The Open Journal of Occupational Therapy

Volume 9
Issue 3 *Summer 2021*

Article 14

July 2021

Cognitive Orientation to Daily Occupational Performance (CO-OP): 1-week Group Intervention with Children Referred for Motor Coordination Difficulties

Rose Martini
University of Ottawa – Canada, rmartini@uottawa.ca

Jacinthe Savard
University of Ottawa – Canada, jsavard@uottawa.ca

Recommended Citation

Martini, R., & Savard, J. (2021). Cognitive Orientation to Daily Occupational Performance (CO-OP): 1-week Group Intervention with Children Referred for Motor Coordination Difficulties. *The Open Journal of Occupational Therapy, 9*(3), 1-14. https://doi.org/10.15453/2168-6408.1765

Cognitive Orientation to Daily Occupational Performance (CO-OP): 1-week Group Intervention with Children Referred for Motor Coordination Difficulties

Abstract

Background: The aim of this study was to explore the effectiveness of a Cognitive Orientation to daily Occupational Performance (CO-OP) intervention delivered in a group format in a 1-week summer day camp program for children referred for motor coordination difficulties. Transfer of learned skills to self-selected tasks not addressed in the group intervention was also explored.

Method: A quasi-experimental one group pretest-posttest design with a 1-month follow-up was used. Changes in nine children's self-selected occupational performance goals, as well as their sense of self-efficacy for these goals, were determined using nonparametric statistics.

Results: Findings indicate a significant performance improvement at both posttest and follow-up, with large effect sizes. Self-efficacy also significantly changed across sessions on tasks directly addressed, with large effect sizes. No statistically significant changes for any of the measures were noted for the tasks that were not addressed during camp.

Conclusion: The CO-OP in group format in an intensive 4-day summer day camp was effective in improving performance of self-selected camp goals, as well as self-efficacy, but less effective for transfer of learned skills to other tasks.

Comments

The authors declare that they have no significant competing financial, professional, or personal interest that might have influenced the performance or presentation of the work described in this manuscript.

Keywords

Cognitive Orientation to Daily Occupational Performance (CO-OP), developmental coordination disorder, group, children, transfer

Cover Page Footnote

Special thank you to all the children and parents who participated in this study, the occupational therapists and speech language pathologist who collaborated in organizing and implementing the camp, the occupational therapy students who helped with the data collection and video analysis, as well as those who volunteered to videotape.

Credentials Display

Rose Martini, PhD, OT Reg (Ont), OT(C)

Jacinthe Savard, PhD, OT Reg (Ont), OT(C)

DOI: 10.15453/2168-6408.1765

Children with movement difficulties, such as developmental coordination disorder (DCD), have difficulty learning and generalizing motor skills, to the point that they experience problems in daily activities like dressing, writing, and playing (American Psychiatric Association, 2013). These motor difficulties are often complicated by a high rate of co-occurrence with other developmental and behavioral disorders (e.g., attention deficit and hyper activity, speech and language disabilities, reading and mathematical learning disabilities), ranging from 23.9% to 33.6%, with the highest co-occurrence in speech and language disabilities (Pieters et al., 2012). Furthermore, these children experience a lower sense of self-efficacy for undertaking academic and recreational activities (Engel-Yeger & Hanna Kasis, 2010).

The Cognitive Orientation to daily Occupational Performance (CO-OP) is a task-oriented intervention approach that was developed to support skill acquisition in children (Polatajko et al., 2001). The CO-OP is a client-centered approach founded on principles of motor learning and strategy use and was originally developed for children with DCD (Missiuna et al., 2001). It centers on the global strategy of Goal-Plan-Do-Check, which provides an iterative problem-solving framework that can be applied to various tasks and situations. If the plan did not work, then the therapist engages the child in a problem-solving discourse, guiding him or her to discover (guided discovery) (a) the aspects of the plan that did not work and (b) the possible strategies to implement in the plan to overcome the difficulties. The new plan is then implemented, the resulting performance verified, and the guided discovery process continued (Polatajko & Mandich, 2004).

The effectiveness of the CO-OP for improving tasks worked on during therapy, using an individual therapist-child format, with pre-school and school-age children with motor difficulties has been demonstrated (Araújo et al., 2019; Capistran & Martini, 2016; Miller et al., 2001; Taylor et al., 2007). Capistran and Martini (2016) and Araújo et al. (2019) also explored the CO-OP's effect on transfer by determining improvement on tasks not addressed during sessions. Both studies obtained mixed results with some children showing improvement while others did not. In addition to positive effects on task performance, anecdotal data suggests that the CO-OP also has a positive effect on children's self-efficacy (Mandich et al., 2003). The present study aims to further explore the effect of the CO-OP on transfer and self-efficacy.

The use of group intervention is increasingly encouraged because of the fiscal advantages afforded by this intervention format (Camden et al., 2012). A group format also allows for therapists to address more psychosocial objectives, such as confidence, self-efficacy, and self-esteem (DeLucia-Waack, 2006). A CO-OP approach in a group format has been successfully implemented with children with DCD by Chan (2007) in seven weekly group sessions and Green et al. (2008) in 20 weekly group sessions. While Chan obtained statistically significant changes on the Canadian Occupational Performance Measure (COPM)'s perceived task performance and Green et al. obtained statistically significant changes on the Movement Assessment Battery for Children (MABC-2) scores, neither objectively determined the effectiveness of the CO-OP in a group format on improving actual performance of self-selected goals. Thornton et al. (2016) implemented a 10-week group-based CO-OP intervention (three to four children per group) with 20 children 8–10 years of age identified with DCD and obtained significant pre-post scores on the Goal Attainment Scale on goals worked on during sessions. Another study explored group CO-OP intervention where children with DCD participated alongside their mothers (Anderson et al., 2018) for 10 weekly 90-min sessions. The four participants in this study, 7–9 years of age, showed increases in the COPM perceived performance and satisfaction on their handwriting, dressing, and ball skills goals.

Improvement in Performance Quality Rating Scale scores were noted on nine of 12 goals (Anderson et al., 2018). No study to date has determined whether group CO-OP delivered in an intensive 1-week day camp is effective with respect to skill acquisition, generalization, and transfer to a task not addressed during therapy sessions, and no study to date has examined whether group CO-OP influences self-efficacy in children with motor difficulties.

The purpose of the present study was to determine the impact of the CO-OP intervention delivered in a group format during a 4-day summer day camp on improving children's self-selected occupational performance goals, as well as their sense of self-efficacy for these goals. As it is hoped that the CO-OP intervention leads to generalization and transfer of learning to tasks other than the ones worked on in therapy (Polatajko & Mandich, 2004), an ensuing objective was whether the CO-OP intervention would improve performance on a self-selected goal not addressed during therapy sessions.

