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Cognitive orientation to daily occupational performance approach in adults with neurological conditions: A scoping review

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Abstract

Background: The Cognitive Orientation to daily Occupational Performance (CO-OP) approach, top-down, client-centered and goal-oriented approach originally developed for children with Developmental Coordination Disorder (DCD) in 2001 and since used in other populations and settings. The purpose of this scoping review was to examine the extent (number) and nature (features and characteristics) of the literature on CO-OP in adult's populations.

Methods: In this scoping review, 8 online databases were searched up to April 2018 to identify articles that addressed CO-OP in adult's populations. The articles were selected based on inclusion and exclusion criteria. Two raters reviewed all documents independently. Articles were categorized according to diagnosis.

Results: Fifteen studies were identified. To examine application and effectiveness of CO-OP in adult's populations we included individuals with chronic stroke (>6 months post-stroke; n=7), with TBI (n=3), with acute stroke (<6 months post-stroke; n=4) and the older adult populations comprised those with self-reported cognitive difficulties but no diagnosis of dementia, depression, or cognitive impairment (n=1). In all cases, CO-OP showed to be useful and efficient.

Conclusion: CO-OP has been applied in TBI, stroke and age-related executive changes appropriately. The results have shown that CO-OP efficiently improved performance and satisfaction in trained and not trained client chosen goals.

Keywords: Evidence-based practice, Occupational performance, Rehabilitation, Intervention, Neurological conditions

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Introduction

Cognitive Orientation to daily Occupational Performance (CO-OP), the top-down, task-orientated, individualized approach originally developed for children with developmental coordination disorders (DCD) in 2001 by Polatajko and her colleagues (1). CO-OP use global strategy from cognitive behavior modification theories, in particular the verbal self-instruction strategy developed by Meichenbaum (1977) (2). During a CO-OP intervention, therapist guides the client in learning of this self-instruction strategy, which enables him/her to identify which part of the performance is wrong, and to invent and execute plans to correct his/her task performance by using the 'goal-plan-do-check' strategy (GPDC). In addition to a global problem-solving strategy, a number of domain specific cognitive strategies were used to accomplish tasks. Domain specific strategies (DSS) such as task specification, verbal mnemonic, body position, verbal guidance, verbal self-guidance, verbal role script, feeling the move-

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↑What is "already known" in this topic:
To date, no review study has been done to investigate application and effectiveness of CO-OP approach in adult's populations with neurological conditions.

→What this article adds:
The results of this study showed that CO-OP approach has been used in CVA, TBI and elderly and has been able to improve performance and satisfaction in all populations.

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ment and attention to doing are used in specific tasks or situations to help achieve specific occupational performance goals. Other key features of the CO-OP approach include: dynamic performance analysis (DPA) and use strategies through guided discovery. DPA is differ from conventional activity analyses as it is focused on direct observation of actual performance, rather than inferring underlying performance deficits based on observed performance (3); DPA ''acknowledges that optimal performance is the product of the interaction of person, environment, and occupation'' (4). In guided discovery, opposite to pure discovery, person will try to discover the best solution by him/herself; however this process is under the close guidance of an instructor. There is no ready answer; rather, they are guided toward finding a strategy that helps them (5).

Although CO-OP developed as one by one format and to enable skill acquisition in children with developmental coordination disorders, other therapists and researchers used CO-OP in other formats such as groups (6-8) and telehealth (9) and in other population such as ADHD, autism spectrum disorders (ASD), cerebral palsy, stroke and TBI (10-14). Since 2001, CO-OP has been used in different groups in order to making change in participation and performance in activities that affected by motor-based difficulties. Rodger (2009) explained that Motor difficulties are not a problem exclusive to Asperger's syndrome (AS) and commonly be similar to those associated with conditions such as DCD; so, given its success with children with DCD, CO-OP may also be effective in addressing motor goals with children with AS (15). Ghorbani (2017) argued CO-OP was developed to enable children with motor-based occupational performance difficulties who have problems in learning new skills, therefore CO-OP might be an effective intervention for children with Cerebral Palsy (CP) (16). Gharebaghy (2015) stated due to the high co-morbidity of ADHD and DCD and the resemblance of motor problems consistent with DCD in children with ADHD, it is possible that intervention approaches used in DCD may have some applicability in ADHD (17).

