Occupational Therapy Interventions for Improving Health-Related Quality of Life in Adults Post-Stroke: A Rapid Systematic Review

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Key Words

- evidence-based practice
- health-related quality of life
- occupational performance
- occupational therapy
- physical well-being
- stroke

This rapid systematic review of the literature examines 24 articles from the databases of Pubmed and CINAHL to determine the evidence and effectiveness of occupational therapy (OT) interventions in improving health-related quality of life (HRQOL) of adults post-stroke. Many adults report a decline in life satisfaction and occupational performance following a stroke due to various physical, cognitive, and emotional impairments. OT is a key component of stroke rehabilitation; therefore, there is a high need for effective and evidence-based occupational interventions for individuals post-stroke. Findings of this rapid systematic review reveal that the use of occupation-based activities has reasonable yet limited evidence to support its effectiveness in improving HRQOL for adults post-stroke. This review supports the premise that HRQOL, including physical wellbeing and occupational performance, can be positively affected through the use of several commonly used OT interventions. Specifically, there is strong evidence to support the use of robot-assisted therapy and bilateral upper extremity training for improving physical wellbeing. Additionally, there is strong evidence supporting the use of the Cognitive Orientation to daily Occupational Performance (CO-OP) approach for improving occupational performance. All other interventions included in this review ranged from low to moderate levels of evidence in improving HRQOL, therefore, future studies with larger sample sizes and equal treatment groups should be conducted to confirm the results of this rapid systematic review.

Focused Clinical Question

The purpose of this rapid systematic review was to search the literature, critically appraise, and analyze the applicable findings to address the following focused question: For adults post-stroke, what is the effectiveness of occupational therapy for improving health-related quality of life?

Statement of Problem and Background

Stroke is the leading cause of disability in the United States, affecting 700,000 Americans every year (Almhdawi et al., 2016). Individuals living with long-term disability post-stroke may experience decreased function in their affected side, resulting in limited ability to perform meaningful occupations and a decrease in overall quality of life (Lewthwaite et al., 2018). Over 60% of individuals who experience a stroke require rehabilitation to regain function in their daily lives and improve their quality of life, which means that rehabilitation is a crucial part of post-stroke recovery. Despite this need for effective rehabilitation techniques, research related to upper extremity recovery is still limited (Almhdawi et al., 2016). Additionally, research shows that occupational gaps are still widely present in individuals post-stroke even after a full year of stroke rehabilitation (Eriksson et al., 2015).

As mentioned previously, stroke is the leading cause of disability in the United States, which demands that OT interventions for this population are evidence based and effective. Despite this need, research states that there is still limited evidence to support many stroke-related OT interventions and that many individuals still experience occupational gaps after a full year of intervention. Therefore, there is a need for evidence-based and effective OT interventions for improving health-related quality of life in adults post-stroke.

Methods for Conducting the Evidence-Based Review

This rapid systematic review was conducted to identify OT interventions that could be implemented to improve the HRQOL in adults post-stroke. This search topic was chosen by OT students who felt that HRQOL is one of the most important outcomes for adults post-stroke. The articles included in this review were gathered from the databases of Pubmed and CINAHL. This search was conducted by the aforementioned group of OT students with guidance from librarians and professors from IUPUI's School of Health & Human Sciences and Department of Occupational Therapy. Through this collaboration a relevant PICO question was developed, which led to the following search terms. The searches were filtered with the dates of 2010-2021.

Pubmed MESH Term Search:

(("Stroke"[Mesh]) AND ("Occupational Therapy"[Mesh] OR "Occupational Therapy Department, Hospital"[Mesh])) AND "Adult"[Mesh]

CINAHL Search:

stroke and OT and adult

This review utilized the levels of evidence criteria from the article titled "Evidence based medicine: What it is and what it isn't" (Sacket et al.,1996) to determine the level of evidence of each article. Articles that were level I, level II, and level III evidence were included in the study, while articles that were level IV and IV evidence were excluded. This rapid systematic review did not include meta-analyses, systematic reviews, descriptive studies, or case reports. Studies were initially excluded if they were not conducted in English-speaking countries, but due to the limited number of studies, the search was expanded to include studies from all countries. The inclusion and exclusion criteria were as follows:

Inclusion criteria:

- Participants were 18 years or older
- Participants reported a history of one or more strokes
- Written in English
- Method of intervention must be included within the scope of OT
- Outcomes included within the scope of HRQOL

Exclusion criteria:

- Pilot studies
- Studies published before 2010
- Medication-only interventions

A total of 503 studies were imported into Covidence for screening, with a total of 501 studies imported from Pubmed and CINAHL and 2 studies that were personally added due to their high level of evidence and ability to meet the inclusion criteria. Each abstract was screened to determine relevance and level of evidence, and articles required 2 votes from reviewers in order to be moved to the full-text review. Abstract screening resulted in 59 studies, which were moved to full-text review and assessed for eligibility. Each study required 2 votes before being exported and used for the rapid systematic review. A total of 25 articles were selected to be included, although one was dropped due to duplication, resulting in the final total of 24 studies (See Figure 1). The articles included in this rapid systematic review were broken into two main outcomes included within the scope of the overall outcome of HRQOL.

Outcome 1: Physical wellbeing

- Included upper extremity function, muscular strength, range of motion, hand prehension, motor recovery, visual functions, and sensory function

Outcome 2: Occupational performance

- Included performance in functional/daily activities, transfer to untrained activities, community reintegration, participation in occupations, functional use of the arm, quality of life, depression, performance in IADL, personal management, and independence

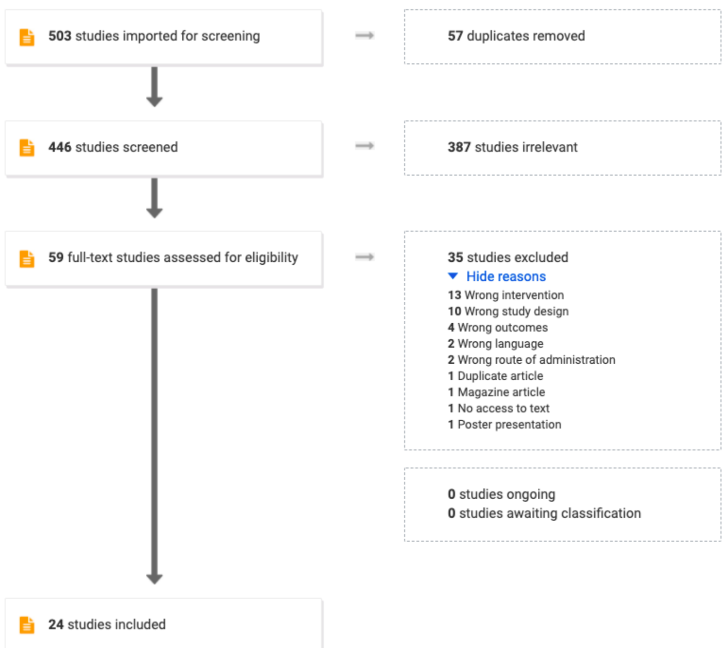

Figure 1: *PRISMA diagram generated by Covidence*

Results

Twenty-four studies were used in this systematic review that followed inclusion and exclusion criteria. Twenty-one were Level I evidence, one was Level II evidence, and two were Level III evidence. From these studies, the authors identified the following HRQOL outcome themes: Physical wellbeing and occupational performance.