Method

This study took place in a clinical milieu, in the context of two 1-week summer day camps. A quasi-experimental one group pretest-posttest design with a 1-month follow-up was used. Such a design is appropriate when evaluating real-world effectiveness of an intervention implemented by clinical staff rather than efficacy of intervention implemented by research staff under research conditions (Maciejewski, 2020; Thorpe et al., 2009).

Summer Day Camp

The summer day camp was developed to address a clinic's long waiting list. The participants were recruited from referrals to the clinic. The clinic occupational therapist was trained in the CO-OP approach by the first author, a trained CO-OP therapist and instructor. The first author also ensured fidelity in the CO-OP administration by reviewing videos with the therapist at the end of each camp day.

The day camp (from 9am to 4pm) followed the protocol described in Martini et al. (2014) whereby it consisted of an array of games and activities (e.g., swimming, going to the park) and children participated in two 50-min CO-OP group intervention sessions per day, for a total of eight sessions over 5 days. For the group CO-OP intervention sessions, the adult child ratio for each camp week was three adults to six children. The adults included: a CO-OP trained occupational therapist who was always present; four professional master's in occupational therapy students who took turns videotaping and assisting with the intervention; and a clinic speech pathologist knowledgeable about the CO-OP approach, but not trained, who was present for about three of the eight group CO-OP sessions. During the day camp, each child worked on at least one of the goals that they had identified, as well as tasks that were identified as goals by other children. As in the individual CO-OP intervention sessions, the children participating in this group format were encouraged to participate in the strategy use process, not only through guided self-reflection, but also by observing other children undertaking activities and identifying performance breakdowns (also guided by one of the adults). Other children's suggestions were also incorporated during the guided discovery process. The CO-OP trained occupational therapist also used reinforcement, modeling, and shaping when needed with various children.

Participants

Twelve children, 6–9 years of age, were recruited to participate in a 4-day summer day camp program delivered in a CO-OP framework. Two 1-week camp sessions (with six children in each week) took place. Both 1-week camps took place over 4 days because one camp day was a statutory holiday or a day-outing where self-selected camp goals could not be addressed. Children were included in the study if they were referred to the University Interprofessional Clinic for motor coordination difficulties, were

not identified as having intellectual delay (as per clinical or parental report), and were able to identify at least three occupational performance goals (i.e., activities and tasks they wanted or needed to do but were not able to do, as identified by the child).

Preliminary Descriptive Measures

Two preliminary measures were used to describe the participants with respect to their psychomotor skills (Movement Assessment Battery for Children, 2nd edition [MABC-2]) and their impact on daily living (Developmental Coordination Disorder Questionnaire-French Canadian [DCDQ-FC]). The MABC-2 is a normative measure designed to identify children 3–17 years of age with motor difficulties (Henderson et al., 2007) with reasonable test-retest reliability (Wuang et al., 2012). The DCDQ-FC is the French-Canadian cultural adaptation of the Developmental Coordination Disorder Questionnaire (DCDQ), an activity-focused questionnaire developed to screen children for DCD. It has excellent internal consistency and test-retest reliability and adequate concurrent and construct validity (Martini et al., 2011).

Pre/Post Follow-Up Outcome Measures

Performance Quality Rating Scale-Operational Definitions (PQRS-OD)

The PQRS operational definitions version (PQRS-OD) is a unique, objective measure of performance and quality of client-selected activities whereby performances of client-selected activities are rated from video recordings by a blinded independent observer using a 1 to 10 point scale (Martini et al., 2015). For this version of the PQRS, operational definitions are developed for at least every other numerical rating for each of the self-selected goals identified. This 10-point scale has been found to be reliable and responsive (Martini et al., 2015). The reliability of this measure was further verified for this study where an excellent interrater reliability (ICC = 0.95) was obtained using a random selection of 20% of the videos. The videos were randomized and then rated by a master's in occupational therapy student who was trained in the use of the PQRS by the first author and was blind to the session and week of video.

Perceived Self-Efficacy Scale

The children's perceived self-efficacy was rated using a 10-point Likert response scale inspired from Chase (1997; as cited in Feltz & Chase, 1998) that consisted of five circles ranging in size from small to progressively larger circles placed under the numbers. The smaller circle, under the lower numbers, represented low feelings of self-efficacy, with progressively larger circles under the greater numbers representing greater feelings of self-efficacy. This scale has been used in previous research and found to be effective in measuring self-efficacy (Clark & Ste-Marie, 2007; Chase, 1997, as cited in Feltz & Chase, 1998). As instructed by Bandura (2006), the self-efficacy question and scales were tailored for each different activity so that each activity reflected gradations of challenges to successful performance. As recommended, prior to administering the scale for the first time, the researchers ensured that the children understood the concept of self-efficacy, a judgement of capability to execute a type of performance (i.e., "how certain are you that you can" [Bandura, 2006]), and a practice item was used to (a) familiarize them with the 10-point scale and (b) clarify possible misunderstanding about the concept or scale. For the practice task, markers were placed on the floor at progressively further distances and children were asked to identify on the scale (1 = *cannot do it* to 10 = *certain I can do it*) how confident they were that they could jump to each of the distances. The perceived self-efficacy scale was administered prior to the PQRS-OD.

Canadian Occupational Performance Measure (COPM)

The COPM (Law et al., 2005) is a measure designed to identify and prioritize (using an importance scale) occupational performance issues, as well as self-perceived performance and satisfaction in these

identified problematic activities. As recommended for use with young children, scoring cards were modified with illustrations (e.g., happy and sad faces on extremes of scoring continua) and therapists ensured each child's understanding of the 10-point scale as well as the COPM concepts (importance, performance, satisfaction) (COPM, n.d.). The perceived performance and satisfaction scores were obtained at pretest, posttest, and follow-up.

