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## Integration of occupation based intervention in hand injury rehabilitation: A Randomized Controlled Trial



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## ABSTRACT

**Study design:** Randomized Controlled Trial (RCT).**Introduction:** Engagement in daily occupations and day to day activities helps to restore function in individuals with injured hands and provides a platform to practise selected occupations.**Purpose:** The purpose of this study was to investigate the effectiveness of a combination of Occupation Based Intervention (OBI) and Therapeutic Exercise (TE) compared to TE alone for the rehabilitation of hand injuries.**Method:** A single center RCT, parallel group was conducted at the Kuala Lumpur General Hospital (KLGH), Malaysia. Forty-six adult clients with hand injuries who consented to participate were randomly allocated to either the OBI + TE group or to the TE group.**Results:** Following a ten week intervention program, statistical significance differences were found in DASH score (TE = 18.64 ± 14.84 vs OBI + TE = 9.50 ± 9.14,  $p = 0.02$ ); total active motion (TE = 1035.85 ± 179.84 vs OBI + TE = 1203.65 ± 133.60,  $p = 0.01$ ); neuropathic pain (TE = 2.90 ± 2.79 vs OBI + TE = 1.05 ± 2.01,  $p = 0.02$ ); COPM performance (TE = 7.62 ± 2.03 vs OBI + TE = 9.53 ± 0.64,  $p < 0.001$ ); and COPM satisfaction (TE = 7.60 ± 2.11 vs OBI + TE = 9.49 ± 0.76,  $p < 0.001$ ) in favor of OBI + TE group.**Conclusion:** This study highlighted the integration of OBI into hand injury rehabilitation improved outcomes for clients.**Level of evidence:** 1b.

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## Introduction

Hand injuries are common in developing countries such as Malaysia due to recent increases in industrialization and motorization. In the United States surveillance for fatal and non-fatal injuries found that injuries to the hand and arm (28.3%) were the

second most common accidents after the head and neck (29.5%).<sup>1</sup> However, in the occupational sectors in Malaysia, more than one-quarter of work-related injuries reported to the Malaysian Social Security Organisation (SOCSO) for compensation involved the upper limb.<sup>2</sup> The trends were similar from 2009 to 2012, where the majority of upper limb injuries involved the finger, hand, wrist and forearm.<sup>2,3</sup> Similarly in the United States, injuries to the hand and finger are the most common non-fatal occupational injuries that were treated in hospital emergency departments and laceration was the most common type of accident.<sup>1</sup> In the Malaysia industrial sector, the majority of hand injuries involved fingers, with laceration as the most common type of accident as well.<sup>4</sup>

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People aged between 25 and 35 years were commonly involved because they were highly likely to be employed in construction or manufacturing industries.

Hand injuries not only have a significant impact on physical function, but also on daily living activities, and on social, psychological and financial aspects of life.<sup>5–9</sup> Many individuals with hand injuries experience pain and stiffness for up to four years after their injury.<sup>5</sup> They also suffer problems in day to day activities, especially during the initial stage of injury, and may require help or rely on others to do these activities.<sup>6,7</sup> Work is also impacted greatly after hand injuries, especially for individuals employed in industries that require them to use both hands to operate tools or machinery.<sup>5</sup> Hand injuries are often associated with a psychological burden such as frustration, stress, discouragement, loss of confidence and fear of re-injury, which can lead to avoidance of certain activities.<sup>7–9</sup> Additionally, sustaining hand injuries can also have an impact on social and financial security as the individuals will be absent from their employment or may lose their employment following the injury.<sup>4</sup> Given the impacts of hand injuries, hand rehabilitation is directed at restoration of function in the injured hand to enable the individuals to return to their day to day activities without least restrictions.

Occupation can be used both as a means and an end, and it is referred to as Occupation Based Intervention (OBI).<sup>10</sup> One of the definitions of OBI is 'occupation as a means,' which refers to occupations or purposeful activities functioning as a remediation agent to restore a client's physical functions.<sup>10–12</sup> Occupation is defined as any daily living activities that people do to occupy themselves, that can be named, organized, and are meaningful and important to the individual or their culture.<sup>13</sup> Occupation includes Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs), rest and sleep, education, work, play, and leisure and social participation.<sup>14</sup> Purposeful activities are any selected activities that can be used to develop skills for occupational performance. For instance, following a hand injury practising writing, tying a shoelace and/or buttoning a shirt can improve fine motor skills and dexterity. OBI uses occupations and purposeful activities as a treatment medium. This concept has a potential to be integrated by both occupational therapists and physical therapists that are specialized in hand rehabilitation.

