The role of occupational therapy in return to work following orthopedic trauma: a case study

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The Role of Occupational Therapy in Return to Work Following Orthopedic Trauma:

A Case Study

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Occupational Therapy Doctorate Program

The University of Toledo Health Science Campus

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Note: This document describes a Capstone Dissemination project reflecting an individually planned experience conducted under faculty and site mentorship. The goal of the Capstone Experience is to provide occupational therapy doctoral students with unique experiences whereby they can demonstrate leadership and autonomous decision-making in preparation for enhanced future practice as occupational therapists. As such, the Capstone Dissemination is not formal research.
Introduction

Background Information

Mr. B is a 34-year-old right-handed computer project manager. He serves as a liaison between client and company management organizing daily and weekly reports and making sure that any and all issues are escalated to the proper personnel. Most of his communication is via email as well as constantly interfacing with management.

On October 9, 2007, Mr. B was helping his friend fix his house and fell off of the roof. He was admitted to Westlake Hospital emergency room in Austin Texas where x-rays revealed a right elbow dislocation and right comminuted completely displaced distal radius ulna fracture.

On October 10th, Mr. B was seen for surgery for performance of a right open reduction with internal fixation and external fixation of the distal radius fracture and a right closed reduction of the elbow. On October 18th, the client was seen in the clinic. Slight dorsal subluxation of the carpal bones was documented and a small incision was made in the palm of the hand to drain a fracture blister.

On November 11th, the surgeon expressed concern with the client’s significantly limited ROM of the wrist and fingers. The external fixator was removed and Mr. B was deemed travel worthy so that he could return home to his family in Toledo. The client then began outpatient physical therapy services three times a week for five weeks. At the end of the five weeks, the client consulted an orthopedic surgeon who referred him to the University of Toledo Medical Center for occupational therapy.
On January 9, 2008 Mr. B was seen for initial evaluation of a comminuted right distal radius fracture. The results of the evaluation revealed a 3.0cm by 2.0cm circumferential scar in the palm hypothenar eminence of the right hand, a 1.5cm horseshoe shaped scar at the dorsal base of the thumb at the CMC, and a 3.0cm scar on the dorsal aspect of the forearm approximately 3 inches distal from the elbow. A swan neck deformity was noted at the middle and ring finger (see figure 1).

According to the Visual Analog Scale, the client reported 0.0cm of pain throughout the evaluation and 1.3cm pain score at worst. The Visual Analog scale is a numerical way of grading pain levels using a 10cm line. The client marks on the line where he feels his pain level is at. Zero indicates no pain and ten indicates excruciating pain.

The client did not have any significant swelling in the right upper extremity compared to the left upper extremity according to the Volumetric Measurement which uses milliliters of water to differentiate between the two extremities (see figure 2). Objectively, the client displayed some diminished light touch around the scar in the hypothenar area according to the microfilament test (see table 1). This exam consists of five testing filaments. The filaments are applied to the test site beginning with the lightest which will identify cutaneous sensation within normal limits. The client will have his eyes closed and respond to the touch of the filament by saying the word “touch” (see figure 2). Subjectively, the client reported altered numbness and tingling throughout the entire right hand.

The client displayed significantly decreased grip and pinch strength. Mr. B exhibited an average of 9 pounds of grip strength on the right hand and 76 pounds on the left hand (see table 2). It was also noted that the client was unable to open his right hand enough to wrap all fingers.
around the dynamometer. Mr. B measured an average of 3.7 pounds on 3-jaw grasp with his right hand and 10.3 pounds on the left hand (see table 3) and an average of 9 pounds of lateral pinch on the right hand and 20 pounds on the left hand (see table 4). The patient displayed significant decreased range of motion in wrist extension, thumb MP and IP extension, middle, ring, and little finger MCP extension, and swan neck deformity in the middle and ring finger (see figure 3).

According to the 9-hole Peg Test the patient measured 2.03min on the right hand and 32sec on the left hand (see table 5). The 9 Hole Peg Test is a simple, timed test of fine motor coordination. The test involves the subject placing 9 dowels in 9 holes. Subjects are scored on the amount of time it takes to place and remove all 9 pegs (see figure 2). Additionally, both Mr. B’s sequential patterns and palmar combinations were absent. A sequential pattern is the ability to use the fingers to complete a sequence of movements. An example of a sequential pattern is twirling a pen between fingers. Palmer combinations are the ability to manipulate objects with the fingers and thumb in the palm of the hand. An example of a palmer combination is using the thumb and fingers to distribute change out of the palm of the hand.