Some evidences have shown that task specific training approach are the most effective than traditional neurodevelopmental approach in stroke (18, 19). According to previous results in DCDs and assuming that cognitive-based approach would be promoted skill acquisition and improve performance in people living with neurological condition such as stroke or TBI (20, 21), several studies have been conducted in these populations. The aim of this review was identifying literature addressing CO-OP as a primary intervention in adult with neurological conditions.

Methods

To meet our goals, we used a scoping review described by Arksey and O'Malley in 2005 (22). As they proposed, there are four common reasons for conducting scoping reviews. First reason, this type of review conducted to create a map from researches exist in the specific field without critically appraised those researches. Thus, this may be useful to determine the value of undertaking a full systematic review that is the second reason. The third reason is 'to summarize and disseminate research findings', that helps health professionals, researchers, and legislators find out about the evidence available and assist them formulating future research projects, supporting clinical practice and informing policy development or revision. The final reason cited for completing scoping reviews is to 'identify research gaps'. CO-OP is a new growing approach that used in different setting and diagnosis and according to these reasons, given that CO-OP approach is new and evidence of its application and effectiveness in the adult population with neurological conditions is less, we decided to use scoping review instead of a systematic review. In rehabilitation sciences which randomized control trials (RCTs) may be limited, and case studies are more common, scoping review could be an appropriate approach type of review (5). In this study, to find evidence in the adult population with neurological condition and to find existing gaps in this fields we also used Population, Intervention, Comparison, Outcome (PICO) framework to conduct these review. We searched studies that conducted in the adult population with neurological conditions (P), used CO-OP as primary intervention (I), whether or not had a control group (C), and in which change in participant's initial participation, function or satisfaction in daily activities was addressed as an outcome (O).

To conduct scoping review, first we identified research purpose, "What studies have used CO-OP in adult population with neurological condition?'' then we used the terms "cognitive orientation to daily occupational performance" and "cognitive orientation to occupational performance," as search keywords in Google scholar, Pubmed, COCHRANE library, Scopus, Proquest, MEDLINE, Magiran and Web of Science from 1997 up to April 2018. Our inclusion Criteria was; (a) the term "cognitive orientation to [daily] occupational performance" or "CO-OP" shall be comprehensively discussed in the paper, (b) English or Persian language, (c) including more than 100 words on CO-OP (not abstract or conference presentations), (d) an experimental research study, and (e) the age of the participants was 19 to 64 years or older adults 65> years. The exclusion criteria were reviews, study protocols, discussion papers, studies conducted in children such as DCD, ADHD, CP, and PDD. Then, PICO criteria were applied as second exclusion. Full text of final articles was examined and data were extracted. Two raters (M.S. and E.E.) reviewed all documents independently. The following data extracted from articles: journal name, origin country of the research performance, type of research design, participant age and diagnosis, question/purpose of the study, whether the research was in accordance with CO-OP approach, conclusions and author's main points about the CO-OP Approach. As scammell et al, based on the guidelines for a scoping review, we did not evaluating the quality of the studies (23).

Results

147 articles were identified in the online search, including the original three articles on CO-OP (Fig. 1). After removing 56 duplicate article and 3 original article (that descript CO-OP's theoretical foundation and protocol), 88

