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# Critically Appraised Paper for "Bobath concept versus constraint-induced movement therapy to improve arm functional recovery in stroke patients: A randomized controlled trial." Clinical Rehabilitation

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## CRITICALLY APPRAISED PAPER (CAP)

Huseyinsinoglu, B. E., Ozdincler, A. R., & Krespi, Y. (2012). Bobath concept versus constraint-induced movement therapy to improve arm functional recovery in stroke patients: A randomized controlled trial. *Clinical Rehabilitation*, *26*(8), 705–715. https://doi.org/10.1177/0269215511431903

### CLINICAL BOTTOM LINE:

The researchers used a Level I, single-blinded, randomized controlled trial design to compare the functional arm recovery of 22 high-functioning poststroke participants. Participants were evenly assigned to receive therapy using the Bobath concept or constraint-induced movement therapy (CIMT).

The first intervention group received therapy using the Bobath concept, a neurodevelopmental treatment focused on specific handling techniques that guide the patient's affected arm through initiation and completion of tasks. The intervention consisted of 1 hr of training per day in an outpatient clinic and a 24-hr home program for 10 consecutive weekdays. The second intervention group received CIMT, a rehabilitation treatment focused on repetitive, task-oriented exercises using the patient's affected arm. The intervention was 3 hr of outpatient training for 10 consecutive weekdays. Additionally, the patients' affected hand was placed in a protective safety mitt for 90% of their waking hours for 12 consecutive days. Both interventions were carried out by the same physical therapist.

Therapy using the Bobath concept and CIMT yielded similar improvements in functional ability, performance time, quality of movement (QOM), and levels of independence in performance of activities of daily living. Although functional outcomes were not significantly different, participants receiving CIMT perceived greater improvements in the amount of use (AOU) and QOM of their affected hand. These findings indicate that occupational therapists may effectively treat high-functioning poststroke patients with either therapy using the Bobath concept or CIMT.

However, the limitations that potentially affected the outcomes of this study must be considered. The intervention biases included unequal intervention durations for each group and the physical therapist's variable proficiency in each intervention, given that the

therapist was more familiar with CIMT. These intervention biases limit the reliability of the study. Additionally, the variability in the amount of time between the patient's stroke and the study increases the probability of confounding variables, which threaten the validity of the study. The small sample size limits the generalizability of the researchers' findings to the greater poststroke population.

Although this study contributes to the evidence supporting therapy using the Bobath concept and CIMT, clinicians cannot look to the outcomes of this study as a recommendation for clinical practice, given the plethora of intervention biases. Rather, through clinical reasoning, clinicians should discern the merit of both treatment approaches and choose the approach that best suits each unique client. Because of the numerous biases, additional research should be done that examines functional arm recovery with therapy using the Bobath concept. Until further research with better construct validity is conducted and a consensus on the most effective treatment for functional hand recovery among high-functioning poststroke patients is reached, it is up to the clinician to stay current with the literature and to use client-centered, pragmatic reasoning.

**RESEARCH OBJECTIVE(S)**

List study objectives.

To compare the effectiveness of both the Bobath concept and CIMT on arm functional recovery on the affected side among stroke participants with a high level of function

**DESIGN TYPE AND LEVEL OF EVIDENCE:**

Level I: single-blinded, randomized controlled trial

**SAMPLE SELECTION**

How were subjects recruited and selected to participate? Please describe.

The study participants were recruited from the outpatient clinic of the stroke unit of the Florence Nightingale Hospital, Istanbul, Turkey. Eighty-three participants were assessed for eligibility, and 24 participants met the inclusion criteria. Participants were randomly assigned to one of the two intervention groups, CIMT or the Bobath concept, according to the randomization function in Microsoft Office Excel software.

**Inclusion Criteria**

Participants included in the study

- were all 3 to 24 months after their first stroke
- were between the ages of 18 and 80
- had active range of motion of 45° or more of shoulder flexion, abduction, or scaption; 20° of wrist and elbow extension; and 10° of active extension of the

metacarpophalangeal and interphalangeal joints in all fingers
- had the capacity to sustain standing balance for 2 min, with arm assistance if needed
- possessed sufficient vision and hearing to comprehend daily therapy sessions and the test
- possessed sufficient communication skills
- had no significant cognitive disorders, as indicated by a Mini Mental State Exam score of greater than or equal to 24
- displayed no pain that would hinder their ability to engage in treatment
- exhibited minimal to no spasticity in any joints of the affected arm, as indicated by a Modified Ashworth Scale score of 2 or lower
- displayed a substantial amount of nonuse of the affected upper limb, as indicated by a score of less than 2.5 on the Motor Activity Log–28
- displayed weakness in the affected arm.

