



AOTA Critically Appraised Papers Series

Evidence Exchange

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

CRITICALLY APPRAISED PAPER (CAP)

Che Daud, A. Z., Yau, M. K., Barnett, F., Judd, J., Jones, R. E., & Muhammad Nawawi, R. F. (2016). Integration of occupation based intervention in hand injury rehabilitation: A randomized controlled trial. *Journal of Hand Therapy*, 29(1), 30–40.
<https://doi.org/10.1016/j.jht.2015.09.004>

CLINICAL BOTTOM LINE:

The research article suggests that therapeutic exercise and occupation-based intervention combined demonstrate better outcomes for upper extremity injuries than does therapeutic exercise alone. The authors found statistically significant differences in the disability of the arm, shoulder, and hand (DASH); total active motion (TAM); scores on the Canadian Occupational Performance Measure (COPM); and neuropathic pain after 10 weeks of hand therapy, in favor of the occupation-based therapy. Methods compared therapeutic exercise with therapeutic exercise plus occupation-based intervention. Outcome measures included the Purdue Pegboard Test, TAM, grip strength, pinch strength, COPM, and DASH.

Both groups received range of motion (ROM) exercises, strengthening exercises, and paraffin bath. However, the intervention group added picking up small everyday objects, typing on a keyboard, and washing and wiping dishes as occupation-based interventions. Strengths of this study include standardized outcome measures, randomized assignment, and blinding of the participants and evaluators. The interventions were performed by occupational therapists.

Occupational therapists can use the findings from this study for individuals with upper extremity injuries. This study shows that integrating occupation-based intervention with therapeutic exercise for individuals with upper extremity injuries can decrease pain and improve active ROM of finger joints, independence in functional everyday activities, and satisfaction with everyday occupational performance.

RESEARCH OBJECTIVE(S):

List study objectives.

To determine whether therapeutic exercise with integration of occupation-based intervention is more effective than therapeutic exercise alone in decreasing pain and improving TAM, functional status, occupational performance, and satisfaction with occupational performance for clients undergoing rehabilitation for upper extremity injuries

DESIGN TYPE AND LEVEL OF EVIDENCE:

Level I: randomized controlled trial

SAMPLE SELECTION

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

Patients who were being treated for upper extremity injuries were recruited from the outpatient hand occupational therapy clinic at Kuala Lumpur General Hospital in Malaysia.

Inclusion Criteria

Injury to the hand, wrist, or forearm that was related to a bone, tendon, or peripheral nerve. Participants could not be on any other hand therapy protocols or have communication or cognitive deficits. The participants had to be able to read or write in either Malay or English and give consent to take part of the study.

Exclusion Criteria

Patients with specific injuries, such as bilateral hand injuries, brachial plexus injury, shoulder or elbow injury, repetitive strain injury, and burn injury, were excluded from this study.

SAMPLE CHARACTERISTICS

N= (Number of participants taking part in the study): 46

#/ (%) Male: 29/(72.5%)

#/ (%) Female: 11/(27.5%)

Ethnicity: NR; study conducted in Malaysia

Disease/disability diagnosis: Upper extremity injuries

INTERVENTION(S) AND CONTROL GROUPS

Group 1: Therapeutic exercise

Brief description of the intervention	Participants were provided with therapeutic exercise after a paraffin bath. Exercises included ROM and a strengthening activity. Exercises used passive ROM provided by therapists and active ROM done by participants. Strengthening activities were performed actively in Theraputty and with the Digi-Flex. Participants then performed 4 weeks of a home exercise program, during which they completed only exercises.
How many participants in the group?	23

Where did the intervention take place?	Outpatient hand occupational therapy clinic at Kuala Lumpur General Hospital; home exercise program
Who Delivered?	Occupational therapists
How often?	Supervised hand therapy was 60 min each session, twice a week. Home exercise program was 120 min, once a week.
For how long?	Supervised hand therapy lasted from Weeks 1 to 6. Home exercise program lasted from Weeks 7 to 10.

