesser impact on outcomes that benefit from active strategy formation and self-monitoring (Wolf et al., 2016). For clients who demonstrate the cognitive capacity for active self-reflection and can benefit from learning flexible problem-solving strategies, the CO-OP approach along with COT is likely to be the more effective choice (Wong et al., 2024). In contrast, for clients who may have significant cognitive limitations or who thrive in more structured, repetitive training environments, the GDT approach along with COT might be more appropriate as it may reduce cognitive load and focus on consistent, goal-directed practice (Dobkin et al., 2011). Ultimately, the choice of intervention should be informed by a thorough assessment of the client's cognitive abilities, readiness for self-directed learning, and specific occupational performance goals (McEwen et al., 2019).

This study has some limitations. Sample size was determined using a power analysis, and while it was adequate for detecting significant effects, future studies with larger sample sizes may provide even clearer insights into the clinically meaningful differences. Furthermore, the absence of follow-up assessments is another limitation of the study. To better understand the long-term impact of the intervention, future studies should include follow-up evaluations at 6- or 12-month intervals to determine whether the observed benefits are sustained over time.

5 | CONCLUSION

This study provides valuable target information investigating and comparing the effects on occupational performance and functional status in children with CP receiving CO-OP and GDT approach in addition to the COT program, which has not yet been adequately investigated in children with CP. It has been demonstrated that the CO-OP approach along with COT has stronger effects on occupational performance and functional status compared to the GDT approach along with COT. Our results

suggest that further studies with larger sample sizes and examining the effects on children with different diagnosis groups are needed to examine the long-term effects of CO-OP and GDT approach along with COT approaches in CP on occupational performance and functional status and different rehabilitation interventions.

AUTHOR CONTRIBUTIONS

Zeynep Kolit conceived the study, conducted the data collection, contributed to analyses, and writing of the manuscript. Rüya Gül Temel was responsible for the design of this study, conducted the data collection, carried out analyses, and manuscript preparation. Gamze Ekici supervised data collection, as well as carrying out analyses, and revision of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Approval was obtained from the ethics committee of Hacettepe University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

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