**Exclusion Criteria**

NR

**SAMPLE CHARACTERISTICS**

**N= (Number of participants taking part in the study):** 22

**#/ (%) Male:** 12/(55%)

**#/ (%) Female:** 10/(45%)

**Ethnicity:** NR

**Disease/disability diagnosis:** Ischemic stroke (*n* = 17) or hemorrhagic stroke (*n* = 5)

**INTERVENTION(S) AND CONTROL GROUPS**

*Add groups if necessary*

Group 1: Bobath concept group

| | |
|---|---|
| **Brief description of the intervention** | Before treatment began, participants in the Bobath concept group had individual sessions with a physical therapist to identify realistic and appropriate client-centered goals. The therapist then met with each participant individually to analyze his or her movement and identified physical dysfunctions and limitations that would affect task performance related to the rehabilitation goal. According to the Bobath concept, coordinated movement was to be achieved through the integration of postural control and task performance. From there, every day for 10 consecutive weekdays, each participant received a 1-hr therapy session focused on muscle tone, QOM, external support, weight bearing, and trunk stability when performing functional arm activities. At the end of the |

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|---|---|
| | intervention, participants received a 24-hr/day program to continue at home. |
| **How many participants in the group?** | 11 |
| **Where did the intervention take place?** | Outpatient physiotherapy department of a stroke unit at Florence Nightingale Hospital, Istanbul, Turkey |
| **Who Delivered?** | Physical therapist |
| **How often?** | 1 hr/day plus 24-hr home program |
| **For how long?** | 10 consecutive weekdays |

Group 2: CIMT group

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|---|---|
| **Brief description of the intervention** | CIMT facilitated by the physical therapist required participants to participate in repetitive task-oriented exercises with their impaired arm for 3 hr for 10 consecutive weekdays. The physical therapist selected activities that addressed the participants' most pronounced deficits, which exhibited the most potential for improvement. Individualized CIMT sessions incorporated behavioral methods, which promoted generalization from therapy sessions to their home setting. Behavioral methods included implementing a behavioral contract, caregiver contract, home practice, home diary, and home skill assignment. Throughout the study, the less-affected hand was placed in a protective safety mitt for 90% of the participant's waking hours for 12 consecutive weekdays. |
| **How many participants in the group?** | 13 participants; 2 dropped out by personal choice |
| **Where did the intervention take place?** | Outpatient physiotherapy department of a stroke unit at Florence Nightingale Hospital, Istanbul, Turkey |
| **Who Delivered?** | Physical therapist |

| | |
|---|---|
| **How often?** | 3 hr/day |
| **For how long?** | Therapy sessions were for 10 consecutive weekdays; the less-affected hand was put in a safety mitt for 90% of the participant's waking hours for a period of 12 consecutive days. |

**Intervention Biases:** *Check yes, no, or NR and explain, if needed.*

Contamination:

| | |
|---|---|
| YES ☐<br>NO ☐<br>**NR ☒** | *Comment:* The authors failed to mention whether the two intervention groups met at different times of the day (so that there was no chance for contamination to occur). If both intervention groups met at the same time, the risk would be greater that participants might share information between groups. |

Co-intervention:

| | |
|---|---|
| **YES ☒**<br>NO ☐<br>NR ☐ | *Comment:* Seven participants had received botolunim toxin A injection within the past 3 months, which might have influenced the outcomes. |

Timing:

| | |
|---|---|
| **YES ☒**<br>NO ☐<br>NR ☐ | *Comment:* There was a variance of daily therapy among the two groups, whereby the Bobath concept group received 1 hr and the CIMT group received 3 hr. This imbalance might have skewed the outcomes. |

Site:

| | |
|---|---|
| **YES ☒**<br>NO ☐<br>NR ☐ | *Comment:* Although the main portion of the study was conducted at Florence Nightingale Hospital, the potential for site bias was still present because of the diverse home settings of the individualized home programs. |

Use of different therapists to provide intervention:

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|---|---|
| YES ☐<br>**NO ☒**<br>NR ☐ | *Comment:* A single physical therapist was used for both intervention groups. The physical therapist had 10 years of experience with stroke rehabilitation. However, the physical therapist had 5 years of experience in implementing CIMT and had completed a basic course in |