Group 2: Therapeutic exercise and occupation-based intervention

Brief description of the intervention	<p>The three selected interventions were picking up small everyday objects, typing on a keyboard, and washing and wiping dishes, on the basis of the therapist's interviews. Participants were encouraged to bring in other everyday materials and activities from home. During the home exercise program phase, participants were encouraged to incorporate the occupation-based interventions into their regular daily routines, rather than completing them as an exercise session.</p> <p>Therapeutic exercise included ROM and strengthening activities. Exercises used passive ROM by therapists and active ROM by participants. Strengthening activities were performed actively in Theraputty and with the Digi-Flex. Therapy was performed after a paraffin bath. Four weeks of a home exercise program consisted entirely of occupation-based interventions.</p>
How many participants in the group?	23
Where did the intervention take place?	Outpatient hand occupational therapy clinic at Kuala Lumpur General Hospital; home exercise program
Who Delivered?	Occupational therapists
How often?	Supervised hand therapy was 60 min each session, including 10 min for each occupation-based intervention, twice a week. Home exercise program was 120 min, once a week (including integrating occupation-based intervention into daily living).
For how long?	Supervised hand therapy lasted from Weeks 1 to 6. Home exercise program lasted from Weeks 7 to 10.

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

Contamination:

YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> NR <input type="checkbox"/>	
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Co-intervention:

YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>	
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Timing:

YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>	Both groups could be expected to improve as a result of normal healing processes, which would favor a “no difference” finding; long-term outcomes were not evaluated.
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Site:

YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> NR <input type="checkbox"/>	
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Use of different therapists to provide intervention:

YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>	Two occupational therapists provided interventions. Each therapist provided intervention to only either the control or the experimental group.
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MEASURES AND OUTCOMES

Complete for each measure relevant to occupational therapy:

Measure 1: Purdue Pegboard Dexterity Test

Name/type of measure used:	Purdue Pegboard Dexterity Test
What outcome was measured?	Body structure and function: fine and gross coordination
Is the measure reliable?	YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program, for an average of three trials

Measure 2: TAM

Name/type of measure used:	TAM
What outcome was measured?	Body structure and function: active flexion and extension of metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints of digits and metacarpophalangeal and interphalangeal joints of the thumb
Is the measure reliable?	YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>
Is the measure valid?	YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program

Measure 3: Grip strength

Name/type of measure used:	Dynamometer
What outcome was measured?	Body structure and function: grip strength
Is the measure reliable?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program, for an average of three trials

Measure 4: Pinch strength

Name/type of measure used:	Key pinch
What outcome was measured?	Body structure and function: pinch strength
Is the measure reliable?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program, for an average of three trials

Measure 5: Neuropathic pain

Name/type of measure used:	Graphic Numerical Rating Scale
What outcome was measured?	Body structure and function: pain after upper extremity injury
Is the measure reliable?	YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>

When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program
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Measure 6: COPM

Name/type of measure used:	COPM
What outcome was measured?	Participation: subjective performance and satisfaction with occupational performance
Is the measure reliable?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program

Measure 7: DASH

Name/type of measure used:	DASH
What outcome was measured?	Participation: symptoms and subjective functional status
Is the measure reliable?	YES <input type="checkbox"/> NO <input type="checkbox"/> NR <input checked="" type="checkbox"/>
Is the measure valid?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> NR <input type="checkbox"/>
When is the measure used?	Assessed at baseline, after 6 weeks of supervised hand therapy, and after 4 weeks of a home exercise program

Measurement Biases

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

YES <input checked="" type="checkbox"/>	
NO <input type="checkbox"/>	
NR <input type="checkbox"/>	

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

YES <input checked="" type="checkbox"/>	Participants had to recall past performance for the COPM, DASH, and pain scales.
NO <input type="checkbox"/>	
NR <input type="checkbox"/>	

Others (list and explain):

There were two blinded evaluating occupational therapists, but it is unclear which therapist evaluated clients in which groups and at what time points.

