Cognitive Orientation to (daily) Occupational Performance (CO-OP) Approach and Children with Disabilities

Amidon, E., OTS, Matteo, K., OTS, O'Toole, K., OTS, Pistilli, C., OTS, Slomowitz, A., OTS., & Potvin, M.-C.

June 2018

INTRODUCTION

The Cognitive Orientation to (daily) Occupational Performance (CO-OP) approach is a manualized performance-based intervention that utilizes guided discovery and problem-solving strategies to facilitate motor acquisition, cognitive awareness, and skill generalization.[1] Generally delivered over 12 sessions, the CO-OP approach utilizes specific cognitive strategies such as the "Goal, Plan, Do, Check" process to improve motor-based performance problems.[6] The CO-OP approach encourages individuals to identify solutions to motor problems to improve overall occupational performance.[6]

Studies have found this approach to be efficacious when delivered both individually and in group to its target population of children with developmental coordination disorder (DCD).[2,5,6] The approach has also been used with individuals diagnosed with attention deficit hyperactivity disorder (ADHD), cerebral palsy (CP), and autism spectrum disorder (ASD).[1,6] Like children with DCD, those with such diagnoses have difficulty with motor coordination, social participation, and activities of daily living.[6]

There is a growing body of research evidence for the CO-OP approach since first published in 2001.[8] Individual studies such as single case designs have found positive outcomes using this approach, however, no prior systematic reviews exist. Therefore, this review aims to compile and evaluate the efficacy of the CO-OP approach in children with disabilities.

TEXT BOX 1

motor acquisition: improvement of motor learning using goal-directed, problem-solving methods

cognitive awareness: attention to processes related to problem solving

***skill generalization*:** ability to transfer learned motor skill and performance across environments and situations

guided discovery: inductive teaching strategy that generates interest and excitement to help children explore and learn causal relationships

METHODS

An *a priori* protocol was developed prior to conducting this systematic review to increase its validity. The protocol is a step-by-step outline which include the PICO question, search strategies for each electronic database, inclusion/exclusion criteria, and search methodology (Appendix 1). The protocol was developed by five collaborating reviewers and

followed closely to identify, appraise and synthesize all relevant published studies.

Identification of Relevant Studies:
A systematic search of all relevant studies was conducted in February and March 2018 using the following databases: PsychINFO, Clinical Key, Cochrane, OT Search, PubMed, OT Seeker, and Google Scholar. Google Scholar and Clinical Key were searched manually. Search restriction included quantitative group studies published in English in peer-reviewed journals. Table 3 of the protocol provides the search terms (i.e. combination of keywords and subject headings) used to conduct the search within each electronic database (Appendix 1).

To be included in this systematic review, studies retrieved during the search had to meet the following criteria: (1) at least half of the population must have been children ages 3 - 21 years old; and (2) used the Cognitive Orientation to Daily Occupational Performance (CO-OP) Approach as the primary mean of intervention. Studies whose subjects had an IQ score below 60 were excluded since the CO-OP approach is not intended to be used with this population. Table 5 of the protocol provides a complete list of inclusion and exclusion criteria (Appendix 1).

Two independent reviewers searched each database and applied the inclusion/exclusion criteria to each study retrieved during the search. Inclusion criteria was first applied to article titles and abstracts of articles. When determination of the inclusion of an article was uncertain, the inclusion criteria was applied to the full text of the article. The flowchart summarizes the results of the search and application of the inclusion and exclusion criteria (Figure 1). Each independent reviewer created a list of included articles per database, the two lists for each database were compared, and discrepancies were resolved through a consensus process with a third reviewer as needed. A final list of all included articles across all databases was created after all authors came to consensus.