Physical Wellbeing

Four level I randomized controlled trials compared robot active assisted therapy to traditional occupational therapy (OT) (Orihuela-Espina et al., 2016; Xu et al., 2020; Sale et al., 2014; Lee et al., 2018). Three of the four studies concluded that the intervention of robot assisted therapy showed significant physical improvements using the Wolf Motor Function Test, Fugl-Meyer Score, and/or the Barthel Index compared to the control group. One study reported no significant difference between the two groups after treatment overall (Xu et al., 2020).

A Level I two-group randomized comparison design study (Hayner et al., 2010) measured upper extremity function in constraint-induced movement therapy (CIMT) versus traditional bilateral upper extremity OT using the Canadian Occupational Performance Measure and the Wolf Motor Function Test. The authors found significant improvements in bilateral upper extremity function within both groups, and no significant differences between groups.

A Level I two-group randomized controlled trial (Lee et al., 2016) compared bilateral upper extremity training in a virtual reality environment and traditional bilateral upper extremity training. The authors found that the intervention group exhibited significant improvements in upper extremity function and muscle strength after the 6 week training program when compared to the control group.

A Level I randomized controlled trial (Jang et al., 2016) compared the effectiveness of Brain-Computer Interface-Controlled Functional Electrical Stimulation Training (BCI-FES) paired with conventional OT to functional electrical stimulation (FES) on shoulder subluxation. The authors found that BCI-FES paired with conventional OT had the greatest impact on improving shoulder flexion and abduction and reducing vertical subluxation when compared to FES alone.

One Level I single-blind randomized trial (Winstein et al., 2016) randomized individuals into one of three groups. The intervention was completed within 16 weeks and involved accelerated skill acquisition program, monitoring only and customary care UCC, and dose-equivalent usual practice. Among participants with motor stroke and primarily moderate upper extremity impairment, the use of the task-oriented program did not significantly improve motor function. The findings do not support the superiority of the ASAP intervention among patients with motor stroke and moderate upper extremity impairment.

One Level I randomized controlled trial (Pandian et al., 2011) compared Brunnstrom hand manipulation (BHM) and a motor relearning program (MRP) to determine their outcomes on chronic stroke patients. The authors concluded that both interventions were effective in enhancing motor recovery in the hand, however, there were statistically significant results in favor of Brunnstrom movement therapy. Specifically, BHM was found to be better than MRP at improving wrist and hand recovery, especially mass finger flexion, extension, and grasp.

One Level I randomized controlled trial (Lin et al., 2010) compared the effects of bilateral arm training (BAT) to traditional OT in adults post-stroke. The authors reported that BAT showed better temporal and spatial efficiency during unilateral and bilateral tasks compared to standard OT, and the BAT group demonstrated significantly greater improvements in motor performance and motor impairment.

A Level I three-armed randomized control trial (Mödden et al., 2012) compared the effects of Restitution Training (RT) and Compensatory Training (CT) to OT. The Visual Field Assessment, Testing Battery for Attention Performance, Behavioral Inattention Test, and Extended Barthel Index were used to assess visual field expansion for RT, visual search performance for CT, reading performance for both treatments,The Barthel Index and Visual conjunction. Evidence from this study suggests that CT resulted in a better visual search performance compared to OT, and RT did not result in a larger expansion of the visual field. CT improved all defined outcome parameters and RT several, whereas OT only improved one.

One Level I randomized control trial (Iwamoto et al., 2019) looked at 12 acute first time stroke patients that were divided into two groups. Group one received combination hybrid assistive limb (HAL-SJ) and OT, and group two received just traditional OT. There were no significant differences seen in motor function severity defined by the outcome measures between groups on day 14 after stroke. ADL limitations were not significantly different between groups either. Overall, there were no significant changes between group one and two after intervention.

Occupational Performance

Four Level I randomized controlled trials utilized the Cognitive Orientation to daily Occupational Performance to compare to other methods (Ahn et al., 2017; Song et al., 2019; McEwen et al., 2015; Wolf et al., 2016). All four studies reported the CO-OP approach to be beneficial, a positive therapeutic intervention, and highly significant compared to the control groups.

One Level I randomized controlled trial (Mortensen et al., 2016) compared the use of combined transcranial direct current stimulation (tDCS) and home based OT. This study looked at the ability to complete the Jebsen-Taylor Test (JTT) for activity and function, and also looked at the stroke impact scale scores. There was a tendency for greater improvement in ADL performance in the anodal group compared with the sham group, and statistically significant improvement in grip strength in the anodal group compared to sham. Over time, both groups did improve in logJTT.

One Level I randomized controlled trial (Sackley et al., 2014) utilized a three-month long program of OT which was delivered by occupational therapists and assistants and involved patient centered goal setting, education, and adaptations to the environment. Scores on the Barthel Index were measured for ADLs at three months post-randomization, along with 6 and 12 months. Between the treatment arms, there was no significant difference. The adjusted mean difference in Barthel index score at three months was .19 points higher in the intervention arm.

One Level III single group non-randomized pretest-posttest design (Egan et al., 2010) found that a Community Stroke Navigation service that included case coordination, "just in time" education, coaching, family support organization, and accompaniment resulted in a small improvement in community reintegration among stroke survivors and no significant changes among care partners. No changes in physical or emotional health were reported by stroke survivors or care partners.

One Level I cross-over randomized controlled trial (Almhdawi et al., 2016) provided evidence that a 6-week task-oriented OT intervention that was individualized using the COPM produced statistically higher functional change scores than the control, which included significant improvements in all functional measures including the Canadian Occupational Performance Measure (COPM), Motor Activity Log (MAL), and Wolf Motor Function Test (WMFT). The authors did not report significant improvements over the control on any of the impairment outcomes including measures of active range of motion (AROM) and muscular strength.

One Level III single group repeated measures design (Henderson & Manns, 2012) found that group modified constraint induced movement therapy (mCIMT) resulted in statistically and clinically significant improvements in functional use of the arm and participation in meaningful occupations in thirteen stroke and two brain injury participants. Significant improvements in motor recovery were found as well.

One Level I randomized controlled trial (Linder et.al., 2015) compared the effectiveness of a home-based robot assisted rehabilitation program paired with a home exercise program (HEP) to a HEP alone on improving the quality of life and depression in adults post-stroke. The authors reported that both interventions were similar in effectiveness producing no superior results over another.

One Level II cohort study (Msengana et. al., 2019) assessed the effectiveness of a two-month conventional OT program on improving upper limb mobility and personal management in adults post-stroke. The authors reported that there were significant improvements in all aspects of upper limb function personal management, self-care, toileting, and mobility.