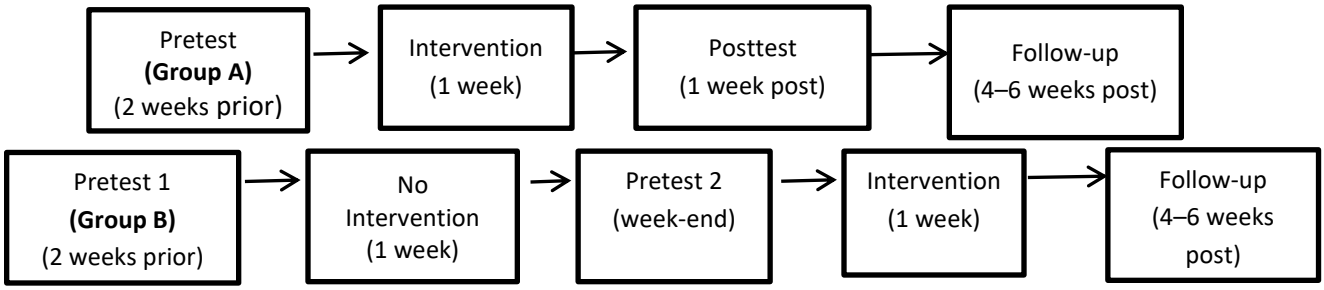
Procedures

This study was approved by the university research ethics board. For all of the participants, parent consent was obtained by the first author and child assent was obtained by the clinic's occupational therapist at the goal identification session. The occupational therapist administered the preliminary descriptive measures and the COPM (for goal identification). Only activities that the child identified as greater than seven on the COPM's importance scale were considered for the camp. A maximum of four activities could be practiced with children using the CO-OP approach during the summer day camp program. When selecting the activities for the camp sessions, we ensured that we would be able to address at least one goal that had been identified by each child. As a result of this process, four children had two goals directly addressed during the day camp group sessions (Participants 1, 4, 7, and 8), and five children (Participants 2, 3, 5, 6, and 9) had only one of their own goals addressed during the camp therapy sessions (see Figure 2). Each child also had at least one goal that was not addressed during the camp therapy sessions.

Once goals were confirmed, pre/post/follow-up outcome measures were administered. To determine the impact of the intervention, outcome measures were administered over three different time points: (a) in a 2-week period prior to the first week of camp (pretest), (b) in a 2-week period after the end of the camp week (posttest), and (c) in 4 to 6 weeks after the posttest (follow-up). To lessen concerns regarding the lack of a control group, the participants from the second camp week acted as historical controls and were also seen prior to the first week of camp (they did not receive any intervention during the first week of camp); as such, these participants obtained two pretest measures on the PQRS-OD (see Figure 1).

Figure 1

Research Design



The CO-OP approach was briefly explained to the parents. They were provided with the day camp schedule and invited to observe as many sessions as they wished. At the end of each camp day, the parents were asked to attend a half-hour review session where plans and strategies discovered over the course of the day were reviewed and homework for the evening discussed. The parents were provided with a journal to keep track of homework and strategies used at home, as well as to communicate other observations or comments around the summer day camp and the CO-OP intervention approach.

Analysis

To effectively control for the probability of Type I errors because of the low number of participants, analyses were undertaken using non-parametric tests. Resource constraints and ethical considerations meant it was not possible to include a genuine control group. Instead, to provide some confidence that change in task performance between pretest and posttest was indeed a result of the intervention, the Week 2 children served as a historical control group for the Week 1 group. A Mann-Whitney U test was performed on PQRS-OD change scores from pretest to posttest for Week 1 participants and from Pretest 1 to Pretest 2 for Week 2 participants.

To maximize power, analyses to determine intervention effectiveness were conducted with all of the participants. The Friedman test was used to determine whether the children improved in the performance of their goals worked on during the camp week. The Wilcoxon test was used as a post hoc test. A Holm-Bonferroni sequential approach was used as a correction for multiple testing. To optimize statistical power, the participants of both weeks were merged for these analyses determining improvement on goal performance.

The effect size estimates for the Mann-Whitney U and the Wilcoxon tests were calculated using the formula $r = Z$ / sq rt N, where N is the number of observations over the two time points (Grisson & Kim, 2012). These were interpreted as per Cohen's (1992) criteria of r effects: small $\geq .10$, medium $\geq .30$, large $\geq .50$. This same analysis was done with goals not addressed during day camp sessions to determine whether any transfer of learning was obtained and to determine changes in self-efficacy, perceived performance, or self-satisfaction.

Results

Twelve day camp participants were recruited. The parents of one participant informed us that their child could no longer participate in the camp; another participant lived a significant distance out of town, which made pretest and follow-up data collection impossible; and a third participant assented to participate in day camp activities but refused to participate in any of the data collection tasks. As such, nine participants (five girls, four boys) were included in the analysis: six (of six camp participants) from the first day camp session and three (of five camp participants) from the second day camp session. The study participants' demographics and their goals are presented in Table 1. Because of the small numbers, to corroborate statistical findings, individual participant scores are illustrated in Figure 2 and means with confidence intervals are provided in Table 2. As the camp was run in a clinical milieu, all of the children referred to the clinic for motor coordination difficulties participated in the summer camp, including two who did not meet all the DSM-5 criteria for a DCD diagnosis. All analyses were run with and without these two participants and their inclusion did not change the overall results. To maximize power, analyses were conducted with all nine participants.

Table 1

Participant Demographics and Goals

	Gender	Age (years, months)	MABC-2 (percentile)	DCDQ-FC (score)	Camp week	Intervention goals (goals worked on at camp)	Generalization goals (goals not directly addressed at camp)
1	F	8,6	13th	55 (suspect DCD)	1	-tie shoelaces -jump rope	-throw a basketball in basket
2	F	8,6	< 1st	53 (suspect DCD)	1	-tie shoelaces	-tennis serve

	Gender	Age (years, months)	MABC-2 (percentile)	DCDQ-FC (score)	Camp week	Intervention goals (goals worked on at camp)	Generalization goals (goals not directly addressed at camp)
3	M	7,7	29th	23 (suspect DCD)	1	-bicycle (2 wheels)	-get a soccer ball away from opposing player
4	F	8,6	6th	51 (suspect DCD)	1	-tie shoelaces -skip rope individually	-count money
5	M	9,9	< 1st	32 (suspect DCD)	1	-swing on a swing by himself	-make a clay Pokémon® figure
6	F	6,6	15th	52 (not suspect DCD)	1	-bicycle (2 wheels)	-cut a shape along the lines
7	F	8,0	29th	32 (suspect DCD)	2	-tie shoelaces	-catch and throw a baseball
8	M	7,10	< 1st	not returned	2	-swing on a swing by himself -tie shoelaces	-build a Lego® car
9	M	7,3	< 1st	55 (not suspect DCD)	2	-bicycle (2 wheels)	-build a Lego® robot

