

Effect of Cognitive Orientation to Daily Occupational Performance (CO-OP) Programme on Playfulness in Children with Attention Deficit Hyperactivity Disorder

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Abstract:

Objective: To investigate the effect of cognitive orientation to daily occupational performance (CO-OP) programme on playfulness in children with attention deficit hyperactivity disorder.

Material and Methods: Seventy Attention deficit hyperactivity disorder participants (N=70), aged between 6–8 years were recruited from a local community-based setting. The children were divided into an experimental (n=35) and a control group (n=35). The experimental group participants received CO-OP and the control group participants received the conventional occupational therapy programme; for 12 weeks. The test on playfulness was used to measure playfulness in children.

Results: There were statistically significant differences between pretest and post-test scores of the test of playfulness (TOP) in the experimental group ($p\text{-value}\leq 0.05$) components of: Extent, Intensity and Skillfulness, and there were statistically significant differences between pretest and post-test group of TOP in the control group ($p\text{-value}\leq 0.05$) in Intensity and Skillfulness. There was no statistically significant difference in pretest and post-test scores of TOP in the component of Extent. Further analysis revealed that clinically there was significant differences in the post-test scores of TOP between the control and experimental group components of Extent, Intensity and Skillfulness.

Conclusion: CO-OP was effective in improving playfulness in children with attention deficit hyperactivity disorder.

Keywords: cognitive interventions, intrinsic motivation, occupational therapy, play

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Introduction

Children diagnosed with attention deficit hyperactivity disorder (ADHD) tend to participate less in cooperative and associative play compared to their typically developing peer, as highlighted by a research study¹. Another study² indicates that children with ADHD exhibit decreased playfulness. Additionally, researchers¹ discovered that these children face challenges when transitioning between different play activities. Furthermore, another study³ also reported that children with ADHD manifest greater instances of negative behaviors during play; including disruptions and breaches of rules. It's important to note that children lacking motivation to engage in an activity will encounter difficulties in sustaining the necessary effort to concentrate on that specific task⁴.

Children diagnosed with ADHD who display hyperactivity struggle to effectively manage their actions in response to different situations, often transitioning rapidly from one task to another⁴. In the context of play, children with ADHD exhibit reduced enthusiasm for engaging in specific activities and encounter challenges maintaining the necessary focus, thus prompting frequent task-switching and subsequently diminishing their level of playfulness. The presence of internal control plays a pivotal role in influencing intrinsic motivation⁵. Regrettably, children with ADHD experience a deficit in self-control, which manifests as hyperactive and impulsive behaviors, thereby impeding their ability to regulate themselves⁶. This lack of self-regulation leads to characteristic hyperactivity and impulsiveness seen in children with ADHD; ultimately contributing to their reduced inclination for playful interactions⁷.

Freedom⁸ to suspend reality, as the player is not bound by unnecessary constraints of reality, and is thus able to choose how close to objective reality a transaction will be. The capability to suspend reality is based on how taking control. Children with ADHD, who have less internal control, show less ability to suspend reality; which

indicates the children to be less playful. Framing⁸ is defined as a player's capacity to deliver and receive social cues in a game situation. Children with ADHD have impaired social functioning due to their inattention, impulsivity, and hyperactivity⁹. Hence, due to their lower capacity to offer and respond to social cues, children with ADHD are less likely to be playful.

According to one research¹⁰, fostering a strong parent-child relationship can contribute to an increase in playfulness. In another study¹¹, it was discovered that children who partook in community playgroup interventions displayed heightened levels of playfulness following their participation in these groups. The application of self-determination theory offers researchers a valuable framework to better comprehend children's motivations and eagerness to engage in various activities. This theory also aids in exploring the connections between self-determination theory and cognitive orientation to daily occupational performance (CO-OP)¹² programme. As per this perspective, a fundamental aspect of CO-OP involves an inherent drive to achieve competence, which entails children setting goals and leveraging their motivation to master tasks.