One Level I randomized controlled trial (Bertilsson et al., 2014) compared the effects of client-centered ADL (CADL) OT to usual care OT including the ability to use home-help service, independence in ADL, life satisfaction, perceived participation, and satisfaction with training. In their significant others, it looked at life satisfaction, caregiver burden, and informal care. The results indicate that CADL does not appear to cause short-term differences in outcomes. A part of the SIS was "emotion" which created a significant effect, calculated from intention-to-treat due to drop-outs.

Implications for Practice and Research in Occupational Therapy

This rapid systematic review shows strong evidence that a variety of occupational therapy interventions are effective in improving HRQOL in adults post-stroke. Specifically, there is evidence that supports that OT interventions improve physical wellbeing and occupational performance, which are both major components of HRQOL. The review found moderate evidence to support the use of robot-assisted therapy and constraint-induced movement therapy (CIMT) for improving both occupational performance and physical wellbeing.

Overall significant physical improvements were noted from robot-assisted therapy, CIMT, bilateral upper extremity training, Brain-Computer Interface-Controlled Functional Electrical Stimulation Training with OT, Brunnstrom Hand Manipulation (BHM), motor relearning program, and compensatory training. There was strong evidence to support the use of robot-assisted therapy and bilateral upper extremity training for improving physical wellbeing. All other interventions with significant results had limited evidence to support their clinical use.

Overall significant improvements in occupational performance were reported for CO-OP, task-oriented OT, combined transcranial direct current stimulation with home-based OT, group mCIMT robot-assisted therapy with an HEP, HEP alone, and conventional OT. There was strong evidence to support the use of the CO-OP approach for improving occupational performance. All other interventions with significant results had limited evidence to support their clinical use.

The results of this review can be used in practice as a means to support the use of occupational therapy interventions for improving HRQOL in adults post-stroke. This review indicates that robot-assisted therapy, bilateral upper extremity training, CIMT and CO-OP are all beneficial in improving aspects of HRQOL of adults post-stroke. Occupational therapists can adapt these interventions and implement them with a stroke population to address health-related quality of life including occupational performance and physical wellbeing.

The feasibility of implementation of the aforementioned interventions may be affected by the financial costs and accessibility to equipment. The need for training on certain techniques and intervention strategies adds additional barriers to implementation.

This review found multiple significant gaps in the literature. First, there appears to be a significant lack in the number of studies on this topic that were conducted and published in the United States. Due to the large variability in healthcare systems used throughout the world, there is a need for more studies exploring post-stroke OT interventions to be conducted within the United States. Additionally, many of the interventions explored in this review had limited numbers of high level studies conducted on them. Therefore, there is a need for more research, especially randomized controlled trials, to be conducted on OT stroke interventions. Lastly, there was a lack of feasibility studies conducted on the OT interventions included in this review. Due to the wide variety in resources between healthcare facilities, additional feasibility studies should be conducted to determine the feasibility of various stroke-related OT interventions.

Limitations

The majority of studies used in this review are Level I evidence and published within the last eleven years. Despite these strengths, there were still several limitations for this review. This review is a rapid systematic review, and not a full systematic review, which means that a limited number of articles were included in this review and that many potentially relevant articles were excluded. An additional limitation was the lack of access to articles. Because of this lack of access, several articles were excluded from screening. Other limitations include small sample sizes, unequal treatment between groups, use of self-reporting measures, unsuitable follow up times, drop outs due to death, and inadequately short treatment durations.

Conclusions

Overall, this review suggests that OT interventions are beneficial in improving HRQOL in adults post-stroke. The reviewed studies indicate that there is strong evidence for the effectiveness of robot-assisted therapy and bilateral upper extremity training on physical wellbeing. Additionally, strong evidence was found for the use of CO-OP in improving occupational performance. Lastly, there was moderate evidence that CIMT and robot-assisted therapy improved both physical wellbeing and occupational performance in individuals post-stroke

It should be noted that some of the studies included in this review had conflicting results, potentially due to methodological limitations and structure. Additionally, there was limited evidence on the majority of the interventions included in this review, therefore, there is a need for further investigation of post-stroke OT interventions to improve HRQOL. Future studies with larger sample sizes and equal treatment groups are needed to confirm the results of this rapid systematic review.

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Table 1: Evidence Table				
Author/Year	**Level of Evidence/Study Design/ Participation/ Inclusion Criteria**	**Intervention and Control Groups**	**Outcome Measures**	**Results**
Ahn, S.-nae, Yoo, E.-young, Jung, M.-ye, Park, H.-yean, Lee, J.-yeon, & Choi, Y.-im. (2017). https://doi.org/10.3233/nre-161416	Level I RCT N= 43 adults post stroke % of gender was not known M age =52 years Intervention group, n=20 Control group, n=23 Inclusion criteria: ● Adults should be diagnosed with stroke and lives in the community ● Adults received above 19 points in Mini Mental Examination-Korean. ● Adults without problems of verbal communication ● Adults who set the goal of desired occupational performance ● Adults that agreed to	**Intervention:** provided with intervention through CO-OP approach, GOAL-PLAN-DO-CHECK strategy and conventional occupational therapy for 12 sessions **Control:** provided with intervention through CO-OP approach. Treatment goals were determined by the therapist.	Canadian Occupational Performance Measure (COPM): to assess occupational performance based on the ability of the client. Performance Quality Rating Scale (PQRS): monitors and measures the quality of performance by operational definition of the therapist after determining the goal activity.	CO-OP approach was identified to be effective for the increase in occupational performance of stroke patients. Performance and satisfaction of COPM in the trained task was significantly higher for the score in the experimental group compared to the control group ($p < 0.001$). PQRS score in the trained tasks was significantly higher in the experimental group compared to the control group ($p < 0.001$) When comparing before and after training in the experimental group that applied CO-OP approach, increased significantly after the training rather than before the training ($p <$ 0.001), and the control group that underwent

	research			conventional occupa- tional therapy also exhibited a significant increase in the occupational performance after training rather than before training (*p* < 0.01)
Almhdawi, K. A., Mathiowetz, V. G., White, M., & delMas, R. C. (2016). doi:10.1002/oti.1447	Level I RCT (cross-over) N= 20 persons post-stroke 65% male 35% female M Age= 62.3 years old Immediate intervention group, n= 10 Delayed intervention group, n= 10 Inclusion Criteria: ● At least 3 months post-onset of stroke ● At least 10 degrees of active anti-gravity shoulder abduction and flexion ● At least 10 degrees of elbow flexion-extension in the more affected upper extremity	Immediate and delayed intervention groups were used for this study. The immediate intervention group received 6 weeks of intervention while the delayed group received no intervention. After the 6 weeks, the delayed group then received intervention while the immediate intervention group received no intervention. **Intervention:** Participants received task-oriented therapy for two 1.5 hour sessions/week for 6 weeks. This approach is highly client-centered and based upon motor learning and motor control principles. Each participant's intervention was individualized using their COPM results to identify the functional activities that were most important to	Outcome measures were administered at baseline (week 1 pretest), between the two phases (week 7 posttest 1), and after the second phase (week 12 posttest 2). COPM Motor activity log (MAL) Wolf motor function test (WMFT) AROM (with goniometer) Muscular strength (hand-held dynamometry and hand-grip dynamometry	The task-oriented intervention produced statistically higher functional change scores including performance and satisfaction on the COPM, MAL scores, and WMFT scores.