Subjectively the patient reported difficulty with opening jars/cans, cutting food, turning doorknobs, brushing his hair, pouring milk and juice, lifting, tying his shoes, working on his computer, carrying papers and folders, and shaking hands. He reported maximum concern with not being able to work. He also reported that he uses his left hand as much as possible to complete most of his ODL’s. In summary, the patient displayed increased pain, decreased sensation, decreased ROM in wrist extension and finger extension, and decreased pinch and grip strength which yields difficulty with basic and advanced ODL’s.
Models of Practice

The models of practice that will be used in this case study include the Model of Human Occupation, and the Biomechanical Model.

MOP

The Model of Human Occupation (MOHO) provides theory aimed at explaining aspects of healthy occupation and problems that arise in association with life transitions including illness and disability (Forsyth, 2003). Jepsen-Thomas and Nelson, 2003 defined occupation as a dynamic relationship among an occupational form, a person with a unique developmental structure, subjective meanings and purposes, and a resulting occupational performance. Meaning is the person’s entire interpretive process when encountering an occupational form. Meaning depends on both the occupational form and the person’s developmental structure (Nelson, 1996). The theoretical principles of MOHO include how occupation is organized, the components of the person including volition, habituation, and performance capacity, environment, and occupational performance (Keilhofner, 2004). Volition refers to an individual’s personal causation, values, and interests. Habituation refers to the habits and roles which structure one’s everyday life patterns. The Essential role of the occupational therapist is to synthesize occupational forms that yield meaning, purpose, and therapeutic occupational performance on the part of a unique human being (Nelson & Stucky, 1992). Evaluations for this model of practice can be observational, self-reports, interviews, or a mixture of all of the methods.
Rationale for this MOP with this case

The evaluation in this case study will involve a mixture of different methods. The therapist will observe the client through different occupations such as writing and standardized testing. The therapist will also ask various questions about pain level, difficulty with occupations of daily living (ODL’s), and major concerns. The occupational therapist in this case study will use this model to strategically conceptualize and plan occupations for this client that will improve his self care and work productivity by planning occupations that are meaningful and purposeful for a 32 year-old male who is motivated to resume his previous occupational performance.

MOP

The Biomechanical Model of Practice is used to treat individuals with limitations in occupational performance due to impairments in biomechanical body structures and functions, including structural instability, decreased strength, limited ROM, and poor endurance. The goal of intervention is prevention, restoration, adaptation and or compensation (Kielhofner, 2004). Adaptation is the positive effect of a person’s purpose and occupational performance on his or her developmental structure. In other words, the therapist helps the person set up a situation in which performance will lead to self-change (Nelson, 1996). Compensation is the achievement of a successful impact through a substitute occupational performance in the context of a synthesized occupational form. This involves finding a way around an intractable problem (Nelson, 1996). Interventions of the biomechanical model focus on improvement of function through the use of occupations and exercise which may be purposeful or rote (Keilhofner, 2004). Kielhofner also states that motion underlies occupational performance. Whether for manipulation of objects,
gesturing in communication, or standing in line while waiting a turn, all occupations involve
persons stabilizing and moving their bodies.

**Rationale for this MOP with this case**

Impairments in strength and ROM, were characteristics of this young man described in
this case study. Intervention will focuses on improving function through both rote and
occupationally embedded exercise. Compensatory methods including splinting will also be used
to improve the client’s abilities.

**Scientific Evidence for MOP**

There has been a broad range of research involving the Model of Human Occupation.
Authors such as Doble, 1991; Mallinson, Keilhofner, & Mattingly, 1996; Oakley et al., 1986 and
Pan & Fisher, 1994 have examined the construct validity to verify the concepts of the model.
Josephsson et al., 1995; and Kielhofner & Brinson, 1989 examined the outcomes of services
based on the model. Baron and Littleton, 1999 stated that little has been written about application
of the model of human occupation to the treatment of patients with hand dysfunction. These
authors examined the model of human occupation along with the biomechanical model in the
treatment of a patient with hand injury. The authors found that a combination of the two models
facilitated the improvement of their client’s functional status as played out in her daily life.

Research related to the theory of the biomechanical model is substantial and continues to
grow. The research is producing new understanding of muscle physiology, the effects of
exercise, and the dynamic role of muscles and muscle groups in movement (Basmajian & Wolf,
1990). Kircher, 1984 examined the ability of measures of physical capacities to predict injured
workers’ return to work. Spaulding et al, 1989 examined the relationship of wrist muscle tone to
self-care abilities. Wahi Michener et al., 2001 examined the relationship of grip strength to functional outcomes and work performance following hand trauma.

Studies have even evolved in to inquiring how the purpose or meaning of effects compliance, effort, fatigue, and improvement in movement capacity. A study of elderly women supported the conclusion that adding imagery to movements is more effective than rote exercise in eliciting frequency and duration of movement (Riccio, Nelson, & Bush, 1990.)