Table 2

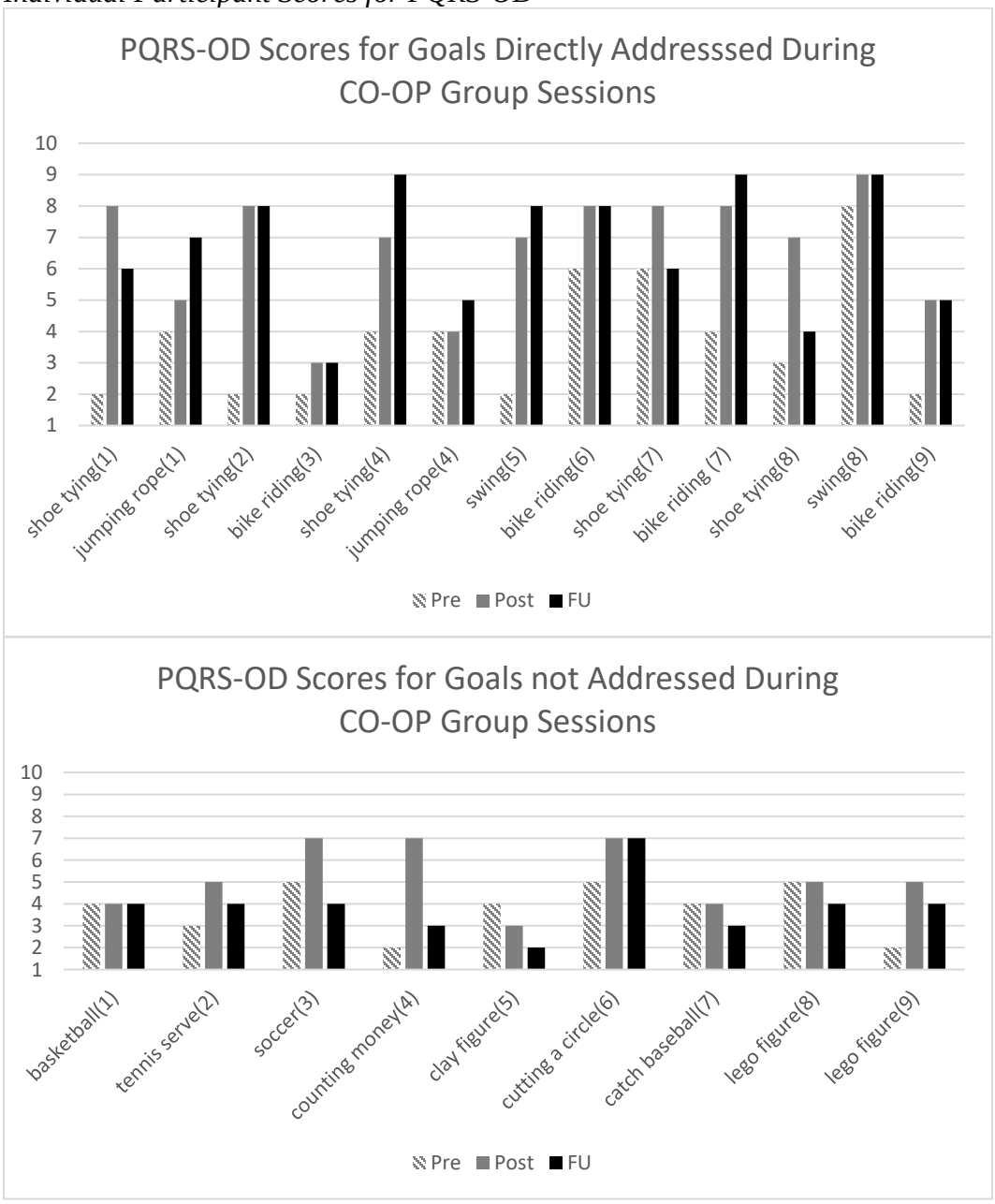
Pre/Post/Follow-Up Measures Means and Confidence Intervals

Goal	Sessions	Mean	95% CI
PQRS-OD			
Directly addressed goals	Pretest	3.77	[2.39, 4.78]
	Posttest	6.69	[5.39, 7.78]
	Follow-up	6.69	[5.27, 7.90]
Goals not addressed	Pretest	3.78	[2.08, 5.93]
	Posttest	5.22	[3.59, 6.41]
	Follow-up	3.89	[2.70, 4.16]
Self-Efficacy			
Directly addressed goals	Pretest	4.23	[1.73, 5.72]
	Posttest	8.92	[7.35, 10.28]
	Follow-up	8.38	[6.31, 10.05]
Goals not addressed	Pretest	5.00	[2.45, 7.84]
	Posttest	5.22	[3.10, 7.47]
	Follow-up	6.11	[3.76, 7.95]
COPM Performance			
Directly addressed goals	Pretest	5.08	[2.60, 7.76]
	Posttest	9.23	[8.03, 10.15]
	Follow-up	7.92	[6.29, 8.80]
Goals not addressed	Pretest	5.56	[1.93, 6.93]
	Posttest	6.89	[4.61, 9.39]
	Follow-up	7.44	[4.51, 8.63]

Note. CI = Confidence Interval; PQRS-OD = Performance Quality Rating Scale-Operational Definitions; COPM = Canadian Occupational Performance Measure.

Figure 2

Individual Participant Scores for PQRS-OD



Note. (n) = participant; Pre = Pretest score; Post = Posttest score; FU = 3-month follow-up score; PQRS-OD = Performance Quality Rating Scale-Operational Definitions.

Task Performance (PQRS-OD)

The PQRS-OD score was used as an objective measure of change in task performance. Considering a Holm-Bonferroni corrected alpha at .0125, results of the Friedman test indicate that the participants showed a significant improvement trend across sessions for tasks directly addressed during group CO-OP sessions, χ^2 (2) = 17.476, p = 0.001). Pairwise comparisons indicated that median posttest ranks were statistically significantly higher than median pretest ranks (Z = -3.069, p = 0.002) with a large effect size (r = 0.626), and median follow-up ranks were significantly higher than median pretest ones (Z = -2.953, p = 0.003) with a large effect size (r = 0.603). When only children below the 15th percentile on the MABC-

2 were included (i.e., children identified as meeting all the DSM-5 criteria for DCD diagnosis), significant improvement trend across sessions was also obtained ($\chi 2$ (2) = 13.938, p = 0.001) as well as between pretest and posttest ((Z = -2.673, p = 0.008) with a large effect size (r = 0.598) and between pretest and follow-up ((Z = -2.680, p = 0.007) with a large effect size (r = 0.599). While no significant differences were found across sessions for goals not addressed during day camp, improvements at posttest are noted for five participants (2, 3, 4, 6, and 9) but only maintained for one (6) (see Figure 2).