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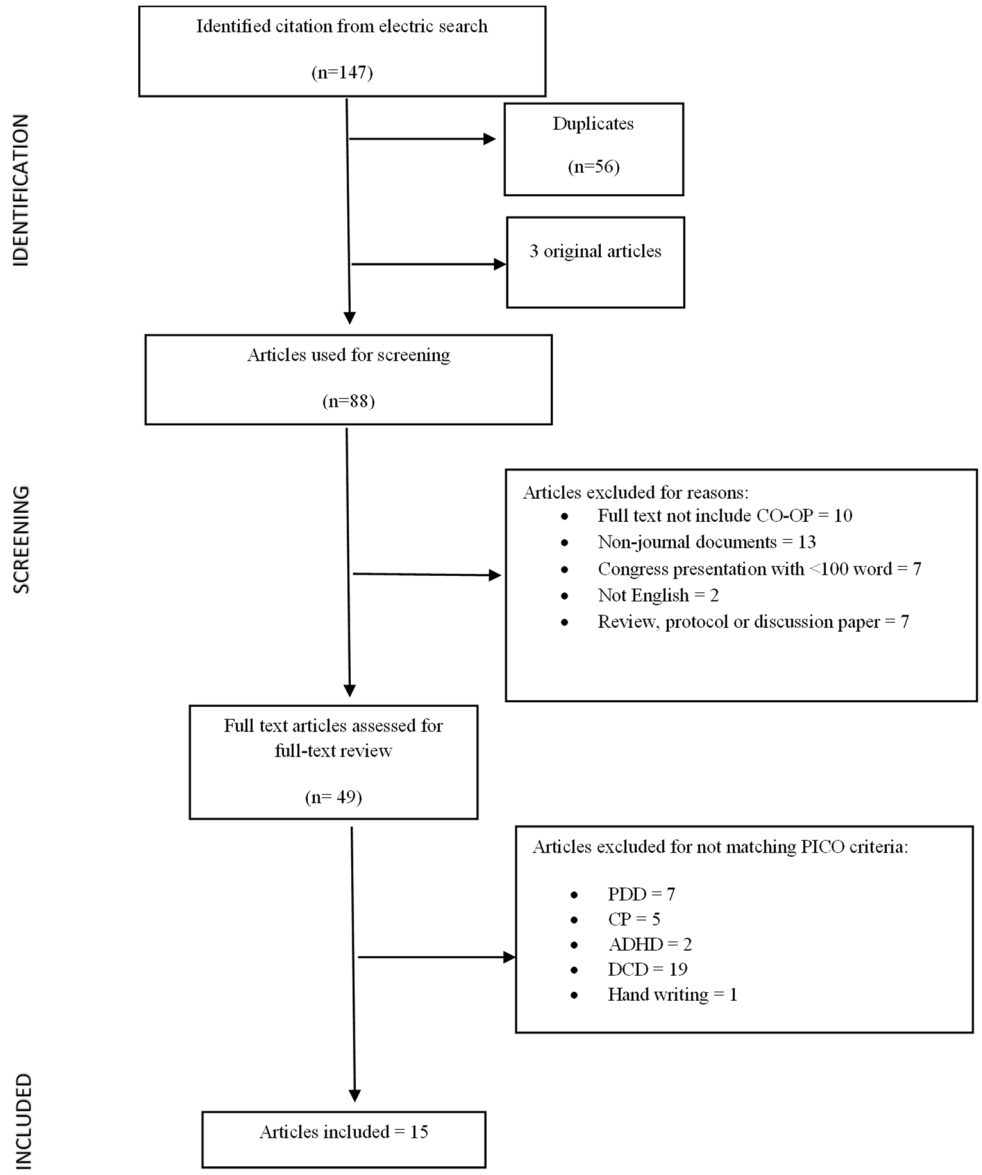

Fig. 1. PRISMA flowchart of inclusion and exclusion of studies for this review

articles used for screening. Based on first and second exclusion criteria 39 and 34 other articles were removed respectively; 15 articles remained that addressed CO-OP on adult population. We used full-text of these articles for review.

Characterization of Research Articles

Journal and authorship: These articles have been published in 11 peer-reviewed journals; most of these journals were in the field of occupational therapy or rehabilitation. Various authors participated in these articles, 42 different authors in total and one of the authors (Polatajko) appeared on 10 of the articles. These authors affiliation was related to academic departments of occupational therapy and occupational science, rehabilitation sciences, physiotherapy, psychiatry and psychology, neurology, education, medicine, and health studies.

Populations: Based on our aim and screening protocol, we gathered articles that looked at adults. These researches included adult with stroke; chronic (>6 months post-stroke; 7 articles), acute (<6 months post-stroke; 4 articles), with TBI (3 articles), and the older adult with self-reported cognitive difficulties but no diagnosis of dementia, depression, or cognitive impairment (1 article).

Adherence to protocol: Since 2001 that Polatajko and her colleagues explained the CO-OP protocol, various studies have made variation to this protocol in different manner, causing adaptations to the original protocol and also, expansions of the approach. for the first time, In order to meet the specific needs of adults with TBI, Dawson made some adjustments of the CO-OP protocol In 2009 (20). These adaptations covered both format and session structure, the number of sessions increased from 10 to 20 and conducted sessions in a more natural environment. In 2011, Skidmore et al. used CO-OP in different setting. To making CO-OP possible for acute inpatient stroke pa-

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tients, she and her colleagues reduced the duration of sessions to 45-min daily sessions over 14 days (24). In addition, Green et al changed delivery format of the CO-OP in 2008. He used group setting instead of an individual face-to-face format (25). Also, Ng et al. delivered CO-OP via telehealth for patient with TBI in 2013 (9).