**Goal Setting**

**Occupational Therapy Goals**

Long Term Goal

1. Return to work

Short Term Goal Related to Long Term Goal

a. Increase speed and efficiency while typing on the computer.

b. Be independent with filing papers

Long Term goal

2. Be independent with ODL’s and IODL’s

Short Term Goals Related to Long Term Goal

a. Be independent with morning self care- showering, dressing, personal hygiene, grooming

b. Be independent with simple meal preparation- eating, feeding, cleaning up
e. Be independent with home establishment and management- laundry, cleaning the home

Long Term goal

3. Increase motor skills

Short Term Goals related to Long Term Goal

f. Increase ROM of wrist and digits in right hand

g. Increase grip and pinch strength in right hand

h. Increase coordination and manipulation in right hand

Justification of goals

Both long term goals one and two were developed using the Model of Human Occupation. MOHO is designed for application to any person experiencing difficulty in occupational functioning like living and working. Throughout the evaluation the client expressed that being a worker was of great importance to him, as was returning to his present job. As a 34 year old, Mr. B has specific volitions. He has the responsibility of paying his rent and other bills, and, without working, he would be unable to fulfill this role.

In addition to returning to work, Mr. B described his difficulty with getting dressed and cooking. He stated that it takes him twice as long to get ready in the morning. He was also unable to open various containers for meal preparation, he was using his non-dominant hand to comb his hair and brush his teeth, and he could not carry his laundry because his hand was not strong enough. The injury was affecting the client’s habituation or life patterns.
Long term goal number three was developed based on the biomechanical model of practice. The model of human occupation provides only a general framework for viewing performance capacity. Therefore, it is necessary to use other models such as the biomechanical model to provide a framework for understanding specific performance limitations. Mr. B presented with severe limitation of function of the right hand, primarily in range of motion, strength, and coordination.

**Interventions**

The therapist introduced the idea of using a computer keyboard to assist with extension of the MCPs and thumb. The client and therapist worked on repetition with striking various keys to increase ROM, coordination, and efficiency on the keyboard.

The therapist also organized a routine on the Baltimore Therapeutic Exercise (BTE) machine to assist with opening containers for meal preparation. The intervention involved a graded level of exercise based on the size of the door knob used on the BTE. As the client was able to open the webspace between his thumb and index finger, he was upgraded from a 1 inch diameter simulated door knob to a 3 inch diameter simulated door knob. The client repetitively turned the various door knobs in a counterclockwise and clockwise position to work on grip and pinch strength for opening various containers.

The compensatory method of splinting was used to address the client’s swan neck deformity in the middle and ring fingers of the right hand. Two silver ring splints were ordered to fit the patient to correct for the laxity of the fibrous plate in the fingers (see figure 4).

Physical agent modalities such as heat, ultrasound, and vibration were also used as an intervention. The client had a significant amount of scar tissue secondary to a fracture blister in
the palm of his hand. The scar tissue hindered the client’s ability to open up his hand to grasp objects necessary to complete ODL’s and work tasks. These modalities helped break up and release the scar tissue so that the right hand could be more functionable.

**Occupational Analysis of One Occupational Treatment Session**

**Occupational Form**

For the occupation of “typing a memo.” The important occupational forms included a Hewlert Packard laptop, a 2 ft high table, and a four-legged chair. These occupational forms were located in the outpatient therapy clinic. The therapist gave the client cues during the occupation and provided the client with feedback.

**Occupational Performance**

Before starting the occupation, the therapist gave instructions on the importance of spreading out the fingers and using proper typing etiquette. The client stated that he understood and he placed his fingers on the proper keys.

The client then began to type the word “attention.” When the client began to type the letters “i” and “o,” he released his right hand and struck the keys with his right index finger. The therapist then gave a verbal cue that he did not use the correct fingers to type the letters “i” and “o.” The client stated that it is very difficult for his fingers to reach to the top line. The therapist then stated to stop tying the memo for a few minutes and just work on extending the right fingers to strike the keys properly.

The client began to repeatedly pressing the “i” key with his right middle finger. He stated that he can do it but it is just hard and it takes too long. The therapist advised him that the more
he practices the proper technique, the faster his fingers will become. He then began pressing the “o” key with his right ring finger and the “p” key with his right small finger.

Next, the client continued to write his memo. The patient stated that using his small finger to press the comma key is the hardest key to strike. He stated that he feels like his finger cannot reach the key. The client then continued to type the memo with the proper typing etiquette.

After completing the occupation, the occupational therapist asked the client how well he thought he performed the occupation. The client verbalized that he is not using the proper typing etiquette at home and recognizes that with practice he will be able to return to typing the way that he did before his injury.

*Meaning and Purpose Inferred*

The client recognized the importance of completing the occupation-based task of typing a memo in order to achieve his long term goal of successfully returning to work.

*Impacts*

The client had impact on the keys of the laptop as he pushed the keys to form words on the computer. The client had impact on the computer as he formatted a memo to be printed.