	Exclusion • Persons with unstable medical conditions • Persons with moderate to severe cognitive impairments indicated on the Mini-Mental Status Test • Persons with neurological disorders other than stroke that affect upper extremity function • Persons with severe spasticity characterized by a rigid affected upper extremity indicated by the modified Ashworth scale • Persons with severe pain in affected upper extremity	them. Roughly 70% of therapy time was used to intensively work on the identified functional activities in the COPM, while the other 30% was spent on supplementary exercises including grasp-release training, strengthening, and spasticity management. A logbook was kept for in-clinic and home-based activities for each participant with the purpose of gradually increasing the intervention challenge and enhancing participant compliance. No other professional upper extremity rehabilitation was received during intervention. **Control:** Participants in the control group did not receive intervention for six weeks.		
Bertilsson, A. S., Ranner, M., von Koch, L., Eriksson, G., Johansson, U., Ytterberg, C., Guidetti, S., & Tham, K. (2014).	Level 1 RCT N=280 people post-stroke, 28 drop-outs from 16 different rehabilitation	**Intervention:** The CADL intervention group included client-centered practice and using the COPM for intervention. The OT observed the client	Independence in ADL, perceived participation, life satisfaction, use of home-help service, and satisfaction with training and, in their significant others, regarding: caregiver	The results indicate that CADL does not appear to bring about short-term differences in outcomes. There was a significant effect on the outcome "emotion" which is a part

https://doi.org/10.3109/11038128.2014.880126	centers CADL: Age, year mean: 74 Men/women:73/56 UADL: Age, year mean: 71 Men/women: 95/56 Inclusion Criteria: • treated for acute stroke in a stroke unit • ≤ 3 months after stroke onset • dependent in at • least two ADL domains according to Katz Extended • ADL Index • not diagnosed with dementia, • able to understand and follow instructions • referred for rehabilitation to one of the 16 • participating units.	performing an activity and they evaluated the activity together. The OTs had a 5-day CADL workshop prior. CADL(n=120) Geriatric: n=68 Medical rehab: n=21 Home rehab: n=40 CADL Significant others: (n=87) **Control:** The UADL control group received a variety of strategies customary to ADL intervention. UADL (n=132) Geriatric: n=53 Medical rehab: n=11 Home rehab: n=87 UADL Significant others (n=93)	burden, life satisfaction, and informal care.	of the SIS, which was calculated from intention-to-treat due to drop-outs.
Egan, M., Anderson, S., & McTaggart, J. (2010) https://doi.org/10.1310/tsr1703-183	Level III One group, nonrandomized (pretest and posttest)	**Intervention:** A registered occupational therapist delivered the Community Stroke Navigation service. The goal of this service	Pre-test and post-test measures: 2-minute walk test Daily functioning subscale	The post-test results indicated small improvements in community reintegration among stroke survivors but

	Pretest: N= 41 stroke survivors ○ 51% male ○ 49% female ○ M Age= 68.6 years old N= 32 care partners ○ 28% male ○ 72% female ○ M Age= 64.1 years old Posttest: N= 35 stroke survivors N= 26 care partners Stroke Survivor Inclusion Criteria: ● Had experienced one or more strokes ● Lived within 1-hour drive of the city of Ottawa	was to enhance the well-being and community integration of the participants and their care partners. Each service delivery was personalized to the participant and their care partner (when present) through the use of an open-ended interview and the administration of the community reintegration measure. The intervention plans included case coordination, family support organization, "just in time" education, coaching, and accompaniment. Case coordination involved identifying and suggesting community programs and services that would be of interest to or provide benefits to the stroke survivor and their care partner. Family support organization targeted the needs of the family and promoted social activities and quality of life for the caregivers. "Just in time" education was used to address the specific information needs of the stroke survivors and/or	of the Reintegration to Normal Living Index (RNLI) Depression subscale of the Hospital Anxiety and Depression Scale (HADS)-- administered to the stroke survivors only The General Well-Being Schedule-- administered to the care partners only Post-test measures only: Interview that asked about what the Community Stroke Navigator had done for them, what they found most beneficial, and what they recommend to improve the service	no significant changes among the care partners. Additionally, there were no changes in physical or emotional health among stroke survivors or their care partners.

		care partners. Coaching was utilized to coach stroke survivors and care partners on successful transitions by engaging their service providers in conversations focused on their information needs. Through accompaniment, stroke survivors were accompanied to new groups/events by a trusted individual who understood their challenges and could assist them when necessary. Service provision occurred for 4 months, and stroke survivors and their care partners were visited anywhere between 1-8 times by the Community Stroke Navigator during this period. The Community Stroke Navigator also aided the participants and care partners through written correspondence, phone calls, and visits to community agencies.		
Hayner, K., Gibson, G., & Giles, G. M. (2010). https://doi.org/10.5014/ajot	Level 1 Two-group randomized comparison design study ,	Both groups had 6 hours of OT for 10 consecutive days plus varying amounts of at-home therapy.	Wolf Motor Function Test and Canadian Occupational Performance Measure were used to measure upper	The results indicated that significant improvements were found in WMFT and COPM scores across time

.2010.08027	pretest posttest, 6-month follow up. N=12 adults with UE dysfunction due to CVA Inclusion criteria not specified; was structured in order to be less stringent than past studies. Intervention trial was stratified by severity.	**Intervention:** Constraint-induced movement therapy (CIMT) where participants wore a mitt on the unimpaired UE N=6 **Control:** Bilateral OT, where participants were intrusively and repetitively cued to use both UE's N=6	extremity function.	in both groups. No significant between-group differences were found on the WMFT
Henderson, C. A. & Manns, P. J. (2012). https://doi.org/10.3109/09638288.2012.673686	Level III One group, nonrandomized (quasi-experimental, repeated measures design) N= 15 participants (13 with stroke and 2 with brain injury) 73% male 27% female M Age= 57.1 years old Inclusion Criteria: ● Mild to moderate upper extremity hemiparesis as a result of stroke or other brain injury ● Reduced functional use	**Intervention:** Participants received a group modified constraint-induced movement therapy (mCIMT) intervention in a clinical setting. The treatment was delivered 3.5 hours/day for 10 consecutive weekdays. The therapy sessions included behavioral enhancements, such as reviewing the home diary, discussing mitt wear, and creating home skills assignments. They also included adaptive task practice, where movement goals were approached in incremental steps that were repetitive. The majority of the sessions were spent in	Assessment was administered at baseline, immediately preprogram, immediately post-program, 1-month post-program, and 3-month post-program. WMFT- Functional Ability Scale (FAS) WMFT- Time MAL- Amount of use (AOU) MAL- Quality of movement (QOM) COPM	The intervention resulted in statistically and clinically significant improvements in motor recovery, functional use, and participation and they were maintained over a 3-month follow-up period.