Need for the study

Children diagnosed with ADHD are often associated with reduced levels of playfulness, wherein their participation in associative and cooperative play tends to be limited¹. One study¹³ investigated the impact of CO-OP of children with ADHD, and revealed notable enhancements in both goal-setting and motor performance post-intervention. These findings provided substantial backing for the implementation of CO-OP for children affected by ADHD. In the realm of playfulness, intrinsic motivation emerges as a pivotal factor, representing a core aspect of playfulness¹⁴⁻⁹. Intrinsic motivation pertains to engagement in activities that are authentic, self-directed, and personally endorsed. The

pursuit of competence-driven intrinsic motivation holds significance within the framework of CO-OP, whereby children select their own objectives. CO-OP stands out as a methodology that bolsters intrinsic motivation.

However, as of now, no research has explored the impact of CO-OP on playfulness in the context of ADHD. Therefore, this present study aimed to ascertain the influence of CO-OP intervention on playfulness among children diagnosed with ADHD.

Material and Methods

Methodology

The study obtained approval from the institution ethical committee of SRM Medical College Hospital and Research Centre: ethical clearance no. 2089\IEC\2020. The research design was of a quasi-experimental study design. Seventy Attention deficit hyperactivity disorder participants (N=70) were recruited through convenience sampling. Participants were randomly allotted into either the control group (n=35) or the experimental group (n=35). Children diagnosed with ADHD, of both genders and aged 6 to 8 years were included. Children with motor disabilities and co-morbidity disorders with ADHD were excluded from the study.

Outcome measures

Vanderbilt ADHD diagnostic rating scale (VADRS):

The VADRS^{20,21} is an evaluative tool designed for parents of children aged 6 to 12 years. Its purpose is to assess the severity of symptoms associated with attention deficit hyperactivity disorder (ADHD). To diagnose ADHD, the child must meet the criteria for both inattention and hyperactivity. For the Predominantly Inattentive type, a score of 2 or 3 is required on at least 6 out of 9 items, from questions 1 to 9, along with a score of 4 or 5 on any of the performance questions; from 48 to 55. For the

Predominantly Hyperactive type, a score of 2 or 3 on at least 6 out of 9 items, from questions 10 to 18, is necessary, along with a score of 4 or 5 on any of the performance questions, from 48 to 55. The scale demonstrates strong internal reliability, as indicated by its Cronbach's alpha coefficient exceeding 0.90 (parent). Test-retest reliability was found to be satisfactory ($r > 0.80$). In terms of its predictive value, the VADRS exhibited a sensitivity of 0.80, specificity of 0.75, a positive predictive value of 0.19, and a negative predictive value of 0.98 when identifying cases of attention-deficit hyperactivity disorder^{20,21}.

Test of playfulness (TOP)

The TOP²² is an assessment tool designed to evaluate the play behavior of individuals ranging from 6 months to 18 years of age. The assessment comprises items that are assigned scores based on the observation of the individual's spontaneous play in both indoor and outdoor settings. For optimal reliability, it's recommended that the TOP assessment be conducted following play sessions lasting approximately 15 minutes. The items are scored on a 4-point Likert scale, focusing on three dimensions: Extent (ranging from 0, indicating rarely or never, to 3, signifying almost always), Intensity (ranging from 0, meaning not, to 3, indicating highly), and Skillfulness (ranging from 0, representing unskilled, to 3, indicating highly skilled). The TOP has shown evidence of excellent inter-rater reliability (data from 96% of raters fit the expectations of the Rasch model), moderate test-retest reliability (intraclass correlation 0.67 at p -value < 0.01) and construct validity (data from 93% of items and 98% of people fit Rasch expectations)²².

Data collection procedure

The researchers provided parents with a clear explanation of the study's objective and obtained written consent forms. They then randomly assigned children into either the experimental or control group. The experimental

group underwent CO-OP programme training, while the control group received conventional occupational therapy over a period of 12 weeks. A post-test was administered using the TOP. The experimental group engaged in 45 minutes of CO-OP intervention sessions. These sessions were tailored to each child's individualized goals. In the second session, the children were instructed on global strategies, such as GOAL-PLAN-DO-CHECK, as well as domain-specific strategies (DSS). They were trained to implement these strategies during their practice sessions.