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| | the Bobath concept through the International Bobath Instructors Training Association. |

**MEASURES AND OUTCOMES**

Complete for each measure relevant to occupational therapy:

Measure 1: Wolf Motor Function Test

| | | | |
|---|---|---|---|
| **Name/type of measure used:** | A modified Wolf Motor Function Test from the University of Alabama at Birmingham | | |
| **What outcome was measured?** | Motor ability and performance time among persons with arm motor deficits. The modified Wolf Motor Function Test Functional Ability subscale (WMFT FA) measured motor ability, and the modified Wolf Motor Function Test Performance Time subscale (WMFT PT) measured performance time. The modified version consisted of 17 tasks, 15 of which were timed, and 2 of which were strength tasks. The timed tasks were the only tasks rated in this study. | | |
| **Is the measure reliable?** | YES ☐ | NO ☐ | **NR ☒** |
| **Is the measure valid?** | YES ☐ | NO ☐ | **NR ☒** |
| **When is the measure used?** | Both the WMFT FA and the WMFT PT were measured before Day 1 and after Day 10. | | |

Measure 2: Motor Activity Log–28 (MAL-28)

| | | | |
|---|---|---|---|
| **Name/type of measure used:** | MAL-28, Turkish version | | |
| **What outcome was measured?** | Scores 28 activities of daily living tasks in regard to AOU and QOM in the participant's affected arm. Each item was scored on a 6-point scale. | | |
| **Is the measure reliable?** | **YES ☒** | NO ☐ | NR ☐ |
| **Is the measure valid?** | **YES ☒** | NO ☐ | NR ☐ |
| **When is the** | Before Day 1 and after Day 10 | | |

| | |
|---|---|
| **measure used?** | |

Measure 3: Motor Evaluation Scale for Arm in Stroke Patients (MESUPES)

| | | | |
|---|---|---|---|
| **Name/type of measure used:** | MESUPES, Turkish adapted form | | |
| **What outcome was measured?** | Arm performance after a stroke, taking into account quality of upper limb movement. The scale has two parts: MESUPES Arm, which looks at the arm, and MESUPES Hand, which looks at the hand. | | |
| **Is the measure reliable?** | **YES ☒** | NO ☐ | NR ☐ |
| **Is the measure valid?** | **YES ☒** | NO ☐ | NR ☐ |
| **When is the measure used?** | Before Day 1 and after Day 10 | | |

Measure 4: Functional Independence Measure (FIM)

| | | | |
|---|---|---|---|
| **Name/type of measure used:** | FIM, Turkish adapted version | | |
| **What outcome was measured?** | Level of independence during activities of daily living. The Self-Care subscale and total scores were used to assess the efficiency of the treatments. | | |
| **Is the measure reliable?** | YES ☐ | NO ☐ | **NR ☒** |
| **Is the measure valid?** | YES ☐ | NO ☐ | **NR ☒** |
| **When is the measure used?** | Before Day 1 and after Day 10 | | |

Measurement Biases

Were the evaluators blind to treatment status? *Check yes, no, or NR, and if **no**, explain*.

| | |
|---|---|
| **YES** ☒<br>NO ☐<br>NR ☐ | *Comment:* At the beginning of the study, the blinded evaluators were trained to administer the assessments. |

Recall or memory bias. *Check yes, no, or NR, and if **yes,** explain*.

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|---|---|
| YES ☐<br>NO ☐<br>**NR** ☒ | *Comment:* The MAL-28 required participants to self-report. Although the authors noted that the MAL-28 QOM was subjective, they did not comment on recall or memory bias of the MAL-28 regarding patient responses. |

Others (list and explain):

| |
|---|
| NR |

**RESULTS**

List key findings based on study objectives

Include statistical significance where appropriate ($p<0.05$)

Include effect size if reported

Both groups displayed statistically significant improvements across all measures from baseline to posttreatment (MAL-28 AOU, $p = .003$; MAL-28 QOM, $p = .01$; WMFT FA, $p = .137$; WMFT PT, $p = .922$; MESUPES, $p = .947$; FIM total, $p = .336$). The CIMT group had significantly better results on the MAL-28 AUO ($p = .003$) and MAL-28 QOM ($p = .01$) posttreatment. In contrast, there were no statistically significant differences between the two treatment groups' posttreatment results on the MESUPES, WMFT FA, WMFT PT, or FIM total.