	of upper extremity indicated by the MAL-amount of use score ● At least 6 months post injury ● Able to participate in 3.5 hours of therapy daily, with short rest breaks as needed ● Adequate communication, perceptual, and cognitive skills to participate in self-rate scales ● Medically stable, including no significant joint or upper extremity pain ● Independent with activities of daily living (including toileting and medication administration) ● Not receiving Botulinum Toxin A for upper extremity spasticity during treatment period or follow-up period	group functional task practice, including both individualized taks and collaborative activities. A padded safety mitt was worn on the less involved upper extremity throughout therapy and was encouraged to be worn 90% of waking hours outside of therapy.		
Iwamoto, Y., Imura, T., Suzukawa, T., Fukuyama, H., Ishii, T., Taki, S., Imada, N., Shibukawa, M., Inagawa, T., Araki, H., & Araki, O. (2019)	Level I RCT N= 12 acute stroke patients divided into two groups.	**Intervention:** Patients received combination hybrid assistive limb (HAL-SJ) and occupational therapy	Recovery grade, hemiplegia Br-stage Motricity Index	No significant differences seen in motor function severity defined by recovery grade of hemiplegia, Br-stage, motricity index grip

https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.03.006	Inclusion Criteria: • First time stroke Brunnstrom recovery stage II to IV • Study participant within 2 weeks after stroke onset Excluded: • The surface electrode could not be attached to skin due to cutaneous disease • Not able to follow instructions	**Control:** conventional occupational therapy	Grip strength of affected hand Modified Ashworth Scale of biceps Sensory function. ADLS. Measured on days 14, 19, 24, 29, and 34 after stroke onset.	strength, modified ashworth scale, or sensory function between groups on day 14 after stroke. ADL limitations were not significantly different between groups, mini-mental state examination score was not as well.
Jang, Y. Y., Kim, T. H., & Lee, B. H. (2016) https://doi.org/10.1097/md.0000000000008023	Level I RCT N=23 adults post-stroke Inclusion Criteria: • Onset within 6 months post-stroke • Diagnosed with shoulder subluxation by X-ray finding • Scored more than 24 points on the Mini-Mental State Examination (MMSE) • Had unimpaired visual and somatosensory function.	**Intervention:** Brain-Computer Interface-Controlled Functional Electrical Stimulation Training and conventional occupational therapy (BCI-FES) **Control:** Functional Electrical Stimulation (FES)	Vertical and horizontal distance of subluxation Visual analogue scale Modified Ashworth Scale Manual Function Test	The results showed statistically significant changes in vertical distance of subluxation ($p<0.001$), horizontal distance of subluxation ($p=0.002$), visual analogue scale ($p=0.009$) and manual function test ($p<0.001$) for the BCI-FES group and significant changes in vertical distance of subluxation ($p=0.034$), visual analogue scale ($p=0.003$), and manual function test ($p=0.007$) for the FES group

Lee, M. J., Lee, J. H., & Lee, S. M. (2018). https://doi.org/10.3233/thc-181336	Level I RCT N= 30 adults post stroke 63% male, 37% female M age = 52 yrs Intervention group, n= 15 Control group, n=15 Inclusion Criteria: ● Patients were diagnosed with stroke-induced hemiplegia occurring at least 6 months before enrollment ● Patients were capable of communicating on their own with a score of > 21 points on the Korean version of the Mini-Mental State Examination (MMSE-K) ● Patients had a muscle tone of grade 2 or below on the Modified Ashworth Scale in the hemiplegic upper extremity ● Patients had a	**Intervention:** Received general occupational therapy consisting of five 30-min sessions per week for 8 weeks. The experimental group received an additional 30 min of robot-assisted therapy using the REJOYCE robot treatment. **Control**: Received general occupational therapy consisting of five 30-min sessions per week for 8 weeks. The control group received an additional 30 min of general occupational therapy. General occupational therapy comprised stretching exercises to promote flexibility. NDT to promote postural reaction, resistance exercise to improve strength, and fine motor training.	The Fugl-Meyer Assessment (FMA) quantitatively assesses the upper limb's motor function in hemiplegic patients. The modified Barthel Index (MBI) examines the level of independence in ADL.	There was no significant difference between the experimental and control groups with respect to pre-treatment FMA and MBI scores ($p > 0.05$). Both the experimental and control groups showed a statistically significant increase in post-treatment FMA and MBI scores as compared to the pre-treatment scores ($p < 0.05$). Intergroup comparisons showed a statistically significant increase in scores for all assessments in the experimental group as compared to those for the control group. The experimental group showed a significantly greater improvement in upper-extremity function than did the control group. The distal part of the hand showed improvement in function based on FMA scores with respect to the ability to grip paper, pen, cans, and balls.

	minimally functional upper limb (Fugl-Meyer Score > 35).			
Lee, S., Kim, Y., & Lee, B.-H. (2016). https://doi.org/10.1002/oti.1437	Level I RCT N= 18 adults post stroke 44% male, 56% female M age =69 years Intervention group, n= 10 Control group, n=8 Inclusion criteria: ● Diagnosis of stroke at least 6 months prior ● Mini Mental State Examination (MMSE) score of 24-30, ● Brunnstrom recovery stages 1-4 ● Modified Ashworth Scale (MAS) score of an upper extremity of less than 2	**Intervention:** Subjects in the VRBT group performed bilateral upper extremity training in a VR environment for 30 minutes per session, 3 days a week, for 6 weeks. Conventional occupational therapy for 30 minutes persession, 5 days a week, for 6 weeks was also completed. The animation consisted of four training programmes, including symmetric upper extremity training, asymmetric upper extremity training, sym- metric upper extremity training at 0° and 45° in the VR environment, and asymmetric upper extremity training at 0° and 45° in the VR environment. Each movement was performed for 4minutes, followed by 1 minute of rest designed to minimize fatigue. During training, the subject grasped the	Upper extremity function was measured using: Jebsen–Taylor Hand Function Test (JHFT) Box and Block test (BBT) Grooved Pegboard Test (GPT).	Compared with the BT group, the VRBT group exhibited significant improvements in upper ex- tremity function and muscle strength ($p < 0.05$) after the 6-week training programme. The Box and Block test results revealed that upper extremity function and elbow flexion in hand strength were significantly improved in terms of group, time and interaction effect of group by time. Furthermore, the VRBT group demonstrated signif- icant improvements in upper extremity function, as measured by the Jebsen Hand Function Test and Grooved Pegboard test, and in the hand strength test, as measured by elbow extension, grip, palmar pinch, lateral pinch and tip pinch, in both time and the interaction effect of group by time.