Appraisal of Included Studies:
As shown in the flowchart, nine articles remained after inclusion/exclusion criteria were applied and authors came to a consensus (Figure 1). Adhering to the protocol, two independent reviewers appraised each article in terms of quality evidence using predetermined criteria appropriate for the study level of evidence (Appendix 1)[3]. *Quality of evidence* refers to the methodological rigor (e.g. were blind assessors used, how were biases avoided) while *level of evidence* denotes the study design itself (e.g. a randomized control trial type of study has more internal validity than a single-case design study). The two reviewers compared their independent ratings of the quality of evidence of each study. Discrepancies between reviewers were resolved by discussion until a consensus was reached. The quality of methodology ratings of each included study is compiled in the quality of evidence table (Table 1).

The two reviewers also worked independently to summarize the objective information from each study to create the study description Table, then came to consensus (Table 2). The table includes information about the population, intervention, relevant outcomes, tools used, results data, and the statistical and clinical significance of the data (Table 2). Statistical and clinical significance are defined in textbox 2. When clinical significance was not reported in an article, reviewers calculated when possible the minimally detectable difference (MDD; Textbox 2). Using the study description table, practice recommendations for clinicians were generated using a modified version of the Grading of Recommendations Assessment, Development, and Evaluation System (GRADES)[3].

TEXT BOX 2

statistical significance: results from experiments do not occur by chance but are relative to a cause[14]

quality of evidence: degree of rigor within the methodology section of the study[3]

clinical significance: measurable way to determine if the change experienced by participants is large enough for them to detect it or have a meaningful impact on their life.[10]

MDD: the mean difference of the treatment and control groups to identify a change in state[12]

MCID: ability to transfer learned motor performance and skills across environments and situations

effect size: the level of difference amongst groups (i.e. treatment, control) or the number of participants necessary for the study to repeat the same results every time[13]

RESULTS

A total of 262 articles were retrieved through the database searches, nine of which met the predetermined inclusion criteria (Figure 1).

As can be noted in the study description table, the included studies used a mix of designs with a level of evidence ranging from I to IV (Table 2)[3]. Specifically, four of the included articles are single case designs that compare subjects to themselves and are based on repeated measurement at multiple phases: baseline, intervention, and follow-up or withdrawal phase. Overall, four studies were quasi-experimental, or uncontrolled before and after studies. Two studies used one group of subjects that collected data before and after the intervention was implemented. Two studies utilized two groups with data collected pre and post intervention, however without randomization of the participants. One study was a randomized controlled trial (RCT), with two groups, data collected before and after the intervention, and randomization of subjects. RCT is the highest level of evidence (Level I).

The level of evidence of the studies provided in this systematic review ranged from moderate to high, with one article providing low level evidence[3]. The quality of the individual studies also ranged from moderate to high with one study classifying as low quality of evidence[3]. A total of six out of nine studies were high quality (70%+) with two studies classified as moderate quality (40%-69%). The RCT was recognized as high quality of evidence. The quality of evidence table provides further details about each individual study (Table 1). A total of four studies classified as level IV, two studies for level III,

and two studies for level II[3]. The included studies measured changed in six outcomes: (1) occupational performance, (2) task completion, (3) motor skills, (4) adaptive behavior, (5) visual motor skills, (6) handwriting.

Occupational Performance:
Eight out of nine studies addressed occupational performance and satisfaction. The studies ranged from moderate to high quality of evidence and low to high level of evidence. The *Canadian Occupational Performance Measure* & *Self-Perception Profile for Children* were utilized to assess both occupational performance and satisfaction. The psychometrics of these assessments are both valid and reliable. Three out of eight studies were statistically significant, those that were not is due to study design. Six out of eight studies were clinically significant.

Task Completion:
Eight out of nine studies were identified for task completion. Of those eight studies five were low level of evidence, one was moderate level, and two were high level. Six out of the eight studies were high quality of evidence, one was moderate quality of evidence, and one was low quality of evidence. Included measurement tools for task completion were *Performance Quality Rating Scale* (PQRS), *Activity Scale for Kids* (ASK), and Goal Attainment Scale (GAS). The PQRS has been found to be reliable, however further research is needed to determine validity. The ASK and GAS both have been proven to be valid and reliable. Seven studies established statistical significance. Statistical significance was not able to be calculated for one study due to the study design. Six studies demonstrated a positive result in terms of clinical significance. Clinical significance was not able to be calculated for the final two studies due to the study design.