Intervention (CO-OP)

Goal Plan Do Check

All the children involved in the study were able to apply the global strategies of Goal, Plan, Do and Check.

Goal: The children were initially oriented to the process of global strategies.

Plan: The strategy of planning was taught to each child, according to the goal they had set.

Do: Do was the task performance.

Check: Checking strategy was taught by making the children compare their play to the previous days or the previous week, and it helped them to see if they were improving or still needed to improve.

GOAL – What do I want to do?

PLAN – How am I going to do it?

DO – Do it (carry out the plan)

CHECK – How well did my plan work?

Below is the intervention program administered to the participants for CO-OP.

Table 1 Check strategy for CO-OP intervention

Check strategy	Description
Comparative discussion	Both the therapist and the child participate in a dialogue concerning the plan's efficacy in enhancing task performance.
Self-rating\ Evaluation	The child assesses their own performance.
General question and answer	The therapist inquires, "Did the plan work?" and awaits a simple "yes" or "no" response from the child.
Therapist evaluation	The therapist assesses the child's performance.

CO-OP=cognitive orientation to daily occupational performance

Table 2 Domain specific strategies for CO-OP interventions

Domain specific strategies	Description
Task specification	Conversations aimed at enhancing motor performance by modifying task requirements.
Verbal mnemonic	Identifying task elements that aid motor performance, via mental imagery.
Body position	The child or therapist verbalizing strategies about body or body part positioning to improve task performance.
Feeling the movement	Demonstrating movements through mime to help the child develop an understanding of the movement pattern.
Attention to doing	Aiding the child in maintaining task focus and fostering the development of performance analysis skills.
Verbal guidance	The therapist guides the child verbally through the task.
Verbal self- guidance	Child gives self-reminders.

CO-OP=cognitive orientation to daily occupational performance

Results

The data was analyzed using the Social Science Statistical Software (SPSS version 24.0), through a series of methods. Descriptive statistics were employed to assess data distribution and summarize the information. Non-parametric analysis techniques were chosen. The Wilcoxon signed rank test was utilized to analyze scores within each group for outcome measures, while the comparison of outcome measures between the groups was performed using the Mann-Whitney U test. The research aimed to determine if there was a statistically significant impact from the treatment provided and a significance level of $p\text{-value} \leq 0.05$ was applied to evaluate statistical significance.

Table 3 and Figure 1 present a comparison of pretest scores for the TOP between the control and experimental

groups. The results revealed no statistically significant difference between the control and experimental groups. This suggests that there was no substantial variance in the baseline of TOP scores between these two groups. Table 4 and Figure 2 exhibit a comparison of pretest scores for the individual elements of the TOP between the control and experimental groups. The findings indicated no statistically significant difference in these TOP elements between the control and experimental groups. Table 5 and Figure 3 depict the comparison of post-test scores for the TOP between the control and experimental groups. The outcomes demonstrated a clinically significant discrepancy in the post-test scores of the TOP components; specifically: Extent, Intensity, and Skillfulness. Table 6 and Figure 4 display the comparison of post-test scores for the individual elements of the TOP between the control and experimental groups.

Table 3 Comparison of pretest scores of test of playfulness between the control and experimental groups

Components of TOP	Group	Mean	S.D.	$\mu\text{-value}$	$p\text{-value}$
Extent	Experimental	11.00	3.317	-1.471	0.141
	Control	8.40	2.408		
Intensity	Experimental	2.00	0.707	-1.386	0.166
	Control	1.40	0.548		
Skillfulness	Experimental	5.60	2.047	-1.792	0.073
	Control	3.20	1.483		

$p\text{-value} \leq 0.05$ The results indicated that there was no statistically significant distinction in the pretest scores of the Test of Playfulness (TOP) components; namely: Extent, Intensity, and Skillfulness ($\mu = -1.471$, $p\text{-value} = 0.141$; $\mu = -1.386$, $p\text{-value} = 0.166$; $\mu = -1.792$, $p\text{-value} = 0.073$, respectively), between the control and experimental groups