The effect size was calculated for each variable. The effect sizes for MAL-28 AOU (.64) and MAL-28 QOM (.53) were large. The effect size for WMFT FA (.31) was moderate. The effect sizes for MESUPES (.01), FIM total (.20), and WMFT PT (.02) were small.

The authors identified various strengths of their study: This was the first comparison of the effects of the Bobath concept and CIMT, and it was done with a randomized controlled trial of Turkish stroke patients. In addition, the interventions were performed by a physical therapist with extensive stroke rehabilitation experience, the blind rater was trained before the study, and prestratification was done in an effort to have homogeneous treatment groups. Another strength was the inclusion of subacute–chronic stroke in an effort to avoid spontaneous recovery affecting the results. The effect size may be used as a reference for future multicenter trials.

Was this study adequately powered (large enough to show a difference)? *Check yes, no, or NR, and if **no**, explain*.

| | |
|---|---|
| YES ☐<br>NO ☐<br>**NR** ☒ | *Comment:* This study inherently was not adequately powered because of the small sample size. |

Were appropriate analytic methods used? *Check yes, no, or NR, and if **no**, explain*.

| | |
|---|---|
| **YES** ☒<br>NO ☐<br>NR ☐ | *Comment:* The study used SPSS for all data analyses. The authors used the chi-square test and Mann–Whitney *U* test to analyze the differences in characteristics among the randomized groups. They applied the Wilcoxon signed-rank test to find the differences from before and after treatment for each group. The authors used the Mann–Whitney *U* test to compare the differences of the efficacy of the interventions among the two groups. Additionally, they determined the effect size for each variance to the differences in performance for the groups. Last, the authors performed linear regression analysis to find whether dominant-side weakness had any impact on the scores of MAL-28 AOU and QOM after the interventions. |

Were statistics appropriately reported (in written or table format)? *Check yes or no, and if **no**, explain*.

| | |
|---|---|
| **YES** ☒<br>NO ☐ | *Comment:* The authors reported and compared each functional outcome measure for the two treatment groups in the results of the study through the use of a table. |

Was the percent/number of subjects/participants who dropped out of the study reported?

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|---|
| **YES** ☒<br>NO ☐ |

Limitations:

What are the overall study limitations?

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| This study lists several limitations. The trial was carried out in the stroke unit of one hospital, which led to a small sample size. The treatments were given to both groups by a single therapist, who could have been biased toward favoring one intervention method over the other. Another limitation was that the majority of participants did not fill out the home diary properly, so the researchers were unable to assess the conditions with regard to using a mitt on the unaffected side. Additionally, the study did not use an intention-to-treat analysis, |

and the 2 participants who dropped out in the CIMT group might have affected results. Finally, the inclusion of 3 participants who scored very close to the upper limit of the Wolf Motor Function Test at pretreatment could have caused a ceiling-effect bias.

Additional limitations to this study that are not mentioned in the article but are important to consider include the inconsistent amount of training the physical therapist had in each intervention. The physical therapist had 5 years of prior experience with CIMT and had only completed a basic course on the Bobath concept. The different experience levels for each treatment could have resulted in unintentional bias. Second, the implementation times in the clinic were 3:1; that is, CIMT had 3 hr of intervention in the clinic, compared with 1 hr intervention in the clinic for participants with therapy using the Bobath concept. The amount of clinic time with the physical therapist could have influenced the results.

Third, although the authors did not necessarily comment on limitations of the MAL-28 regarding patient responses, self-reporting of the MAL-28 could have led to recall bias. Last, the amount of time poststroke varied from 3 to 24 months. This is something to be aware of, because it is likely that the longer a participant was poststroke, the lower was his or her potential for rehabilitation. With that said, given the lengthy amount of time poststroke, other significant factors might have influenced the participants' outcomes, such as learned nonuse.

**CONCLUSIONS**

State the authors' conclusions related to the research objectives.

Patients with a high level of function in the affected arm who received CIMT and therapy using the Bobath concept had similar improvements in functional ability, performance time, QOM, and levels of independence when performing activities of daily living. However, participants rated CIMT as more effective in improving both the AOU and the QOM of the affected arm.

This work is based on the evidence-based literature review completed by Emily Garnica, Savannah Hancock, Tiffany Huang, and Jessica Phung, OT students, Dominican University of California, and Kitsum Li, OTD, OTR/L, faculty advisor, Dominican University of California.