Motor Skills:
Four out of the nine studies addressed motor skills as an outcome, with two out of the four studies being of moderate quality. The remaining two studies ranged from low to high quality of evidence. The *Bruininks-Oseretsky Test of Motor Proficiency* (BOT-MP) and *Movement Assessment Battery for Children* (MABC) were used to assess motor skills, with both measurement tools having sound psychometric properties. Although two of the four studies demonstrated positive results in terms of clinical significance, three out of the four studies were not statistically significant. Therefore, the results cannot be attributed to the applied intervention.

Adaptive Behavior:
One out of the nine studies addressed adaptive behavior as an outcome. This study had moderate level and quality. The study used the *Vineland Adaptive Behavior Scale* (VABS) to calculate an adaptive behavior score. This assessment has valid and reliable psychometrics. While the score increase was statistically significant, it was not clinically significant.

Visual Motor Skills:
One out of nine of the studies addressed visual motor skills in children. This study provided a moderate level and quality of evidence. The assessment utilized was the *Beery-Visual Motor Integration* (VMI) assessment. The VMI had psychometric properties that were both valid and reliable.

The results were clinically significant but not statistically significant, thus the clinical significance could have occured by chance.

Handwriting:
One out of nine of the studies estimated the raw speed score, word legibility, and letter legibility of handwriting in children. This study had a moderate level and quality of evidence. The study used three different measurement tools to assess handwriting. One out of three of the measurement tools had psychometric properties that were valid and reliable. No published psychometric properties could be found for the remaining two measurement tools. The raw score speed and word legibility scores increased with statistically and clinically significant results, whereas letter legibility was not statistically or clinically significant.

PRACTICE RECOMMENDATIONS

Occupational Performance and Task Completion:
Eight of the nine published studies that met this systematic review's inclusion criteria addressed occupational performance and task completion. Of these, there was a preponderance of level III studies[3]. Using a modified GRADES classification system, both outcomes demonstrated moderate quality; meaning that while the quality of evidence was high and the vast majority of the results were statistically and clinically significant, it is still possible that further research may impact the reviewers' confidence in the estimate of effect[3]. As a result, while the evidence from this review for occupational performance and task completion is overwhelmingly positive, further studies with larger sample sizes and more rigorous methodologies are still suggested.

Motor Skills, Adaptive Behavior, and Visual Motor Skills:
The motor skills, adaptive behavior, and visual motor skills outcomes received a low-quality score based on the same GRADES criteria[3]. The evidence was positive but was not consistently clinically significant or statistically significant. Further research is very likely to have an impact on the estimate of effect and validity of the results, making alternative treatment options with these outcomes as goals potentially more effective.

Handwriting:
Like occupational performance and task completion, handwriting also received a moderate quality score with the majority of results being statistically and clinically significant, however this outcome was derived from only one study. As before, it is still recommended that further studies be performed to confirm and generalize the results.

CLINICAL IMPLICATIONS

The nine included studies in this systematic review evaluated the efficacy of the CO-OP approach in children with disabilities on six outcomes. Three out of the six outcomes were classified as moderate quality using the modified GRADES system[3]: perceived occupational performance and satisfaction, task completion, and handwriting. Although further research is warranted, the results for these three outcomes were consistent throughout the applicable articles. The preponderance of studies demonstrated

moderate to large clinical significance with positive change greater than the MDD and/or MCID for these outcomes. Despite only limited equipment and time necessary to implement such intervention, the CO-OP approach does pose potential burdens on a child and his or her family. However, the benefits of the recommended course of action clearly outweighed the burden (e.g. transportation, time) in the three identified outcomes. While study limitations exist, the CO-OP approach is a strong option when addressing perceived occupational performance, task completion, and handwriting skills in children with disabilities as evidenced by moderate-to-high clinical significance in all three outcomes. CO-OP may not be appropriate for all clients, but for these outcomes it should be considered as a legitimate therapy option.