RESULTS

List key findings based on study objectives

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

Include effect size if reported

After 6 weeks of supervised occupational therapy, there were statistically significant differences on TAM ($p = .04$), neuropathic pain scales ($p < .001$), COPM performance ($p = .03$), and COPM satisfaction ($p = .05$) in favor of the occupation-based treatment. After 4 weeks of the home exercise program that followed the supervised therapy (Weeks 7–10), there were statistically significant differences on the DASH ($p = .02$), TAM ($p = .01$), neuropathic pain scales ($p = .02$), and COPM performance and satisfaction ($p < .001$) in favor of the occupation-based treatment.

Linear mixed-model analysis showed that some of the significant differences could have been affected by confounding covariates, such as duration of injury and gender. In the therapeutic exercise group, a longer duration of injury was correlated with lower COPM performance and satisfaction scores, but in the occupation-based intervention and therapeutic exercise group, a longer duration of injury was correlated with higher COPM performance and satisfaction scores.

In the therapeutic exercise group, women had higher DASH scores than men, but in the occupation-based intervention and therapeutic exercise group, men had higher DASH scores than women. These results indicate that duration of injury and gender may interact with the addition of occupation-based exercise to alter the outcome among the population studied. TAM was lower for older patients in both groups, which indicates that older clients may require longer rehabilitation. No significant differences between groups were found in grip strength, pinch strength, or scores on the Purdue Pegboard Test. Effect sizes were not reported.

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

YES <input checked="" type="checkbox"/>	
NO <input type="checkbox"/>	
NR <input type="checkbox"/>	

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

YES <input type="checkbox"/>	Multiple independent <i>t</i> tests were conducted that compared the two groups on several outcome measures at two time points. This resulted in 24 independent tests run, which increased the chances of a Type I statistical error (i.e., finding a difference that does not actually exist).
NO <input checked="" type="checkbox"/>	
NR <input type="checkbox"/>	

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

YES <input checked="" type="checkbox"/>	
NO <input type="checkbox"/>	

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

YES
NO

Limitations:

What are the overall study limitations?

There was no consideration or categorization of treatment techniques on the basis of severity of injury. There is an assessment for hand injury severity, the Modified Hand Injury Severity Score, which the authors did not use. Because there was a large percentage of fractures in the study sample, generalizable findings may be limited to this population. The therapists selected which occupation-based intervention to use initially. This study was conducted in Malaysia, which could limit generalizable findings by cultural context. There was also a risk of finding a difference by chance because of the multiple *t* tests used.

CONCLUSIONS

State the authors' conclusions related to the research objectives.

Significant differences were found in the DASH, TAM, COPM performance, and satisfaction, as well as neuropathic pain, favoring occupation-based intervention in addition to therapeutic exercise after 10 weeks of occupational therapy. Mixed linear model analysis indicated an interaction between the interventions and gender for the DASH and an interaction between the interventions and duration of injury for COPM. Results indicate that occupation-based intervention in addition to therapeutic exercise over 10 weeks (including 6 weeks of skilled hand therapy and 4 weeks of a home exercise program) had the best outcome for upper extremity injuries in decreasing pain and improving active ROM of finger joints, subjective functional status, and subjective performance and satisfaction with occupational performance.

This work is based on the evidence-based literature review completed by Lydia Boyle, MOTS, Concordia University Wisconsin, and Michael Borst, OTD, OTR, CHT, faculty advisor, Concordia University Wisconsin.

CAP Worksheet adapted from "Critical Review Form—Quantitative Studies." Copyright © 1998 by M. Law, D. Stewart, N. Pollack, L. Letts, J. Bosch, and M. Westmorland, McMaster University. Used with permission.



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