		handles or the affected hand was strapped to a handle, depending on the sever- ity of the deficits Control: Subjects in the BT group watched an irrelevant video in a VR environment with bilateral upper extremity training for 30 minutes per session, 3 days a week, for 6 weeks. Conventional occupational therapy for 30 minutes per session, 5 days a week, for 6 weeks was also completed. **Control:** The BT group underwent the same four upper ex- tremity training programmes as did the VRBT group, which consisted of symmetric upper extremity training, asymmetric upper extremity training, symmetric upper extremity training at 0° and 45° in a VR environment and asymmetric upper extremity training at 0° and 45° in a VR environment, while watching an irrelevant nature		

		documentary		
Lin, K.-C., Chen, Y.-A., Chen, C.-L., Wu, C.-Y., & Chang, Y.-F. (2010). https://doi.org/10.1177/1545968309345268	Level I RCT N= 33 stroke patients Intervention group, n=16 ● 62.5% male ● 37.5% female Control group, n=17 ● 52.9% male ● 47.1% female M Age= 53.85 years old Inclusion Criteria: ● Clinical diagnosis of a first or recurrent unilateral stroke ● Ability to reach Brunnstrom stage III or above in the proximal and distal part of the arm ● No serious cognitive deficits indicated by the Mini-Mental State Examination ● No excessive spasticity in the affected arm, including shoulder, elbow, wrist, and fingers	**Intervention:** The intervention group received bilateral arm training 2 hours/day, 5 days/week for 3 weeks. Participants practiced a variety of functional tasks that incorporated the simultaneous movement of the affected and unaffected upper extremities. All activities incorporated simultaneous movement of both hands such as lifting 2 cups, folding 2 towels, or manipulating 2 coins simultaneously. **Control:** The control group received standard occupational therapy focused on upper extremity training 2 hours/day, 5 days/week for 3 weeks. The therapy included neurodevelopmental techniques, weight bearing by the affected arm, fine motor tasks, trunk-arm control, and compensatory strategy practice for daily activities.	Outcome measures were administered within 7 days before and after the 3-week intervention Kinematic analysis Clinical assessment: Upper extremity section of the FMA FIM MAL- amount of use (AOU) MAL- quality of movement (QOM)	Compared to the control group, the BAT group showed better temporal and spatial efficiency during unilateral and bilateral tasks and less online error correction only during the bilateral task. Additionally, the BAT group showed significantly greater improvement in the FMA than the control, but no significant differences in the FIM or MAL.

	that might preclude the functional movements; indicated by the Modified Ashworth Scale • No other neurologic, neuromuscular, or orthopedic disease • Lack of participation in any experimental rehabilitation or drug studies Exclusion Criteria: • Individuals who had a stroke relapse or seizure attack during the intervention			
Linder, S. M., Rosenfeldt, A. B., Bay, R. C., Sahu, K., Wolf, S. L., & Alberts, J. L. (2015) http://dx.doi.org/10.5014/ajot.2015.014498	Level I RCT N=99 Inclusion Criteria: • Unilateral ischemic or hemorrhagic stroke within the previous 6 months • 11–55 on the Fugl-Meyer Assessment • Limited access (logistical, financial,	**Intervention:** Home-based robot assisted rehabilitation (Hand Mentor Pro Robotic Device) paired with a home exercise program (HEP) **Control:** Home exercise program (HEP)	Stroke Impact Scale (SIS) questionnaire assessed physical strength, memory, feelings and emotions or mood, communication, ADLs and IADLs, mobility, hand function and meaningful activities Center for Epidemiologic Studies Depression Scale (CES-D) assessed depressive symptomatology after stroke	This study compared baseline scores for the SIS and CES-D to the end of treatment (EOT) scores for a home-based robot-assistance rehabilitation program coupled with a home exercise program and a home exercise program alone. Each group improved significantly in CES scores and SIS scores except for mood and memory.

	and geographical barriers) to other means of organized stroke rehabilitation programs ● Preserved cognitive function. ● All participants were recruited from Cleveland, OH or Atlanta, GA. Exclusion Criteria: ● Individuals who lacked independence prior to their stroke ● Received an antispasticity injection in the hemiparetic upper limb since the onset of the stroke.			
McEwen, S., Polatajko, H., Baum, C., Rios, J., Cirone, D., Doherty, M., & Wolf, T. (2015). https://doi.org/10.1177/1545968314558602	Level 1 RCT N=26 adults 3 months post-stroke or less Inclusion Criteria: ● Patients who had sustained an ischemic stroke (ICD-10 codes I63 and I64) ● Within 3 months or less when starting outpatient	**Intervention:** CO-OP The goal-plan-do-check method was used as the main problem-solving framework to facilitate activity acquisition. 3 goals were made to achieve and if they were not, the plan would be modified and the participant would break down the performance. This process would repeat until the goal was achieved	The primary outcome was performance of untrained and trained self-selected activities, measured by Performance Quality Rating Scale (PQRS). Other outcomes were measured by the Canadian Occupational Performance Measure (COPM) The Stroke Impact Scale	The results indicate that there was a large treatment effect on follow-up performance on self-selected activities and demonstrated transfer to untrained activities. CO-OP will most likely help patients locally, but it is difficult to tell as there was a small sample size and it cannot be generalized with confidence yet.

	rehabilitation were • Referred to outpatient rehabilitation at Sunnybrook–St John's Rehab in Toronto, ON, Canada, or The Rehabilitation Institute of St Louis, MO • Between March 2011 and March 2013 Exclusion criteria: • Hemorrhagic stroke • Other neurological diagnoses • Major psychiatric illness • Moderate or severe aphasia (combined scores of 6 or less on Canadian Institute of Health Information	and participant is satisfied with their performance on the task at hand. Therapists were trained in a 2-day workshop. **Control:** Usual Care. A combination of functional, task-based training and component-based training, as deemed necessary by the treating therapists.	Participation Domain Community Participation Index Self-Efficacy Gauge compare the effect of long-term activity performance and participation when utilizing Cognitive Orientation to daily Occupational Performance (CO-OP) in comparison to usual occupational therapy	
Mödden, C., Behrens, M., Damke, I., Eilers, N., Kastrup, A., & Hildebrandt, H. (2012). https://doi.org/10.1177/1545968311425927	Level 1 Three-group RCT N=45 stroke participants with a visual field defect admitted for inpatient rehabilitation	In addition to the interventions, all participants also received standard rehabilitation treatment for inpatient rehab setting regarding physiotherapy, speech therapy, and health education. All interventions were completed in the same location. **Intervention:** Restitution Training (RT)	Outcomes measured include the primary outcome measures were visual field expansion for RT, visual search performance for CT, and reading performance for both treatments. Visual conjunction search, alertness, and the Barthel Index were secondary outcomes. The Testing Battery for Attention Performance, Visual Field	Results indicate that compared with OT, CT resulted in a better visual search performance, and RT did not result in a larger expansion of the visual field. Intra-group pre–post comparisons demonstrated that CT improved all defined outcome parameters and RT several, whereas OT only improved one.