In number of studies, involvement and participation of family, caregivers or significant others is mentioned. Some studies reported the this involvement was occasionally problematic (9) and McEwen et al. suggest that involvement of caregiver in CO-OP process is not necessary and could be removed from the protocol for the adults with stroke (21). Skidmore et al. reported if the entire care team support the treatment approach help follow-through of the CO-OP Approach Will be successful (24).

Because it's beyond our purpose of this scoping review to appraise systematically these articles, we just report the authors' conclusions about their results. Tools and instruments that used to check changes in each study, presented in Table 1.

Table 1. Main outcome listed for each article in review.

First author	Year of publication	Population	N	Research design	Instruments	Main outcomes
Dawson	2009	TBI	3	Single case	COPM, Neuropsychological test at baseline (TMT, HVLT, Wisconsin Card Sorting, WIAS-R)	Performance improved on 7 of 9 trained goals and on 4 of 7 untrained goals. Improvement was maintained at a 3-month follow-up assessment.
Ng	2013	TBI	3	Case study	COPM, MPAI, DEX	The CO-OP approach administered in a telerehabilitation format was found to be feasible. All participants indicated improvement in both trained and untrained goals.
Dawson	2013	TBI	13	Partially RCT	COPM, MPAI, DEX, AMPS	Evidence of far transfer was found as the experimental group improved significantly more than the control group on performance and satisfaction
McEwen	2009	Chronic CVA	3	SCED	COPM, PQRS, SIS, SEMCD, ABC, CMSA	… Each participant showed significant performance improvements in at least two goals during the course of the intervention and at follow-up.
McEwen	2010	Chronic CVA	3	SCED	PQRS, SIS, RNL, SEMCD, ABC, CMSA	At follow-up, significant performance improvements were seen in all three single case experiments in all trained and untrained skills.
McEwen	2010	Chronic CVA	5	Qualitative	Interview	Participants reported learning and transferring the strategies taught, and made suggestions for modifications to the approach, such as increasing the number of sessions.
Skidmore	2011	Acute CVA	1	Case report	COPM, PASS, FIM, NIHSS, PRPS, DKEFS	Engagement improved from 3.2 at admission to 4.9. Disability measured by FIM shown 29 point improvement. PASS scores improved from 1.1 at admission to 2.9 at discharge.
Henshaw	2011	Chronic CVA	2	Case study	COPM, PQRS	The findings suggest that the approach has the potential to successfully help clients with stroke achieve their everyday occupational goals and support continued research in this area.
Polatajko	2012	Chronic CVA	8	Pilot RCT	COPM, PQRS	CO–OP participants showed significantly greater improvement in performance compared with SOT but no improvement in satisfaction.
McEwen	2015	Acute CVA	26	RCT	COPM, PQRS, SIS, CPI, SEG	PQRS change scores demonstrated that CO-OP had a medium effect over usual care on trained self-selected activities and a large effect on untrained activities. At a 3-month follow-up, CO-OP HAD a large effect of on both trained and untrained activities. CO-OP had a small effect on COPM and a medium effect on the Community Participation Index perceived control and on the Self-Efficacy Gauge.
Poulin	2015	Chronic CVA	11	Partially RCT	COPM, TMT, CWIT, LIFE-H 3.1	Both treatment groups showed large improvements in self and significant other-rated performance and satisfaction with performance. The COMPUTER group also showed large improvements in some areas of EF impairment and CO-OP group demonstrated large improvements in self-efficacy for performing everyday activities
Wolf	2016	Acute CVA	26	RCT	COPM, PQRS, DKEFS, SIS, ARAT	CO-OP shown greater improvement compare usual-care group in SIS and ARAT scores. data provide early support for the use of CO–OP to improve performance and remediate cognitive and arm movement impairments after stroke over U.C.