Table 4 Comparison of pretest scores of elements of test of playfulness between and the control and experimental groups

Elements of TOP	Group	Mean	S.D.	$\mu\text{-value}$	$p\text{-value}$
Intrinsic motivation	Control	4.40	0.548	-0.346	0.729
	Experimental	4.20	0.834		
Internal control	Control	3.40	1.517	-1.935	0.052
	Experimental	8.80	1.643		
Freedom to suspend reality	Control	3.20	1.483	-0.759	0.448
	Experimental	2.40	1.949		
Framing	Control	2.60	2.074	-1.581	0.114
	Experimental	5.00	2.646		

$p\text{-value} \leq 0.05$ The results show that there was no statistically significant difference in elements of TOP between the control and experimental groups in Intrinsic motivation, Internal control, Freedom to suspend reality and framing ($\mu = -0.346$, $p\text{-value} = 0.729$; $\mu = -1.935$, $p\text{-value} = 0.052$; $\mu = -0.759$, $p\text{-value} = 0.448$; $\mu = -1.581$, $p\text{-value} = 0.114$, respectively)

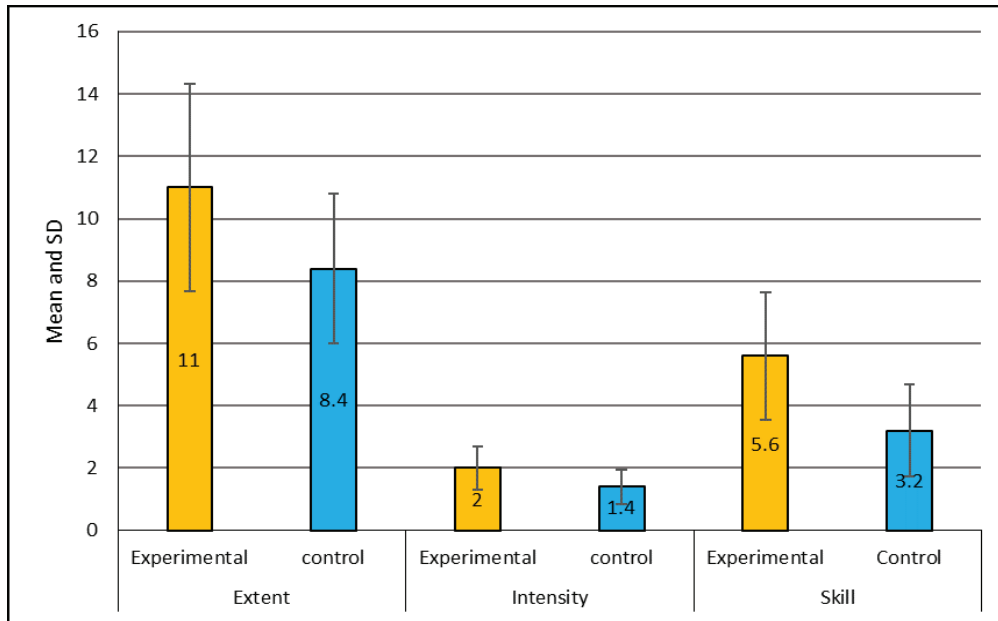


Figure 1 Comparison of pretest scores of test of playfulness between the control and experimental groups