The Mann-Whitney U test was used after Week 1 to compare Week 1 and Week 2 participants' change scores obtained on PQRS-OD for the self-selected activities. A significant pre-post difference was found in PQRS-OD scores (U = 2.00, p = 0.006) with a large effect size (r = 0.533) between the participants who received the intervention (Week 1) and those who had not yet received the intervention (Week 2). This indicates that the participants who received the intervention performed statistically and clinically differently on their self-selected task from participants who did not receive intervention that week. When only children below the 15th percentile on the MABC-2 were included (i.e., children identified as meeting all the DSM-5 criteria for DCD diagnosis), again, significant change was also obtained (U = 1.5, p = 0.033) but with a medium effect size (r = 0.335). For goals not addressed during day camp sessions, no between group differences were found.

Self-Efficacy

The perceived self-efficacy rating was used as a change measure of self-efficacy. Considering a Holm-Bonferroni adjusted alpha at 0.0167, the Friedman test for goals directly addressed during day camp shows a significant effect across sessions (χ^2 (2) = 10.889, p = 0.004), indicating that the participants' perceived self-efficacy for goals directly addressed during day camp increased across sessions. Pairwise comparisons indicate that, as with task performance, significant differences were found between pretest and posttest (Z = -2.450, p = 0.014) with a large effect size (r = 0.707) and between pretest and follow-up (Z = -2.494, p = 0.013) with a large effect size (r = 0.720). No significant differences were found across sessions for goals not directly addressed during day camp. Figure 3 shows a positive 1-point change in pre-post self-efficacy scores for goals not directly addressed for four participants (4, 5, 6, and 7), and a greater than 1-point change for two participants (3 and 9). The improved self-efficacy score was maintained or improved at follow-up in all but two of these children (4 and 9).

Perceived Task Performance (COPM)

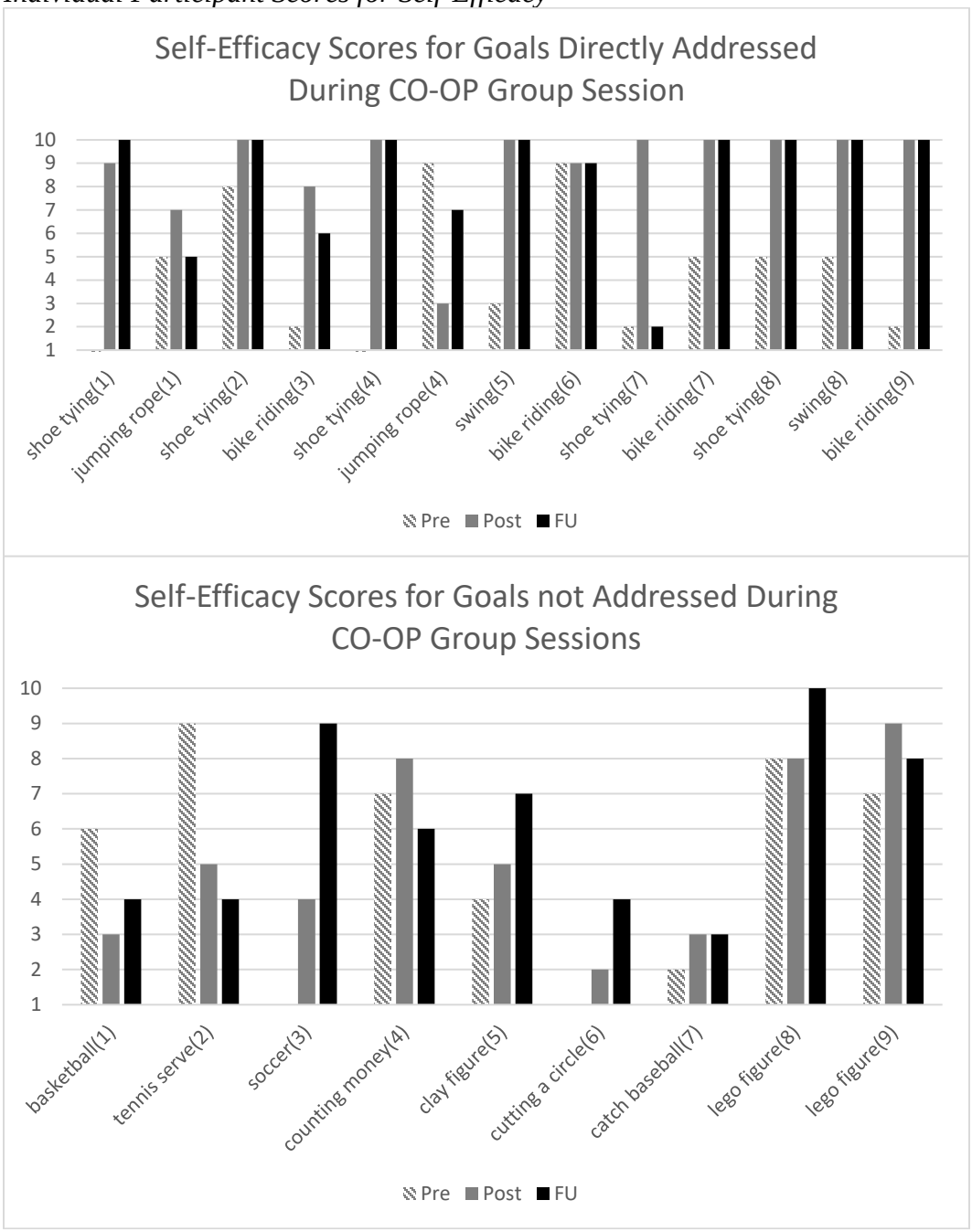
The performance rating on the COPM was used as a change measure of perceived task performance. Considering a Holm-Bonferroni corrected alpha at 0.025, the Friedman test for goals directly addressed during day camp, and that for goals not directly addressed, did not indicate a significant effect across sessions. For goals directly addressed during day camp, a positive average pre-post change of 3.9 points was noted at posttest but decreased to an average 2.4-point positive change from pretest at follow-up. A positive change was also noted for goals not directly addressed during day camp with an average pre-post change of 2.6 points and a 2.14 positive change from pretest at follow-up (see Figure 4).

Self-Satisfaction

For self-satisfaction COPM ratings, with a Holm-Bonferroni adjusted alpha of 0.05, no significant results were obtained from the Friedman's test, neither for the CO-OP goals that were directly addressed nor for those not directly addressed during day camp. Self-satisfaction did not change across sessions.