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Table 1. Ctd

First author	Year of publication	Population	N	Research design	Instruments	Main outcomes
McEwen	2017	Acute CVA	2	Case report	COPM, SIS, SEG, BBS, Box and Block, 2-minute walk test	One participant made gains in most measures, including a 22-point gain in the SIS mobility domain.
Ahn	2017	Chronic CVA	43	RCT	COPM, PQRS	PQRS and COPM scores indicated significantly more improvement in experimental group than the control group in both trained and non-trained goals
Dawson	2014	Cognitive difficulties	19	RCT	COPM, DKEFS	Half the CO-OP group improved on COPM performance and satisfaction, significantly more than control for performance. Not maintained at follow-up.

COPM = Canadian occupational performance measure; DEX = Dysexecutive Questionnaire; AMPS = assessment of motor and process skills; ABC = Activity Specific Balance Confidence Scale; MPAI = Mayo-Portland Adaptability Inventory–4 participation index; NIHSS = National Institutes of Health Stroke Scale; PASS = Performance Assessment of Self-Care Skills; CMSA = Chedoke–McMaster Stroke Assessment; PQRS = Performance Quality Rating Scale; DKEFS = Delis-Kaplan executive function system (subcomponents—TMT = Trail-Making Test; CWIT = Color Word Interference Test); ;SEG = self-efficacy gauge; CPI = Community Participation Index; FIM = Functional Independence Measure; SIS = Stroke Impact Scale; LIFE-H = Assessment of Life Habits; ARAT = action research arm task; BBS = Berg Balance Scale.

Literature on CO-OP in TBI: Based on our investigation, for the first time in adult population, CO-OP were conducted on person with executive dysfunction following traumatic brain injury by Dawson and her colleagues in 2009. 3 adults, 5 to 20 years post-TBI identified their goals by Canadian Occupational Performance Measure. Performance improved on majority of trained goals (7 of 9) but only 4 of 7 of untrained goals showed improvement. Also this improvement was maintained at a 3-month follow-up assessment. despite the CO-OP efficacy to improve performance in daily functioning for adults with executive dysfunction following TBI, in response to the less positive effects on untrained goals, Dawson et al Pointed out to some reasons such as limited length of the intervention and difficulty in identifying goals (20).

Dawson et al. in another study conducted the partial RCT to investigate the impact of their modified version of CO-OP for adults with Traumatic Brain Injury, the occupation-based strategy training. The main researcher's question where can patient with TBI identify real goals, follow twenty hours intervention and then score their performance and satisfaction of performance in these goals? All participants in the experimental arm received 20 hours of training. According to researchers opinion delivering the intervention in participants' home caused this fully adhered to the protocol. Also to identify real occupational goals, all but 1 participant could do this independently. Confirming the results of their previous pilot study CO-OP approach improves performance on trained tasks (26).

NG et al in 2013 examined whether they could implement Cognitive Orientation to daily Occupational Performance approach (CO-OP) in a telerehabilitation format for adults with traumatic brain injury and then investigated effect of intervention on community integration and executive dysfunction. CO-OP approach was provided to participants and their significant others through videoconferencing to instruct three of five self-identified goals. Results showed that implementation of the CO-OP approach via telerehabilitation are feasible. Although participants got higher performance and satisfaction scores on the COPM for self-identified goals after receiving the CO-OP training, but telerehabilitation has fewer improved goals at post-intervention (5 of 10 improved trained goals) than in the face-to face method (7 on 9) conducted in the Dawson's study. Interpreting these results, researchers have explained some reasons such as limited clinical observations that is necessary for dynamic performance analysis, lack of verbal exchange during sessions, the variation in participation of the SOs and limitation in use of internet-based neuropsychological assessments (9).

Literature on CO-OP in stroke

The use of CO-OP approach to improve the functional performance of adults with chronic stroke was first performed by McEwen and her colleagues. They used Performance Quality Rating Scale (PQRS) to rate participants' performance in trained goals. performance significantly improved in at least two goals for each participant during the course of the intervention and at follow-up (21).

Because transfer of skills learned in clinical setting to new skills and another context like home has been notoriously difficult to achieve, according to the existence of evidence that CO-OP has been associated with improvement in untrained skills in other populations, McEwen et al. investigated impact of CO-OP on trained and untrained goals of people living with stroke and stated that cognitive-based approach was associated with improved performance in trained and untrained skills in all three participants in their study (27).