Utilizing a modified GRADES classification system, the remaining three outcomes (i.e., motor skills, adaptive behavior, and visual motor skills) were categorized as low-quality recommendations[3]. The preponderance of studies for these outcomes were of moderate quality. However, these studies results had minimal to no clinical significance, making the potential burden on families exceed the expected amount of benefits. Therefore, given this limited level of support, the CO-OP approach should be implemented with extreme caution when addressing motor skills, adaptive behavior, and visual motor skills.

CLINICAL TIPS

The CO-OP approach is a recommended intervention option when working with children with disabilities ages 5-12 years old on occupational performance, task completion, and handwriting. The most crucial factor for occupational therapists who want to implement the CO-OP approach is the need to partake in the required advanced clinical training[15]. While not mandated, the standard frequency of intervention is one session per week for 10-12 weeks, each session lasting one hour[15]. The results from this review can be generalized to male and female children with an IQ of at least 65, intact expressive and receptive communication, functional hearing and vision, and self-motivation. These children also had one of the following disabilities: developmental coordination disorder, cerebral palsy, attention deficit hyperactivity disorder, and high-functioning autism spectrum disorder. The CO-OP approach relies on client-directed goals and behaviors, meaning that the therapist must utilize the child's self-motivation to promote guided discovery[15].

REFERENCES

1. The International CO-OP Academy. (2017). *The co-op approach*. Retrieved from http://co-opacademy.ca/about-co-op/the-co-op-approach/
2. 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.
3. Dijkers, M. (2013). Introducing GRADE: a systematic approach to rating evidence in systematic reviews and to guideline development. KT Update 1(5). Retrieved from http://www.ktdrr.org/products/update/v1n5/dijkers_grade_ktupdatev1n5.h tml2
4. Martini, R., & Polatajko, H. J. (1998). Verbal self-guidance as a treatment approach for children with developmental coordination disorder: A systematic replication study.

Occupational Therapy Journal of Research, 18(4), 157–181.
5. 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.
6. Gharebaghy, S., Rassafiani, M., & Cameron, D. (2015). Effect of cognitive intervention on children with ADHD. *Physical & Occupational Therapy in Pediatrics, 35*(1), 13-23. doi: 10.3109/01942638.2014.957428
7. Jokic, C. S., Polatajko, H., & Whitebread, D. (2013). Self-regulation as a mediator in motor learning: The effect of the cognitive orientation to occupational performance approach on children with DCD. *Adapted Physical Activity Quarterly, 30*(2), 103-126. doi: 10.1123/apaq.30.2.103
8. Scammell, E., Bates, S., Houldin, A., & Polatajko, H. (2016). The cognitive orientation to daily occupational performance (co-op): a scoping review. *Canadian Journal of Occupational Therapy, 83*(4), 216-225. https://doi.org/10.1177/0008417416651277
9. Sackett, D.L., Rosenberg, W.M., Muir Gray, J.A., Haynes, R.B. & Richardson, W.S. (1996). Evidence-based medicine: What it is and what it isn't. *British Medical Journal, 312*, 71- 72.
10. Higgins, S. (1991). *Motor skill acquisition*. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/1989008
11. Portney, L. & Watkins, M. (2008). *Foundations of Clinical Research: A Clinical Application*. Upper Saddle River, N.J: Pearson/Prentice Hall.
12. Brock, T. C. M., Hammers-Wirtz, M., Hommen, U., Preuss, T. G., Ratte, H.-T., Roessink, I., … Van den Brink, P. J. (2015). The minimum detectable difference (MDD) and the interpretation of treatment-related effects of pesticides in experimental ecosystems. *Environmental Science and Pollution Research International*, *22*(2), 1160–1174. http://doi.org/10.1007/s11356-014-3398-2
13. Sullivan, G. M., & Feinn, R. (2012). Using Effect Size—or Why the *P* Value Is Not Enough. *Journal of Graduate Medical Education*, *4*(3), 279–282. http://doi.org/10.4300/JGME-D-12-00156.1
14. Tenny, S., & Abdelgawad, I. (2017). *Statistical Significance*. Retrieved from: https://www.ncbi.nlm.nih.gov/books/NBK459346/#article-29464.s7
15. Polatajko, H. J., Mandich, A. D., Missiuna, C., Miller, L. T., Macnab, J. J., Malloy-Miller, T., & Kinsella, E. A. (2009). Cognitive orientation to daily occupational performance (CO-OP) part III: The protocol in brief. *Physical & Occupational Therapy in Pediatrics, 20*(2-3), 107-123. doi: 10.1080/J006v20n02_07