		N=15 Male/Female: 10/5 A series of targets based off of exact measurement of visual field border were presented on a screen and the participants had to respond to each stimulus target as soon as it was perceived by pressing a key. Eye movements were not allowed and controlled by an assistant. **Intervention:** Compensatory Training (CT) N=15 Male/Female: 9/6 Participants followed bright stimuli on dark background and identified targets by eye movement clustered in blind side. The program had several difficulties. **Control:** OT N=15 Male/Female: 7/8 After a standardized assessment of daily living activities, the therapy consisted of	Assessment, Behavioral Inattention Test,and Extended Barthel Index were used.	

		individually adapted stimulation of daily activity tasks to compensate via eye-, head-, and body movements. These compensation strategies included aspects of spatial and body perception, searching or arranging objects, pen and paper searching task, reading maps or newspapers, and self-care activities. The participant was instructed to perform systematic eye movements toward the lost visual field.		
Msengana, Z., De Witt, P., Owen, A., & Franzsen, D. (2019) http://dx.doi.org/10.17159/2310-3833/2019/vol49n3a3	Level II Cohort Study N=45 Inclusion Criteria: ● Medically stable adults ● Between the ages of 18	Conventional occupational therapy	The Fugl-Meyer assessment The South African Data Functional Medicine (SADFM) Beta Scale	The results showed significant improvements in all aspects of upper limb function including personal management, self-care, toileting, and mobility, at all four assessment intervals.

	and 75 years old			
Mortensen, Figlewski, Andersen (2016) https://doi.org/10.3109/09638288.2015.1055379	Level I Double-blind RCT Stratified randomization approach was used Inclusion Criteria: ● 18-80 years old ● >6 months and <5 years from the initial ICH. Exclusion Criteria: ● Traumatic ICH ● Epilepsy, metal implants in the head ● Other neurological diseases ● Cognitive disabilities ● Residence >100hm away from rehabilitation hospital.	Randomized to receive 5 consecutive days of occupational therapy **Intervention:** Combined with either anoda tDCS. **Control:** Combined with sham tDCS.	Ability to complete the Jebsen-taylor Test (activity and function) Stroke Impact Scale. Grip strength	Tendency for greater improvement in ADL performance in the anodal group compared with the sham group; statistically significant improvement in grip strength in the anodal group compared with the sham; both groups improved in logJTT over time.
Orihuela-Espina, F., Roldán, G. F., Sánchez-Villavicencio, I., Palafox, L., Leder, R., Sucar, L. E., & Hernández-Franco, J. (2016).	Level I RCT N= 17 adults post stroke 65% male, 35% female	**Intervention:** Attended therapy 5 times a week until they completed 40 sessions of treatment. The first 4 sessions were shorter and lasted approximately 40 minutes. Therapy sessions lasted 1	Sensorimotor recovery of patients was evaluated with the Fugl-Meyer assessment (FMA) scale The Motricity Index (MI) scale was used to assess the motor recovery rate of the	Statistically significant improvement in performance was found for the FMA for robotic intervention control hand FMA (WSR: p-value 1⁄4 0.097); for the robotic intervention group hand

https://doi.org/10.1016/j.jht.2015.11.006	M age =55 years Intervention group, n=9 Control group, n=8 Inclusion criteria: ● Adult patients >30 with a diagnosis of hemorrhagic or ischemic stroke ● Experience severe upper extremity hemiparesis (estimated by the Fugl-Meyer scale >8 and <30)	hour with rest periods. The intervention group was administered robotic assisted therapy involved two stages; first passive activities (300 repetitions), followed with partial assistance or resistance (300 repetitions) which provides a variable challenge for the patients. From the fourth ses- sion onwards active movements were included (100 repetitions) for a total of 700 repetitions per session. **Control:** Received classical occupational therapy. They were treated with massage and conventional occupational exercises. In each session the patients underwent a stretching stage involving passive move- ments (300 repetitions), a warming up stage with strengthening exercises, and a final training active stage ensemble to promote palmar grasps, and personalized activities with marbles and screw for fine pinching (lateral and pulp)	patients	FMA (WSR: $p < 0.001$). However, the MI did not exhibit the same statistical difference. For control: prehension MI (WSR: p 1⁄4 0.097). For intervention: prehension MI (WSR: p 1⁄4 0.009). Differences for the hand, were as follows: Fugl- Meyer improvements in the motor dexterity for the hand ach- ieved with the intervention therapy was significantly greater than improvement obtained with the control therapy, but the Motricity Index, despite the bigger effect size induced by the intervention therapy, did not show such significant difference for prehension

		control.		
Pandian, S., Arya, K. N., & Davidson, E. W. R. (2011). https://doi.org/10.1016/j.jbmt.2011.11.002	Level I RCT N= 30 chronic stroke patients Brunnstrom hand manipulation group, n= 15 ● M Age= 47.4 years old ● 66.7% male ● 33.3% female Motor relearning program group, n=15 ● M Age= 51.67 years old ● 93.3% male ● 6.7% female Inclusion Criteria: ● Post-stroke patients ● Between the age of 35-60 ● In stage 3 of Brunnstrom recovery stage of the hand ● Intact cognition and perception Exclusion Criteria: ● Individuals with cerebellar lesions ● Individuals with painful or subluxed shoulders	**Intervention:** Participants received Brunnstrom hand manipulation (BHM) along with standard occupational therapy for upper and lower extremities (excluding the hand). BHM was focused on attaining mass grasp and release with the use of reflexive, passive, synergistic and active movements. **Comparison Intervention:** Participants in this group received a motor relearning program (MRP) for their hand along with standard occupational therapy for upper and lower extremities (excluding the hand). Instruction was provided in a variety of ways including verbally, visual demonstration, manual guidance, feedback, and practice of the task. Upper-extremity functional skills were learned through the analysis of the taks, practice of the missing component of the task and	Outcome measures were administered pre-test and post-test Brunnstrom recovery stages of hand (BRS-H) Fugl-Meyer assessment--wrist and hand (FMA-WH)	BHM and MRP were both effective in enhancing the motor recovery of the hand. However, there were statistically significant results in motor recovery of the hand in favor of Brunnstrom movement therapy indicating that BHM is better than MRP for the wrist and hand recovery, especially mass finger flexion, extension, and grasp.

	• Individuals with any contracture or deformity of the upper extremity • Individuals with no sitting balance	practice of the entire task.		
Sackley, Walker, Burton…;2014 doi:10.1136/bmj.h468	Level I RCT N= 1042 care home residents with history of stroke or transient ischemic attack, including those with language and cognitive impairments, not receiving end of life care; randomized between May 2010 and March 2012.	**Intervention:** Targeted three-month program of OT, delivered by OTs and assistants, involving patient centered goal setting, education of care home staff, and adaptations to the environment	Scores on the Barthel index of ADLs at three months post randomization; Barthel Index scores at 6 and 12 months post-randomization Rivermead Mobility Index Geriatric Depression	Primary outcome did not differ significantly between the treatment arms. Adjusted mean difference in Barthel index score at three months was .19 points higher in the intervention arm. Secondary outcomes showed no significant differences at all time points.
Sale, P., Mazzoleni, S., Lombardi, V., Galafate, D., Massimiani, P., Posteraro, F., Franceschini, M. (2014) doi:10.1097/MRR.0000000000000059	Level I RCT N=20 **Inclusion Criteria:** • First acute event of cerebrovascular stroke • Unilateral paresis • Ability to understand and follow simple instructions • Ability to remain in a sitting posture • Mini Mental State	**Intervention:** Robot-assisted therapy **Control:** Intensive Occupational therapy	Fugl-Meyer Scale Medical Research Council Scale for Muscle Strength Motricity Index Modified Ashworth Scale Box and Block Test Barthel Index	A Friedman test showed a significant improvement in the experimental group for the Fugl-Meyer Scale (P=0.0039), the Box and Block Test (P=0.0185), Motricity Index (P<0.0001), Medical Research Council Scale for Muscle Strength (P<0.0001), and Modified Ashworth Scale (P=0.0025). The Friedman test also showed statistically improvements in the control group for the