*Assessment*

The client demonstrated some lack of awareness about his inability to use the proper typing etiquette with his right hand, but the client was able to understand that he is capable of using the correct finger placement and it will just take practice. The therapist recommended having the client type a small paragraph using the proper hand placement each day.
Compensations

There were no compensations used in this occupation.

Re-synthesis

An immediate re-synthesis is that the therapist planned on using a modality and stretching to warm up the client’s hand before typing to increase range of motion when striking the keys. The therapist also planned on visiting the client’s home and work office to make sure that the occupational form is ergonomically correct and allows for the client to use proper hand placement when typing.

Outcomes

This intervention succeeded in accomplishing the STG of increasing speed and efficiency on the computer to which leads to the LTG of returning to work. This intervention also succeeded in accomplishing the STG of increasing the ROM of the digits of the right hand which leads to the LTG of increasing motor skills.

Inferred Meanings and Purposes

It was very important to the client to be able to function like a normal 34 year old. This involved working and paying for his own expenses, taking care of his apartment, and be independent with ODL’s and IODL’s.

Changes in Standardized Assessments and Client’s Report on Progress

After attending occupational therapy approximately three times a week for eight weeks, the therapist began planning for the client’s discharge. Re-administration of the 9-hole peg test
revealed that the client increased his speed and coordination by decreasing his time to 28.5 sec. The client’s grips strength and all three pinch strengths improved by an average of 5 pounds. His ROM in his wrist and MCP’s also increased. Subjectively, the client reports that he can finally open his peanut butter jar at home, he uses his right hand to tie his shoes and comb his hair, he is typing faster, and he is able to handle small objects easier when completing paper work tasks. He also stated that he now feels comfortable shaking hands with a fellow co-worker.

**Conclusion**

**Discharge Recommendations**

1. It is recommended that the client continue to use his right hand for all ODL’s and IODL’s to continue to increase function.

2. It is recommended that the client start a home exercise program to further increase strength in the right upper extremity.

**Discussion of Outcomes in Terms of Literature**

The intervention process described in this paper reflects theories from the biomechanical model and the MOHO. The therapist used evaluation processes used in the MOHO such as observation and interview. The therapist then used various components of the client including volition, habituation. For example the client’s volition was to return to work. The therapist organized interventions that elicited skills that would help the client return to work. The outcome of this treatment allowed the client to accomplish the short term goals of becoming independent with his speed and efficiency on the computer, filing papers, morning self care, meal preparation, and household management.
The therapist used the theory of the biomechanical model to restore the client’s ROM, speed and coordination, and strength. For example the therapist used intervention like the BTE door knob to increase strength and endurance of the right hand. The therapist also used the compensation method of splinting to improve the structural instability of the client’s swan neck deformity. The outcome of this treatment allowed the client to accomplish the goals of increasing ROM of the wrist and digits, increasing grip and pinch strength, and increasing coordination and manipulation in his right hand.

Table 1. Microfilament Interpretation

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<th>Filament</th>
<th>Interpretation</th>
<th>Force (mg)</th>
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<tr>
<td>1 (2.83)</td>
<td>Normal</td>
<td>50</td>
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<tr>
<td>2 (3.61)</td>
<td>Diminished light touch</td>
<td>200</td>
</tr>
<tr>
<td>3 (4.31)</td>
<td>Diminished protective sensation</td>
<td>2,000</td>
</tr>
<tr>
<td>4 (4.56)</td>
<td>Loss of protective sensation</td>
<td>4,000</td>
</tr>
<tr>
<td>5 (6.65)</td>
<td>Deep pressure sensation</td>
<td>30,000</td>
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Table 2. Male Grip Strength (pounds)

<table>
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<th>Age</th>
<th>Hand</th>
<th>Mean</th>
<th>SID</th>
<th>SE</th>
<th>Low</th>
<th>mm</th>
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<td>20.6</td>
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<td>91</td>
<td>167</td>
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<td>176</td>
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Table 3. Male Palmer Pinch/3 Jaw Chuck (pounds)

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<th>SID</th>
<th>SE</th>
<th>Low</th>
<th>mm</th>
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<td>16</td>
<td>36</td>
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Table 4. Lateral/Key Pinch (pounds)

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<th>SD</th>
<th>SE</th>
<th>Low</th>
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Table 5. Average and Standard Deviation of Male participants' Scores For 9-Hole peg test

<table>
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<th>Age</th>
<th>M-right (sec)</th>
<th>M-left (sec)</th>
<th>SD-right</th>
<th>SD-left</th>
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Figure 1. Swan neck deformity

Figure 2. Volumetric Measurement (top), Nine Hole Peg Test (bottom left), Microfilament Test (bottom right)
Figure 3. Client’s Limited Range of Motion

Figure 4. Silver Ring Splint
References


