Functional Changes Following Occupational Therapy in Individuals with a Distal Radius Fracture: A Longitudinal Study

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Importance: Identifying the outcomes of occupational therapy after a distal radius fracture (DRF) is important so that effective strategies can be developed to mitigate the consequences associated with this common fracture.

Objective: To determine whether participation in occupational therapy improved functional status. Secondary objectives were to assess its effects on body functions and to examine the association between changes in outcome measures and occupational therapy-related factors.

Design: Longitudinal.

Setting: Outpatient rehabilitation service.

Participants: Consecutive sampling over a 12-month period. Participants consisted of thirty-eight adults with a unilateral DRF (ages 31–75 yr.; 81.6% female).

Intervention: Multicomponent occupational therapy, including supplemental techniques and activity-based interventions.

Outcomes and Measures: Functional status and body functions were assessed before and after therapy.

Results: All standardized measures of functional status showed significant improvements, which were large in size. Several body functions improved significantly (pain, sleep, wrist/forearm movements, and grip strength fraction) and effect sizes ranged from medium to large. In several outcome variables, earlier therapy was significantly associated with better results; moreover, the likelihood of achieving better outcomes was significantly higher in participants who attended more sessions.

Conclusions and Relevance: Occupational therapy services have an important role to play after a DRF in terms of returning to daily activities and reducing impairments in body functions. Earlier intervention and attending a higher number of occupational therapy sessions are likely to further improve these outcomes.

What this Article Adds

Since the effects of occupational therapy in people with a distal radius fracture remain uncertain, we quantified the outcomes of this intervention in an outpatient rehabilitation service, revealing medium-to-large improvements in the performance of daily activities and in various body functions. Our findings identified two factors associated with better results: early initiation of therapy and a higher number of occupational therapy sessions.

Introduction

A distal radius fracture (DRF) is one of the most common fractures encountered in clinical practice, and its incidence is increasing (MacIntyre & Dewan, 2016; Nellans et al., 2012). It usually involves displacement of bone fragments and can result in complications such as range of motion and strength deficits, complex regional pain syndrome, and significant problems with activities of daily living (ADLs), instrumental activities of daily living (IADLs), leisure, and work (Edwards et al., 2010; Nellans et al., 2012).

A Cochrane review examined the effects of the various rehabilitation interventions used as part of the management of these fractures in adults (Handoll & Elliott, 2015). Many of the interventions discussed are within the scope of practice of occupational therapy (e.g., splints, education, and ADLs training). All trials included were small and most studies did not report on patient-reported outcome measures of function. The reader must keep in mind that patients with serious fractures, treatment-related complications, comorbidities, or poor function were excluded from many of the trials. The authors rated the quality of available evidence as either low or very low and concluded that it is insufficient in order to establish the best form of rehabilitation. Consistently, a systematic review highlighted that the evidence on occupational therapy in adults with a DRF remains limited (Roll & Hardison, 2017). Few studies on DRFs were included (*N* = 7). Moderate evidence suggests that early occupational therapy during immobilization leads to quicker recovery and that joint mobilization and exercise have positive outcomes after these fractures. This review found a paucity of evidence for occupation-based interventions and outcomes.

According to previous literature, relatively little is known about the specific outcomes of occupational therapy interventions after a DRF. More occupational therapy-led research is needed to establish an evidence-based practice. Additionally, a 2019 mapping review emphasized that research on the rehabilitation of these fractures (*N* = 18) is primarily focused on assessing the effects of exercise and patient education, with body functions/physiology being the most common outcome measures (Takata et al., 2019). None of the studies concerning DRFs included in this review evaluated activity-based interventions. Consequently, our research analyzed the results of an occupational therapy intervention characterized by combining the use of activity and occupation with other therapeutic methods. In order to address another of the limitations discussed above, the primary outcome was self-rated functional status. Furthermore, we explored the factors of the intervention that contributed to the improvement in patients. Therefore, the main objective was to determine whether participation in an occupational therapy intervention improved performance of daily activities. Secondary objectives were to assess the effects on body functions, and to examine the association between changes in outcome measures and the characteristics of the occupational therapy intervention.