Appendix 1. "A Priori" Protocol

Table 1

PICO question			
P - Children with disabilities	**I -** CO-OP approach	**C -**	**O –**

SEARCH STRATEGY

List of the Databases to be Search:

Table 2

Databases Included in SR Search	**Planned the Search**		**Will conduct the Search**	
	Person 1	**Person 2**	**Person 1**	**Person 2**
PsychINFO	Liz	Tina	Anna	Kaitlyn
PubMed	Coral	Tina	Liz	Kaitlyn
Clinical Key	Liz	Tina	Anna	Kaitlyn
Cochrane	Kaitlyn	Anna	Tina	Coral
OT Search	Coral	Kaitlyn	Liz	Anna
OT Seeker	Liz	Anna	Tina	Coral
Google Scholar	Kaitlyn	Anna	Coral	Tina

List of Search Terms:
Table 3

	Construct 1: Disabled Children		Construct 2: CO-OP		Limits (if any)
Database	**Subject Headings**	**Keywords**	**Subject Headings**	**Keywords**	**N/A**
PsychINFO	N/A	Child*, youth	N/A	"CO-OP", "CO OP", "Cognitive Orientation to Daily Occupational Performance"	N/A
Clinical Key	N/A	Child	N/A	"Cognitive Orientation to Daily Occupational Performance"	N/A
OT Search	N/A	N/A	N/A	"CO-OP", "CO OP", "Cognitive Orientation to Daily Occupational Performance"	N/A
PubMed	"Disabled children", neurodevelopment disorders	N/A	N/A	"CO-OP"	N/A
Google Scholar	Children	N/A	N/A	"Cognitive Orientation to Daily Occupational Performance"	N/A
OT Seeker	N/A	Children	N/A	"CO-OP Approach", "Cognitive Orientation to Daily Occupational Performance"	N/A

PsychINFO: Utilize truncations for child*; use keywords rather than subject headings for the CO-OP Approach
Clinical Key: Use broad terms for both concepts; "youth" and "adolescent" not included because they did not yield any relevant results
OT Search: This is a straightforward database. Use below Boolean sentence in the regular search bar.
OT Seeker: Keep it extremely broad (i.e. children and CO-OP Approach)
PubMed: Do not go into the advanced search option. Instead, copy and paste the below Boolean sentence into the regular search bar. It is already set up to search MeSH terms versus keywords appropriately. Neurodevelopmental disorder MeSH term was kept as it yielded increased relevant results.
Google Scholar: Keep broad, keyword focused statements. Copy and paste the boolean sentence into the search bar. The search will yield many results, once 3 pages are reached of not finding relevant information, the search can be stopped.