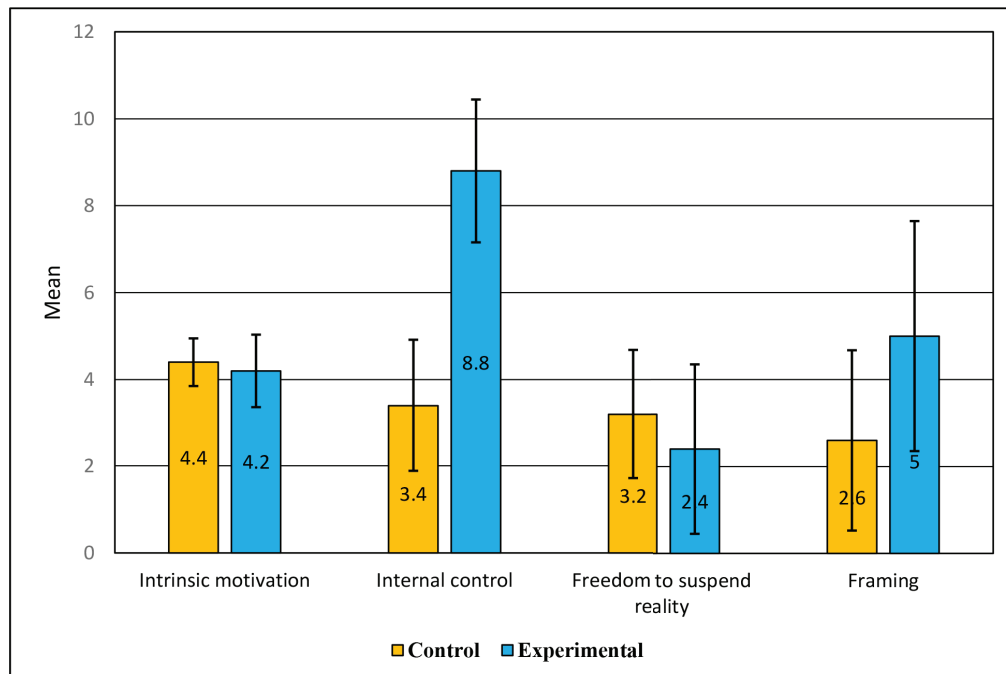


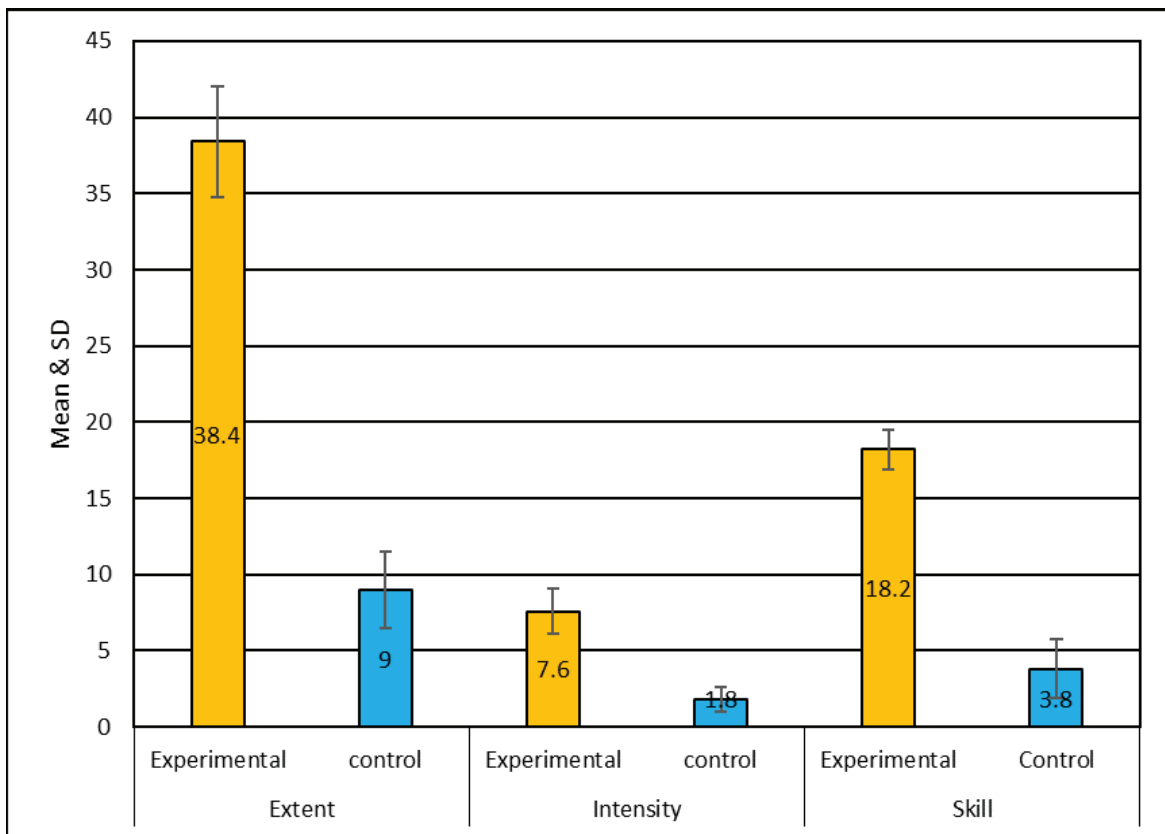
Figure 2 Comparison of pretest scores of elements of test of playfulness between and the control and experimental groups