Figure 3

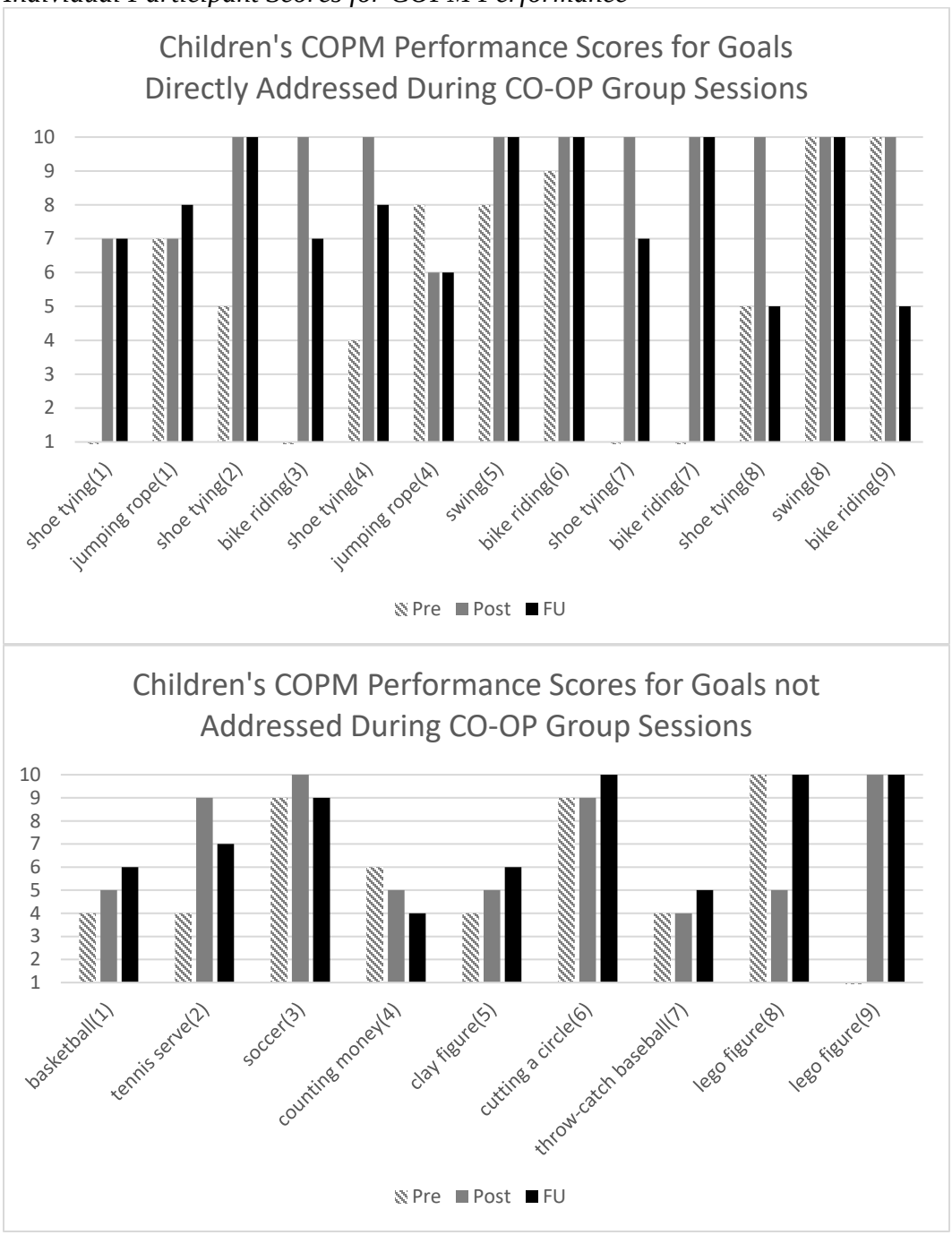
Individual Participant Scores for Self-Efficacy



Note. (n) = participant; Pre = Pretest score; Post = Posttest score; FU = 3-month follow-up score.

Figure 4

Individual Participant Scores for COPM Performance



Note. (n) = participant; Pre = Pretest score; Post = Posttest score; FU = 3-month follow-up score; COPM = Canadian Occupational Performance Measure.

Discussion

The findings of this study show that the CO-OP intervention delivered in a group format in an intensive 4-day summer day camp was effective for improving self-selected occupational performance goals worked on during the summer camp session and the gains were maintained 1 month following. These findings are similar to findings of other CO-OP intervention studies administered in an individual (Araújo et al., 2019; Capistran & Martini, 2016; Miller et al., 2001) or group format with a greater number of sessions

spread over a greater length of time (i.e., less intensity) (Anderson et al., 2018; Thornton et al., 2016). It was anticipated that the CO-OP intervention would also be reflected in an improvement on tasks that were not directly addressed in the group intervention, indicating some evidence of generalization and transfer. Unfortunately, no significant changes were noted in tasks that were not addressed during the summer day camp sessions. A possible reason for the lack of transfer may reside in the intensive CO-OP group format. It is possible that since less individual guidance could be provided in a group format, the effects of CO-OP were diluted with respect to generalization and transfer. Furthermore, the parents in this study reported that because of long camp days, they were unable to have their children do any of the practice tasks assigned at the end of the camp day. Likewise, Capistran and Martini (2016) found that, following a classic 10-session individual CO-OP intervention, only two of the four children in their single subject multiple baseline study demonstrated significant improvement in their task that was not directly addressed. The authors speculate that differences in parent support for ensuring opportunities for practice and strategy use may be one of the factors that enabled some children in that study to obtain transfer, while others did not. The parents of the children in Capistran and Martini study were present at all intervention sessions; however, those who did not obtain transfer reported poor compliance with practice homework and limited to no strategy use outside the therapy session. These authors, along with Araújo et al. (2019), emphasize the importance of parent engagement in therapy sessions for the transfer of strategies to tasks not directly addressed during CO-OP interventions. Another explanation may be that an eight-session group intervention format over 4 days may not be sufficient and that increasing the number of group sessions may facilitate the children's successful application of CO-OP strategies to other tasks. Unlike Thornton et al. (2016), who did not find any significant differences on the MABC-2 over time, Green et al. (2008) found significant post-intervention improvements on the MABC-2, which consists of tasks not addressed during intervention. However, the group intervention in Green et al. took place over 20 weekly sessions, rather than 10 weekly sessions as in Thornton et al., or eight sessions in 1 week as in the present study.