Boolean Sentence for each database:

Table 4

Database Name	Boolean Sentence
PsychINFO	(Child* OR youth) AND ("CO-OP" OR "CO OP" OR "cognitive orientation to daily occupational performance")
Clinical Key	child AND “cognitive orientation to daily occupational performance"
OT Search	“Cognitive orientation to daily occupational performance” OR “CO-OP” OR “CO OP”
Google Scholar	children AND “cognitive orientation to daily occupational performance”
OT Seeker	(children) AND (“CO-OP Approach” OR “Cognitive orientation to daily occupational performance”)
PubMed	(“disabled children”[MeSH Terms]) OR (“neurodevelopmental disorders”[MeSH Terms]) AND (“CO-OP”[All Fields])

ARTICLE INCLUSION and EXCLUSION CRITERIA

Table 5

Inclusion Criteria			
Population	Intervention and Comparison	Outcome	Other
Children (3-21 years old) *-At least half of subjects need to fit this criteria to be included*	Cognitive Orientation to Daily Occupational Performance	N/A	English language
			Peer-reviewed articles
			Quantitative studies

Exclusion Criteria			
Population	Intervention and Comparison	Outcome	Other
Measured IQ score below 60	N/A	N/A	

JUSTIFICATION: Write a brief justification for each inclusion and exclusion criteria included in the table above.

- Children (3-21) need to be able to understand and develop the cognitive strategies to benefit from the CO-OP model. Many individuals with disabilities also stay in the school system and transition until age 21, and they should be included in the definition of children for these purposes.
- A prerequisite to use the CO-OP model is for the client to be able to understand and engage in the cognitive strategies, so they must have a certain level of cognitive functioning but interventions can be modified for a client (Mandich, Wilson, & Gain, 2015, p. 308). Therefore, children with IQs below 60 are unable to cognitively
- The only inclusion criteria for the intervention is the use of the CO-OP model, as this is the basis of our PICO question.
- Specific disabilities (or subheadings within a disability) do not change the implementation of the CO-OP approach, and are therefore not relevant for inclusion criteria.
- English language, peer-reviewed, and quantitative studies are required for inclusion criteria due to the realistic time constraints of OCC767