Table 5 Comparison of post test scores of test of playfulness between the control and experimental groups

Components of TOP	Group	Mean	S.D.	μ -value	p-value
Extent	Experimental	38.40	3.647	-2.619	0.009 S
	Control	9.00	2.550		
Intensity	Experimental	7.60	1.517	-2.643	0.008 S
	Control	1.80	0.837		
Skillfulness	Experimental	18.20	1.304	-2.619	0.009 S
	Control	3.80	1.924		

TOP=test of playfulness, S.D.=standard deviation, S=significant

p -value \leq 0.05 The findings demonstrated a clinically noticeable distinction in the post-test scores of the TOP components: Extent, Intensity, and Skillfulness (μ =-2.619, p -value=0.009; μ =-2.643, p -value=0.008; μ =-2.619, p -value=0.009, respectively), between the control and experimental groups.



S.D.=standard deviation

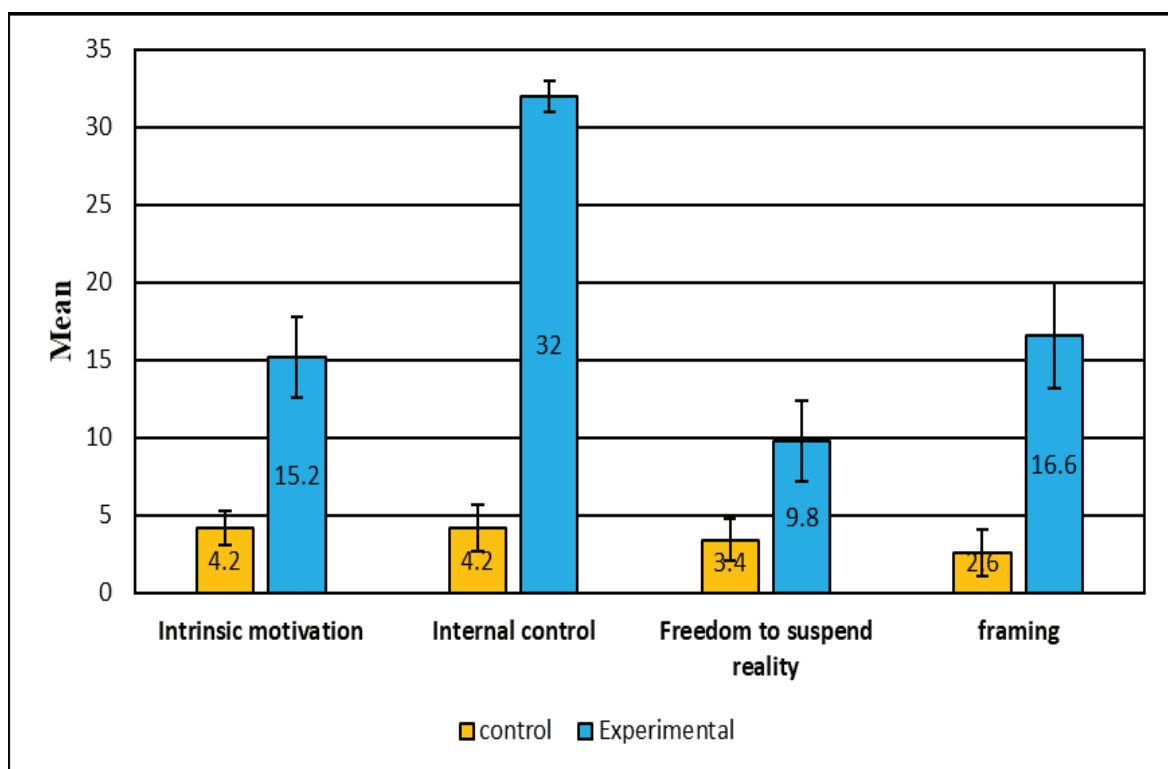
Figure 3 Comparison of post test scores of test of playfulness between the control and experimental groups