Although OBI as a means to remediate impairments and physical dysfunction is intuitively attractive, limited evidence is available to support such practice.<sup>15,16</sup> A single case study that engaged a client with cubital tunnel syndrome in a valued occupation (sewing activities) significantly improved grip strength and eliminated awkward movement patterns.<sup>17</sup> A study involving adult clients with hand injuries found purposeful activities that mimic the ADLs were effective in improving overall hand function, compared with Therapeutic Exercises (TE).<sup>18</sup> Those who received purposeful activities had significantly improved in grip strength, pinch strength, Jebsen-Taylor Hand Function Test (JTHFT), finger-pulp distal palmar crease, total active movement, range of opposition, range of abduction and Disability of Arm, Shoulder and Hand (DASH). In contrast, a study comparing exercise and activity in the clients with distal radius fracture found no significant differences between groups in grip strength, range of motion, pain intensity, and activity limitation and participation restriction.<sup>19</sup> The study concluded that the clients did not require activity-focused intervention however there was no group that combined both treatments.

Purposeful activities such as plays and games speed up the recovery process of injured and burned hands.<sup>20–22</sup> The play activity was compared with rote exercises in the rehabilitation of children with burned hands. The researchers found play activity to be significantly more effective in reducing pain, and improved hand function and total active range of motion.<sup>20</sup> A computer-aided

treatment based game for clients with traumatic fractures found no significant difference in Range of Motion (ROM), edema and grip strength between the experimental and control group.<sup>21</sup> However, the participants in the experimental group perceived that the treatment was more attractive and engaging, which motivate them to do more. A study with a larger sample size found that using computer games as purposeful activities could increase the number of activity repetitions in comparison to non-purposeful activities.<sup>22</sup>

### Purpose of study

Given the uncertainty of outcomes and limited studies on the effectiveness of occupation and purposeful activities as a therapeutic agent, the purpose of this study was to investigate the efficacy of a combination of OBI + TE in comparison to TE alone in hand injury rehabilitation practice. It was hypothesized that the group that received combined treatment would improve to a greater extent compared to the group that received TE only. In contrast with previous studies,<sup>18,20–22</sup> this study used both purposeful activities and occupations as a therapeutic agent to rehabilitate function of the injured hand.

## Methods

### Study design

A single center, parallel groups Randomized Controlled Trial (RCT) study was conducted to investigate the efficacy of OBI + TE in comparison to the standard TE in hand rehabilitation. The RCT design was chosen because of its ability to determine whether a cause-effect relationship exists between intervention and outcome, and allows the findings to be generalized to broader populations.<sup>23</sup> This study was conducted at the Kuala Lumpur General Hospital (KLGH) with collaboration from the Hand Occupational Therapy Unit, and the Hand and Upper Limb Unit. KLGH is a tertiary referral hospital and the largest hospital under the Malaysia Ministry of Health. Approximately 60–70 clients attend the Hand Occupational Therapy Unit for rehabilitation during working days. Permission to conduct the study was obtained from the Malaysian Economic Planning Unit (EPU: 40/200/19/2865). This study was approved by the Medical Research and Ethics Committee of Malaysia Ministry of Health (NMRR-12-660-11901) and the Human Research Ethics Committee of James Cook University, Australia (H4901). This trial was registered with the Australian New Zealand Clinical Trial Registry (ACTRN12614000569606).

### Participants

Potential participants were recruited from the hand out-patient occupational therapy clinic according to the following inclusion criteria: (1) had experienced bone, tendon or peripheral nerve injury to the hand, wrist or forearm; (2) were not on any hand therapy protocol (e.g. flexor/extensor tendon protocol, post fracture stabilization, etc.); (3) had no communication and cognitive deficits; (4) were able to read and write either in Malay or English; and (5) had consented to take part in the study. Clients were excluded from the study if they had: (1) bilateral hand injuries; (2) brachial plexus; shoulder or elbow injury; (3) repetitive strain injury (e.g. tendinitis, carpal tunnel syndrome, de-Quervain syndrome, etc.); or (4) burn injury. The power analysis was calculated based on the findings from a comparable study.<sup>18</sup> Thirty-eight participants were required to detect a significant group difference ( $p < 0.05$ ) of 15 on the DASH score with 80% power. Assuming a maximum 20% drop-out rate as suggested in a recent systematic review,<sup>24</sup> it followed that 46 participants were needed for the study.

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