The group CO-OP intervention did influence self-efficacy ratings across sessions. Significant improvement was noted in self-efficacy ratings from pretest to posttest for goals directly addressed during the day camp session which were maintained at follow-up. The present study's findings are unlike those of Miller et al. (2001), who did not find significant changes on motor-related self-esteem. However, this is probably because of the fact that self-efficacy ratings in this study referred specifically to task self-efficacy, rather than general self-esteem. While both self-esteem and self-efficacy are self-evaluations, self-efficacy refers to one's capability belief in achieving tasks (and is thus task-specific), whereas self-esteem is more of an affective evaluation of self, a sense of self-worth (not task-specific) (Chen et al., 2004). Self-efficacy is related to task performance and achievement and is more malleable than self-esteem. Indeed, improved self-efficacy was obtained for tasks directly addressed during day camp CO-OP sessions but not for tasks that were not directly addressed during day camp. In Mandich et al.'s (2003) qualitative study on understanding the participation of children with DCD, they postulate that as children with DCD noted their progress toward their therapy goals, this actualizes their belief in their capacity to perform their chosen task, which may have led to increased self-efficacy. It is also possible that the group format may have contributed to facilitating self-efficacy. Unlike individual therapy sessions, where the child is the one who is unsuccessful in task performance and in need of help, in the group day camp sessions, all children were able to successfully perform a task that another child could not. As such, all children experienced a helper role as well as a helpee role.

No statistically significant change was obtained for perceived performance or satisfaction at posttest for tasks directly addressed during the day camp CO-OP sessions nor for tasks not directly addressed during day camp. These findings are not consistent with those obtained in previous studies exploring the effectiveness of a CO-OP intervention approach in a group format (Chan, 2007; Thornton et al., 2016). In these studies, significant pre-post changes are reported on the performance and satisfaction score of the COPM. It is likely that the lack of statistical significance in this study is because of the small sample size and the statistical correction (the Friedman test for intervention for COPM performance scores across sessions: (χ^2 (2) = 6.727, p = 0.035). While not statistically significant, a positive pre-post or pre-follow-up change in perceived performance for tasks directly addressed during day camp CO-OP sessions is noted in all but three of the children's goals in Figure 4 (jumping rope for Child 4; swing for Child 8; and bike riding for Child 9).

Limitations

This study presents with several limitations. An obvious significant limitation in this study is the small number of participants and the lack of a bona fide control group for all measures. To compensate for the lack of a control group, intervention effect was confirmed for Week 1 participants with respect to task performance changes by using Week 2 participants as an historical control. To mitigate for the small number of participants, the authors used non-parametric statistics and have provided individual participant score information for transparency. Despite the small number of participants, and ensuing lower statistical power, statistically significant differences with meaningful effect sizes were detected in the objective motor performance measure (PQRS-OD) as well as the more subjective self-efficacy measure, thereby indicating an intervention effect. The fact that the sample contained a higher proportion of girls than boys may also be considered a limitation as it is not representative of what is found in the population, where there is a consensus that the DCD condition is more prevalent in boys (Kirby & Sugden, 2007). It is not clear how this uneven distribution and higher-than-usual proportion of females may have affected intervention results. Hence, a Mann Whitney U test was done to check if there were gender differences in pre-post change scores on the PQRS-OD. The result was not significant, indicating that pre-post changes in goal performance in girls was similar to that of the boys in this study. The influence of gender on the CO-OP intervention results has not been studied in children with motor coordination difficulties. However, for children with cerebral palsy and brain injury, females between 5 and 10 years of age were identified as more likely to be better responders to the CO-OP than males (Jackman et al., 2018). Further studies are needed to confirm if gender has an influence on the outcome of a CO-OP intervention and whether this influence is mediated by age and/or condition.

Conclusion

The results of this study suggest that the use of a modified CO-OP intervention in an intensive 8-session group format is effective in significantly improving performance on tasks addressed directly during sessions, as well as significantly improving children's sense of self-efficacy with respect to these tasks. However, no significant changes were observed in performance of tasks not addressed during the summer day camp sessions. It is speculated that the lack of effect of the CO-OP on tasks not addressed during the day camp sessions may be a result of the intensity and limited number of session and that the children required more support, such as facilitating practice of skills and encouraging strategy use outside of the clinical context, so as to enable them to independently transfer learned skills to a new task. Adults, such as parents, may play a role in the provision of such support. Future research should aim to understand how to best engage parents in the CO-OP intervention to support children's generalization and transfer of learned strategies and skills.

***Rose Martini, PhD, OT Reg (Ont), OT(C)**, is an associate professor in the Occupational Therapy Program, School of Rehabilitation Sciences, Faculty of Health Sciences, University of Ottawa*

***Jacinthe Savard, PhD, OT Reg (Ont), OT(C)**, is an associate professor in the Occupational Therapy Program, School of Rehabilitation Sciences, Faculty of Health Sciences, University of Ottawa*

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association.

Anderson, L., Wilson, J., & Carmichael, K. (2018). Implementing the cognitive orientation to daily occupational performance (CO-OP) approach in a group format with children living with motor coordination difficulties. *Australian Occupational Therapy Journal*, *65*(4), 295–305. https://doi.org/10.1111/1440-1630.12479

Araújo, C. R. S., Cardoso, A. A., & Magalhães, L. de C. (2019). Efficacy of the cognitive orientation to daily occupational performance with Brazilian children with developmental coordination disorder. *Scandinavian Journal of Occupational Therapy*, *26*(1), 46–54. https://doi.org/10.1080/11038128.2017.1417476

Bandura, A. (2006). Guide for creating self-efficacy scales. In F. Pajare & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307–339). Information Age Publications.

Camden, C., Tétreault, S., & Swaine, B. (2012). Increasing the use of group interventions in a pediatric rehabilitation program: Perceptions of administrators, therapists, and parents. *Physical and Occupational Therapy in Pediatrics*, *32*(2), 120–135. https://doi.org/10.3109/01942638.2011.616267

Capistran, J., & Martini, R. (2016). Exploring inter-task transfer following a CO-OP approach with four children with DCD: A single subject multiple baseline design. *Human Movement Science*, *49*, 277–290. https://doi.org/10.1016/j.humov.2016.07.004

Chan, D. Y. K. (2007). The application of cognitive orientation to daily occupational performance (CO-OP) in children with developmental coordination disorder (DCD) in Hong Kong: A pilot study. *Hong Kong Journal of Occupational Therapy*, *17*(2), 39–44. https://doi.org/10.1016/s1569-1861(08)70002-0

Chase, M. A. (1997). Sources of self-efficacy in an ego-involving environment: Developmental concerns in an educational setting. *American Educational Research Association Conference*, Chicago, IL.