Table 6 Comparison of post test scores of elements of test of playfulness between the control and experimental groups

Elements of TOP	Group	Mean	S.D.	μ -value	p-value
Intrinsic motivation	Control	4.20	1.095	-2.643	0.008
	Experimental	15.20	2.588		
Internal control	Control	4.20	1.483	-2.635	0.008
	Experimental	32.00	1.000		
Freedom to suspend reality	Control	3.40	1.342	-2.694	0.007
	Experimental	9.80	2.588		
Framing	Control	2.60	1.517	-2.619	0.009
	Experimental	16.60	3.362		

TOP=test of playfulness, S.D.=standard deviation

p-value \leq 0.05 The findings indicated a statistically significant distinction in the components of the TOP between the control and experimental groups, in terms of Intrinsic motivation, Internal control, Freedom to suspend reality, and Framing (μ =-2.643, p-value=0.008; μ =-2.635, p-value=0.008; μ =-2.694, p-value=0.007; μ =-2.619, p-value=0.009, respectively).

**Figure 4** Comparison of post test scores of elements of test of playfulness between the control and experimental groups

Discussion

Children with ADHD frequently encounter challenges related to gross motor coordination, fine motor skills, and bilateral coordination, which can impact their overall CO-OP. These difficulties can have a direct influence on their participation in play activities. The outcome indicated a statistically significant distinction in these TOP elements between the control and experimental groups. These findings align with the outcomes of a previous study²⁴, which affirmed that intrinsically motivated children tend to exhibit elevated levels of spontaneous interest, excitement, self-assuredness, perseverance and creativity. Similarly, this current study's results suggest that the implementation of CO-OP programme intervention led to enhancements in the elements of TOP. CO-OP, which focuses on a child's occupational and social roles, along with their activities and the contextual settings that either facilitate or hinder their performance. Its primary aim is to foster skill acquisition through the utilization of cognitive strategies. As such, CO-OP represents a valuable addition to the toolkit of occupational therapy practices²⁵. Occupational therapists play a crucial role in employing play-based interventions for children with developmental disabilities, leveraging the frameworks provided by play models²⁶⁻²⁹. Various play-based interventions³⁰ have been designed for children with ADHD, and among them, CO-OP³¹ stands out as an emerging evidence-based approach that has demonstrated positive outcomes in enhancing playfulness in children³².

There are certain limitations to this research. The sample lacked gender and age matching and, in addition, the study's setting was shifted from a clinic to a community environment, which limited resource availability. Furthermore, certain outdoor activities that were initially planned had to be curtailed due to adverse weather conditions. However, this present study will help to understand the effect of CO-OP on playfulness in children with ADHD.

Moreover, this strategy could be used as an application not just in children with ADHD but also in those with other conditions. Overall, this study guides occupational therapists to focus on CO-OP to improve playfulness in children with ADHD.

Conclusion

The current research contributes to the comprehension of how CO-OP influence playfulness in children with ADHD. In essence, this study offers valuable insights for occupational therapists, directing their attention toward the utilization of CO-OP as an avenue to enhance playfulness in children with ADHD. In addition to expanding the applicability of these findings, the study's design could be replicated using a larger and more representative sample. Furthermore, exploring the application of this study across various clinical populations could provide a further understanding of its application. Moreover, future research endeavors could involve follow-up studies to assess the long-term impact of CO-OP on playfulness in children with ADHD.

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Conflict of interest

The corresponding author as well as the other authors declare no conflict of interest.

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