Figure 1. Flowchart

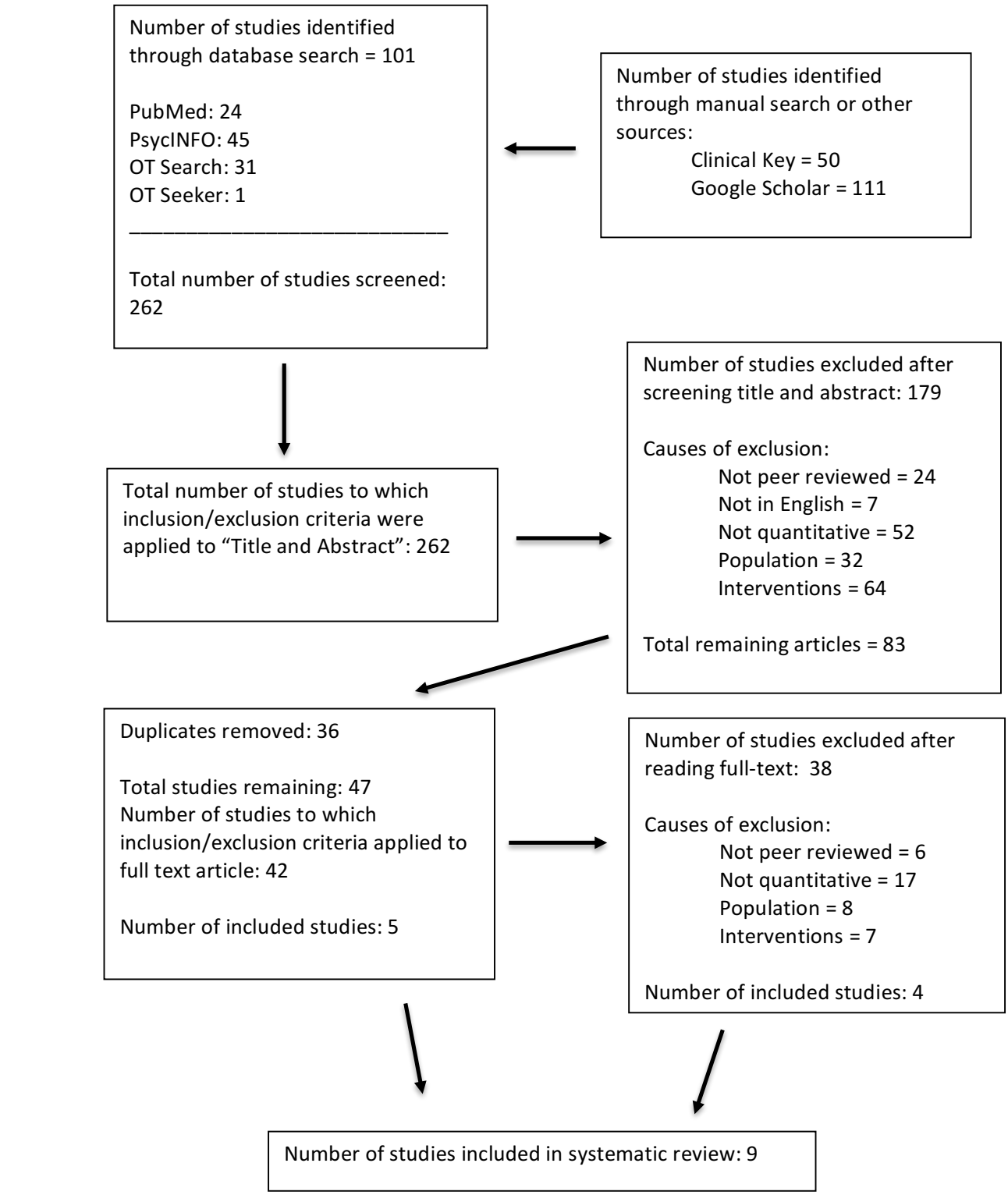

Table 1. Quality of Evidence Table

		Quality Criteria											
Reference	Type of design	1	2	3	4	5	6	7	8	9	10	Quality Level	Evidence Level
Cameron, Craig, Edwards, Missiuna, Schwellnus, & Polatajko (2016)	3	1	1	1	1	1	1	0	1	0	1	80% = High	Level I
Capistran & Martini (2016)	7	1	1	1	1	1	1	1	1			100% = High	Level IV
Gharebaghy, Rassafiani, & Cameron (2015)	7	1	1	1	1	0	1	0	1			75% = High	Level IV
Ghorbani, Rassafiani, Izadi-Najafabadi, Yazdani, Akbarfahimi, Havaei, & Gharebaghy (2017)	6	1	1	0	0	1	1	0	1			62.5% = Moderate	Level III
	7	1	1	1	1	0	1	0	1			75% = High	
Jokic, Polatajko, & Whitebread (2013)	6	0	0	0	0	1	0	1	1			37.5% = Low	Level III
Miller, Polatajko, Missiuna, Mandich, & Macnab (2001)	5	1	1	1	0	1	0	1	0	0	1	60% = Moderate	Level II
Phelan, Steinke, & Mandich (2009)	7	1	1	0	1	1	1	1	1			87.5% = High	Level IV
Taylor, Fayed, & Mandich (2007)	7	1	1	0	1	0	1	1	1			75% = High	Level IV
Thornton, Licari, Reid, Armstrong, Fallows, & Elliott (2015)	5	0	1	1	0	1	0	1	1	0	1	60% = Moderate	Level II