	examination score more than 20 ● Muscle strength in the finger flexion and extension more that 2 (movement without gravity) evaluated with Medical Research Council ● Absence of sensory impairment evaluated using a neurological test.			Fugl-Meyer Scale (P<0.0001), Box and Block Test (P=0.0086), Motricity Index (P-0.0303), and Medical Research Council Scale for Muscle Strength (P=0.001).
Song, C. S., Lee, O. N., & Woo, H. S. (2019). https://doi.org/10.3233/RNN-180853	Level I N= 49 participants with chronic hemiparetic stroke. The pre-test was administered 1 day before training and the post-test was administered one day after the training. Inclusion Criteria: ● Patients were diagnosed with the first onset of unilateral hemispheric stroke due to an ischemic or hemorrhagic attack 6 months prior to the study ● Patients had sufficient cognitive ability to	Both groups underwent sessions 5 days a week, 30 minutes a day, for 4 weeks. **Intervention:** Cognitive Orientation to Daily Occupational Performance (CO-OP) N=25 Male/Female: 16/9 There were two stages; cognitive strategy of goal-plan-do-check and motor-based tasks in the repetitive action. The participants, an OT, and psychologist worked together to recognize problems and performance in self-selected activities.	Before and after training: Box-and-block test (BBT) Canadian occupational performance measure (COPM) Community Integration Questionnaire (CIQ) Wolf motor function test-functional score (WMFT-F)	The results showed significant improvement in the WMFT-F, COPM-P, COPM-S, BBT, and CIQ scores after training in the CO-OP group, but only COPM-S score was significantly improved after training in TUET group ($p < 0.05$). This study also found higher increases in the mean WMFT-F, COPM-P, COPM-S and BBT scores in the CO-OP group than in the TUET group, but CIQ score did not have a significantly higher

	understand and follow simple verbal instructions, as indicated by a mini-mental state examination score of 24 or higher ● Patients were capable of independent walking without any assistance for a distance of at least 10 meters ● Patients did not have visuoperceptual impairment ● Patients did not have any orthopedic conditions that affect the therapeutic effects ● Patients did not have any other neurological diseases other than the first stroke	**Control:** Task-Specific Upper Extremity Training (TUET) N=24 Male/Female: 18/6 Goal-directed, repetitive, and self-selected activities related to upper extremity based on the examination of motor function and COPM score. The OT and participant modified task demands based on limitations and the patient received repetitive selected target tasks, 10 repetitions with a 1-minute rest period per task. The patient took a 3 minute break after performing a task in order to prevent fatigue. After completing 1 task, the patient moved to the next task on the self-selected target task list.		increase between-group after training. The results of the study suggest that the CO-OP approach resulted in a positive therapeutic effect on self-selected occupational performance and daily and functional activities in individuals with chronic hemiparetic stroke.
Winstein, C. J., Wolf, S. L., Dromerick, A. W., Lane, C.	Level I Single-blind RCT	Randomized into 1 of 3 treatment groups.	Outcomes were clearly specified and included: body functions and	Among participants with motor stroke and primarily moderate upper extremity

J., Nelsen, M. A., Lewthwaite, R., … Azen, S. P. (2016). https://doi.org/10.1001/jama.2016.0276	N= 361 participants Inclusion Criteria: ● Older than 21 ● Ischemic or hemorrhagic stroke meeting World health Organization criteria ● Upper extremity hemiparesis ● Voluntary finger extension ● No more than 6 outpatient occupational therapy sessions ● Absence of traumatic or nonvascular brain injury and subarachnoid or primary intraventricular hemorrhage.	**Intervention:** Intervention was completed within 16 weeks of randomization. Accelerated Skill Acquisition Program, monitoring only **Control:** Customary care UCC, and dose-equivalent usual and customary practice (DEUCC). Task-oriented approach.	structures, activities, patient-centeredness, participation, and health-related quality of life.	impairment, use of task-oriented program, did not significantly improve motor function. Findings do not support superiority of the ASAP among patients with motor stroke and primarily moderate upper extremity impairment
Wolf, T. J., Polatajko, H., Baum, C., Rios, J., Cirone, D., Doherty, M., & McEwen, S. (2016). https://doi.org/10.5014/ajot.2016.017293	Level I RCT N= 35 adults post stroke 63% male, 37% female M age =57 years Intervention group, n=19 Control group, n=16	**Intervention:** The participant used the problem-solving strategy Goal–Plan– Do–Check to address and master each goal activity. **Control:** Usual-care stroke rehabilitation consisted of a combination of functional, task-based training, such as practicing dressing, and	Delis-Kaplan Executive Function System (D-KEFS): cognitive function (executive) Action Research Arm Test (ARAT): upper extremity function Stroke Impact Scale (SIS): Health status Canadian Occupational Performance Measure	At Time 2, CO–OP had a large effect over usual care for SIS Re- covery (d = 0.8) and a medium effect over usual care for changes in the SIS Physical summary score (strength, hand function, mobility, and ADL/IADL scores), SIS Hand Function, and the D–KEFS Trail Making subtest (d = 0.5). Data support a positive

	Inclusion Criteria: ● Patients with ischemic stroke ● Referred for OP therapy at either Sunnybrook-St. John's Rehab or the Rehabilitation Institute	component-based training, such as grasping objects, chosen by each individual therapist to meet individual patient needs.	(COPM): Self-reported occupational performance: trained and untrained goals Performance Quality Rating Scale (PQRS): Objective rating of performance of COPM goals.	effect of CO–OP over usual occupational therapy on upper-extremity function, cognitive flexibility, and perceived body functions, areas not directly targeted during treatment.
Xu, Quan, Li, Chong, Pan, Yu, Li, Wei, Jia, Tianyu; 2020 DOI:10.3233/NRE-203130	Level I RCT N=45 stroke patients hospitalized from January 2018 to June 2019 were randomly divided **Inclusion Criteria:** ● Patients with the first onset of cerebral infarction or cerebral hemorrhage Patients with Brunnstrom stage within stage II–V ● Patients with the course of disease within one to six months ● Patients aged between 18 and 75 years ● Patients who can coordinate the rehabilitation treatment	**Intervention:** Received upper limb robot assistance on the basis of traditional training, 20 min/time, once/day, and five days/week. **Control:** Trained with traditional exercises, 40 min/time, once/day, and five days/week. WMFT	WMFT assessment Daily Life Ability Assessment Fugl-Meyer Assessment	No statistical significance in the Fugl-Meyer score, Wolf motor function test, modified Barthel index score between the two groups before treatment. After treatment, the FM score, WMFT score, and MBI score were significantly higher than before treatment. No significant significance between two groups after treatment.

	Patients who signed the informed consent form.			