Chen, G., Gully, S. M., & Eden, D. (2004). General self-efficacy and self-esteem: Toward theoretical and empirical distinction between correlated self-evaluations. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *25*(3), 375–395. https://doi.org/10.1002/job.251

Clark, S., & Ste-Marie, D. (2007). The impact of self-as-a-model interventions on children's self-regulation of learning and swimming performance. *Journal of Sports Sciences*, *25*(5), 577–586. https://doi.org/10.1080/02640410600947090

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

COPM. (n.d.). *Using the COPM with children.* http://www.thecopm.ca/advanced/using-the-copm-with-children/

DeLucia-Waack, J. L. (2006). *Leading psychoeducational groups for children and adolescents*. Sage Publications.

Engel-Yeger, B., & Hanna Kasis, A. (2010). The relationship between developmental coordination disorders, child's perceived self-efficacy and preference to participate in daily activities. *Child: Care, Health and Development*, *36*(5), 670–677. https://doi.org/10.1111/j.1365-2214.2010.01073.x

Feltz, D., & Chase, M. (1998). The measurement of self-efficacy and confidence in sport. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 65–101). Fitness Information Technology Inc.

Green, D., Chambers, M. E., & Sugden, D. A. (2008). Does subtype of developmental coordination disorder count: Is there a differential effect on outcome following intervention? *Human Movement Science*, *27*(2), 363–382. https://doi.org/10.1016/j.humov.2008.02.009

Grisson, R., & Kim, J. (2012). *Effect size for research. Univariate and multivariate application* (2nd ed.). Routledge.

Henderson, S. E., Sugden, D. A., & Barnett, A. (2007). *Movement assessment battery for children* (2nd ed.). The Psychological Corporation.

Jackman, M., Novak, I., Lannin, N. A., Galea, C., & Froude, E. (2018). The cognitive orientation to daily occupational performance (CO-OP) approach: Best responders in children with cerebral palsy and brain injury. *Research in Developmental Disabilities*, *78*, 103–113. https://doi.org/10.1016/j.ridd.2018.04.019

Kirby, A., & Sugden, D. A. (2007). Children with developmental coordination disorders. *Journal of the Royal Society of Medicine*, *100*(4), 182–186. https://doi.org/10.1258/jrsm.100.4.182

Law, M., Baptiste, S., Carswell, A., McColl, M. A., Polatajko, H. J., & Pollock, N. (2005). *The Canadian occupational performance measure* (4th ed). CAOT Publications ACE.

Maciejewski, M. L. (2020). Quasi-experimental design. *Biostatistics & Epidemiology*, *4*(1), 38–47. https://doi.org/10.1080/24709360.2018.1477468

Mandich, A. D., Polatajko, H. J., & Rodger, S. (2003). Rites of passage: Understanding participation of children with developmental coordination disorder. *Human Movement Science*, *22*(4–5), 583–595. https://doi.org/10.1016/j.humov.2003.09.011

Martini, R., Mandich, A., & Green, D. (2014). Implementing a modified cognitive orientation to daily occupational performance approach for use in a group format. *British Journal of Occupational Therapy*, *77*(4), 214–219.

https://doi.org/10.4276/030802214X13968769798917

Martini, R., Rios, J., Polatajko, H., Wolf, T., & McEwen, S. (2015). The performance quality rating scale (PQRS): Reliability, convergent validity, and internal responsiveness for two scoring systems. *Disability and Rehabilitation*, *37*(3), 231–238. https://doi.org/10.3109/09638288.2014.913702

Martini, R., St-Pierre, M. F., & Wilson, B. N. (2011). French Canadian cross-cultural adaptation of the developmental coordination disorder questionnaire'07: DCDQ-FC. *Canadian Journal of Occupational Therapy*, *78*(5), 318–327. https://doi.org/10.2182/cjot.2011.78.5.7

Miller, L. T., Polatajko, H. J., Missiuna, C., Mandich, A. D., & Macnab, J. J. (2001). A pilot trial of a cognitive treatment for children with developmental coordination disorder. *Human Movement Science*, *20*(1–2), 183–210. https://doi.org/10.1016/S0167-9457(01)00034-3

Missiuna, C., Mandich, A. D., Polatajko, H. J., & Malloy-Miller, T. (2001). Cognitive orientation to daily occupational performance (CO-OP). *Physical & Occupational Therapy in Pediatrics*, *20*(2), 69–81. https://doi.org/10.1300/j006v20n02_05

Pieters, S., de Block, K., Scheiris, J., Eyssen, M., Desoete, A., Deboutte, D., Van Waelvelde, H., & Roeyers, H. (2012). How common are motor problems in children with a developmental disorder: Rule or exception? *Child: Care, Health and Development*, *38*(1), 139–145. https://doi.org/10.1111/j.1365-2214.2011.01225.x

Polatajko, H. J., & Mandich, A. D. (2004). *Enabling occupation in children: The cognitive orientation to daily occupational performance (CO-OP) approach*. CAOT Publications ACE.

Polatajko, H. J., Mandich, A. D., Miller, L. T., & Macnab, J. J. (2001). Cognitive orientation to daily occupational performance (CO-OP): Part II the evidence. *Physical and Occupational Therapy in Pediatrics*, *20*(2–3), 83–106. https://doi.org/10.1080/J006v20n02_06

Taylor, S., Fayed, N., & Mandich, A. (2007). CO-OP intervention for young children with developmental coordination disorder. *OTJR: Occupation, Participation and Health*, *27*(4), 124–130. https://doi.org/10.1177/153944920702700402

Thornton, A., Licari, M., Reid, S., Armstrong, J., Fallows, R., & Elliott, C. (2016). Cognitive orientation to (daily) occupational performance intervention leads to improvements in impairments, activity and participation in children with developmental coordination disorder. *Disability and Rehabilitation*, *38*(10), 979–986. https://doi.org/10.3109/09638288.2015.1070298

Thorpe, K. E., Zwarenstein, M., Oxman, A. D., Treweek, S., Furberg, C. D., Altman, D. G., Tunis, S., Bergel, E., Harvey, I., Magid, D. J., & Chalkidou, K. (2009). A pragmatic-explanatory continuum indicator summary (PRECIS): A tool to help trial designers. *Journal of Clinical Epidemiology*, *62*(5), 464–75. https://doi.org/10.1016/j.jclinepi.2008.12.011

Wuang, Y. P., Su, J. H., & Su, C. Y. (2012). Reliability and responsiveness of the movement assessment battery for children-Second edition test in children with developmental coordination disorder. *Developmental Medicine and Child Neurology*, *54*(2), 160–165. https://doi.org/10.1111/j.1469-8749.2011.04177.x