Table 2. Study Description Table

Study	Population	n per Group	Outcome(s)	Measurement	Statistical/Clinical Significance
Taylor, Fayed, & Mandich (2007)	Age: 5-7.5 Sex: M Dx: DCD	n = 4	1. Occupational performance 2. Task completion	1. COPM (0-10, ↑ = +) 2. PQRS (0-10, ↑= +)	1. 37/48 scores improved by 2 or more. MCID = 2. Statistical significance not given. 2. N/A due to study design
Cameron, Craig, Edwards, Missiuna, Schwellnus, & Polatajko (2016)	Age: 7-12 Dx: CP	CT n = 9 Tx n = 9	1. Occupational Performance 2. Task completion	1. COPM (parent & child) (0-10; ↑= +) 2a. PQRS (0-10, ↑= +) 2b. ASK	1. 4/4 clinically significant. Statistical significance not given 2a. Clinically significant, statistical significance not given 2b. NS/not clinically significant
Phelan, Steinke, & Mandich (2009)	Age: 9, 10 Sex: M Dx: Asperger's Syndrome & high functioning Autism	n = 2	1. Occupational performance 2. Task completion	1. COPM (0-10, ↑ = +) 2. PQRS (0-10, ↑= +)	1. 12/12 goals were clinically significant 2. PQRS A PrePost 4.5; B PrePost: 4.3

Gharebaghy, Rassafiani, & Cameron (2015)	Age: 7-12 Dx: ADHD	n = 6	1. Occupational performance 2. Motor skills 3. Task completion	1. COPM (0-10; ↑= +) 2.BOT-MP (0-100 ;↑= +) 3. GAS (-2-2; ↑= +)	1. 59/60 clinically significant. Statistical significance N/A due to study design. 2. N/A due to study design 3. 18/18 clinically significant. Statistical significance N/A
Capistran & Martini (2016)	Age: 7-12 Dx: DCD Other: had comorbidities	n = 4	1.Occupational performance 2. Task completion	1. COPM (0-10; ↑= +) 2. PQRS (0-10, ↑= +)	1. COPM 9/16 goals were clinically significant 2. PQRS 9/16 goals were clinically significant
Miller, Potatajko, Missiuna, Mandich & Macnab (2001)	Age: 7-12 Sex: M, F Dx: DCD Other: normal intelligence, hearing, and vision	n = 20 CT n = 10 Tx n = 10	1. Occupational performance 2. Task completion 3. Motor skills 4. Adaptive behavior 5. Visual-motor skills	1. COPM (0-10; ↑= +) 2. PQRS (0-10, ↑= +) 3.BOT-MP (0-100 ;↑= +) 4. VABS (0-140; ↑= +) 5. VMI (0-100; ↑= +)	1. Statistically/ clinically significant 2. Statistically/ clinically significant 3. NS/not clinically significant 4. Statistically significant, not clinically significant 5. NS, is clinically significant

Thorton, Licari, Reid, Armstrong, Fallows & Eliott (2015)	Age: 8-10 Sex: M Dx: DCD Other: All right handed	n = 20 CT n = 10 Tx n = 10	1. Motor skills 2. Handwriting 3. Occupational performance	1. MABC-2 (0-100, ↑= +) 2a. HST raw score (0-infinite; ↑= +) 2b. Letter legibility (0-infinite; ↑= +) 2c. Word legibility (0-infinite; ↑= +) 3. COPM (0-10; ↑= +)	1. NS 2a. p = 0.018, clinically significant 2b. NS and not clinically significant 2c. p = 0.030, clinically significant 3. p<0.05 for all, clinically significant
Ghorbani, Rassafiani, Izadi-Najafabadi, Yazdani, Akbarfahimi, Havaei & Gharebaghy (2017)	Age: 7-9 Sex: M Dx: CP Other: Farsi-speaking with normal intelligence, vision, and hearing	n = 5	1. Occupational performance 2. Task completion	1. COPM (0-10, ↑= +) 2. GAS (-2-2; ↑= +)	1. 54/54 clinically significant 2. 15/15 clinically significant NS for both due to study design
Jokic, Polatajko & Witebread (2013)	Age: 7-9 Sex: M, F Dx: DCD Other: Grades 1, 2, or 3, public school;	n = 20 CT n = 10 Tx n = 10	1. Task completion 2. Motor skills	1.PQRS (0-10, ↑= +) 2a.MABC Test (0-100, ↑= +) 2b. MABC Checklist (0-30, ↑= +)	1. p>0.05 2a. p>0.05 2b. p>0.05