In a qualitative study, McEwen et al. interviewed with 5 stroke patient to explore their experiences with CO-OP and transfer of learning through this approach. Patient described examples of strategy use that learned through CO-OP in daily routine activities. Result shown cognitive strategy can learn and use as well. "CO-OP was able to provide participants with increased decision-making autonomy, but may require modifications to better support their transition to higher levels of independence" (28).

Skidmore et al. evaluated feasibility and effectiveness of CO-OP approach during inpatient stroke rehabilitation. To assess feasibility, the number of sessions attended, self-selected goals, changes occurred in goal-related performance and rehabilitation engagement and disability

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changes was counted and evaluated. FIM scores (measuring disability) shown great improvement from requiring moderate to minimal assistance, to only supervised assistance and PASS shown 1.8 score improvement at discharge (from full physical assistance to small verbal guidance). Also rehabilitation engagement measured with Pittsburgh Rehabilitation Participation Scale scores improved 1.7 score at discharge (24).

Henshaw et al. also approved previous result. They reported improvements in the FIM and the Stroke Impact Scale (SIS) recovery component for both adult female participants with stroke. In this study participant's performance and satisfaction of performance in all goals significantly improved (29).

In a pilot RCT in 2012, Polatajko et al. compared CO-OP approach and standard occupational therapy (SOT) in 8 patient with chronic stroke. Result showed improvement in both treatment group however patients that received CO-OP approach showed more improvement in PQRS scores and COPM performance, although in COPM satisfaction scores the difference was not statistically significant. According to this findings, CO-OP groups demonstrated larger performance improvement than SOT group (30).

In an exploratory, single-blind, randomized controlled trial; McEwen et al. compared effect of CO-OP approach with usual outpatient rehabilitation on activity and participation in acute stroke patient. According to their results, PQRS change scores indicated that in comparison to usual care, CO-OP had a medium effect on trained self-selected activities and a large effect on untrained activities. At a 3-month follow-up, effect of CO-OP on both trained and untrained activities was large. However, CO-OP had a small effect on COPM and a medium effect on the Community Participation Index perceived control and on the Self-Efficacy Gauge. These result approved large treatment effect of CO-OP approach on performances of self-selected activities in long time which enhances the possibility of transfer to untrained activities (31).

In a second article related to trial mentioned above, wolf et al. compared CO-OP approach with usual outpatient rehabilitation on upper-extremity movement, cognitive flexibility, and stroke impact in people less than 3 months after stroke. In this study, Wolf and colleagues used Action Research Arm Test (ARAT) for measuring arm movement, Delis–Kaplan Executive Function System Trail Making subtest (DKEFS Trails) for cognitive flexibility and subscales of Stroke Impact Scale for stroke impact. Compared with the control group, CO-OP had a moderate effect size in arm function and cognitive flexibility at post-test and follow-up (32).

Poulin and colleagues compared feasibility and efficacy of adapted version of CO-OP and computer-based executive function training (COMPUTER training) for persons with executive dysfunction post-stroke. In this pilot partially RCT, effect of treatment on executive function (EF) measured with three neuropsychological EF tests; The TMT was used to measure speed, attention and cognitive flexibility. The Color-Word Interference Test from the D-KEFS was selected as a measure of cognitive flexibility and inhibition. Finally, we measured working memory using the Digit Span from the WAIS-IV. In addition, change in self-efficacy and social participation measured with Assessment of Life Habits (LIFE-H 3.1). Both groups had shown clinically significant changes on the COPM with large effect sizes for perceived performance of the untrained goals. The CO-OP group was also reported to have significance on the Trail-Making Test and the self-efficacy in daily activities. Evidence supported the feasibility of using both CO-OP and COMPUTER training with patients with executive dysfunction post-stroke (33).

In one different study, McEwen et al. adapted CO-OP to deliver by both occupational therapists and physiotherapists. Although combined delivery required additional communication with the patients but was feasible. However results showed larger improvement in physical and mobility than those seen in past CO-OP research, these results cannot be generalized and needs more investigation with large sample size (34).

In Korea, Si-nae et al. compared the effects of CO-OP approach with conventional occupational therapy on occupational performance in individuals with hemiparetic stroke. Like previous study, they used COPM and PQRS for measured changes in performance and satisfaction. Authors suggested that the CO-OP approach is beneficial for improving occupational performance in individuals with hemiparetic stroke, and participants can generalize and transfer acquired skills to new occupations (35).

Literature on CO-OP in age-related executive changes

Based on our search, there is only one article which deals with the impact of the CO-OP approach on the older adults. Dawson et al. investigated feasibility and effectiveness of CO-OP on healthy older adults who suffer from cognitive difficulties and everyday problems without of mild cognitive impairment, dementia or depression. Result approved occupation-based, meta-cognitive strategy training is feasible for healthy older adults who self-identify with cognitive complaints in the absence of clinical diagnoses. Participants in the CO-OP group reported significantly more improvement on untrained goals (11 of 22 compared with 9 of 46) (36).

Discussion

In this review, we found that CO-OP was first used in adult population in 2009. Since Dawson and colleagues used CO-OP to improve performance in patients with executive dysfunction following TBI to the time of final articles count for this study, we found 15 articles that used CO-OP in different population like stroke and age-related cognitive difficulties, setting like inpatient or at home and format like telehealth. Considering the results of the studies we examined in this review, the authors were optimistic to use the CO-OP. In all studies, the results indicated a positive effect of CO-OP on the patients' performance in trained goals. In 7 articles, which was also focused on changes in untrained goals improvement was also observed in untrained goals that demonstrated transfer of learning through CO-OP approach. In some studies that have addressed cognitive functions, CO-OP reduced DEX

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scores indicated that the impact of executive dysfunction on everyday life has decline (9). In studies that used D-KEFS, results reflected improvement in participants' executive functions (33, 36). Also, based on results of some studies, CO-OP caused improvement in hand and arm movement in patient affected by CVA (27, 31, 32, 34). In one study that have addressed effect of CO-OP on ADL, CO-OP caused improvement in all ADL's measures (24). Also using CO-OP in online medium was possible as evidenced by the improvement observed in trained goal performance (9).

According to the primary purpose of CO-OP protocol for children some modifications were needed from original approach which consist 10 1-hour sessions that were provided twice weekly for 5 weeks (7), to use CO-OP in different populations. Dawson applied some modifications include increasing the duration of training (from 10 to 20h), changing the introductory scripts to make them appropriate for adults, providing workbooks to participants, expanding the techniques used in the guided discovery process and introducing a formal generalization package. Skidmore administered the CO-OP intervention in one 45-minute session per day, 5 days per week, for the length of the inpatient rehabilitation stay (14 days).

In addition to our aim purpose, we conducted this scoping review to determine whether there is a need for a systematic or not. Based on our searches, there are 15 peer-reviewed journal articles examined the effectiveness of CO-OP on adult population, indicating that a systematic review can be warranted. There were some systematic review that examined effectiveness of interventions on children with DCD (37, 38), and in these systematic reviews CO-OP identified as intervention with strong treatment effects but there is not a systematic review that focused specifically on CO-OP, nether in adult's population nor general.

Another purpose of conducting this review, is to identify gaps in the current literature. This scoping review identified the need of a systematic review of the efficacy and effectiveness of CO-OP on adult population as a must urgent gap. Other gaps are lack of specific evidence-based appendices and guidelines for each diagnosis and age group of the populations, testing new settings and populations, use more precise tools and instruments to examine the effects of intervention and changes caused by CO-OP approach, examine CO-OP effectiveness and efficacy compare with predominant treatment approach and introducing CO-OP as efficient approach to other health professionals.

Conclusion

Cognitive Orientation to daily Occupational Performance (CO-OP) is the top-down, verbally-based, individualized and client-centered approach that originally developed for children with DCD in 2001. In 2009, the first article about CO-OP on TBI was published and since this time, CO-OP used in stroke and older adults as well and results represented CO-OP efficacy and effectiveness in adult's population. However, the need for a systematic review is felt. CO-OP can also be performed in other diagnosis such as MS and Parkinson. As mentioned in previous, there are enough researches which can perform the systematic review.

Limitations

During conducting this study, we encountered some limitations. Since the search term CO-OP is not so specific, may resulted in not to find all relevant articles to this subject. In addition, despite using 8 online resources and finding 15 articles, the existence of other papers used CO-OP that we didn't have access to, is probable. As mentioned previously, the critical appraisal of these papers was out of the scope of this study.

Conflict of Interests

The authors declare that they have no competing interests.

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