Method

Design

The study was longitudinal, observational, and prospective.

Participants

The study was conducted at the Rehabilitation Service of the University Hospital of A Coruña (Spain). This service belongs to the National Health Service. The sampling method was consecutive for a 12-month period between 2021 and 2022. All patients with a (radiologically diagnosed) unilateral DRF consecutively admitted to the occupational therapy ward were invited to participate. The eligibility criteria were: (a) ≥18 years old; (b) with a documented DRF as the main reason for referral to occupational therapy; and (c) having enough mental abilities to understand the intervention procedures. Exclusion criteria were: patients with unstable medical conditions; a significant secondary diagnosis involving the central nervous system; or fractures related to malignancy. Ethical approval was granted by the regional ethics committee. All participants provided written informed consent.

Intervention

The primary aim of the occupational therapy intervention was to regain the highest possible level of competent participation in desired daily activities. This outpatient intervention approach was multicomponent, including activities and techniques in a wide variety of domains, grouped into two categories: adjunctive methods and activity-based interventions. These domains are described in the Supplementary Material tables. Referral to occupational therapy was by a rehabilitation physician. All participants went through an individualized combination of interventions from all types of domains, adapted on a case-by-case basis, with a frequency determined by the therapist (typically two 45-minute sessions per week). The number of sessions was tailored to the recovery stage, individual priorities, and specific needs of each participant. An occupational therapist with extensive experience in the field of hand therapy conducted the entire intervention.

Measures

Participants were assessed on admission to occupational therapy (T1) and upon discharge after this intervention (T2). Information was recorded on five domains: sociodemographic data, DRF characteristics, other hand-related health conditions, rehabilitation interventions, and outcome measures. Hospital medical records were reviewed. The following DRF characteristics were obtained: high/low-energy injury, injured hand, surgical treatment, and concurrent distal ulna injuries. Regarding occupational therapy, the length of time from the fracture until the first session, the time elapsed since surgery, and the number of sessions attended were recorded. Additionally, the participants were asked to rate their degree of satisfaction with the occupational therapy on a scale from 0 (very dissatisfied) to 10 (very satisfied) at T2. Outcomes were functional status (primary) and body functions (secondary).

Primary Outcome

Cochin Hand Functional Scale (CHFS) (Duruöz et al., 1996). The CHFS was developed to assess a predefined set of common daily activities in patients with musculoskeletal conditions. This self-report scale consists of 18 questions. The participant is asked to assess the difficulty that he/she has in carrying out these activities. Items are scored on a 0-5 Likert scale (0=no difficulty; 5=impossible). The total score is obtained by adding the scores from all items. The intrarater and interrater reliabilities were 0.97 and 0.96, respectively. The instrument has good convergent validity with general functional disability scales (Duruöz et al., 1996).

Patient-Specific Functional Scale (PSFS) (Stratford et al., 1995). The PSFS was developed to assess functional problems, primarily in individuals with musculoskeletal conditions. This widely used instrument has demonstrated adequate reliability. The intraclass correlation coefficient (ICC) was 0.97 (Stratford et al., 1995). The concurrent validity was supported by a moderate correlation with an upper extremity functionality scale (0.59) (Hefford et al., 2012). The PSFS allows participants to identify activities that are personally relevant to them. Participants had to define their 3 main problems. Each participant was asked to identify a total of three important activities that they found difficult or impossible to perform. For each of three self-generated activities, the participants rated their degree of difficulty on a 0-10 scale (0=unable to perform the activity; 10=able to perform it at the same level as before the injury). An average of these three scores was used. In order to describe the main functional problems at the baseline, we classified each of the chosen important activities into the following four categories: ADLs, IADLs, work, and leisure/social participation.

Secondary Outcomes

Grip Strength. Hand grip strength was measured in kilograms of force following standardized procedures (Fess, 1992). The average of 3 measurements was recorded. Hand dynamometry is a valid and reliable test. This instrument has good intra-observer reliability, with ICC values >0.8. Grip strength showed moderate correlations with upper extremity function scales in individuals with a DRF (Ziebart et al., 2021). Grip strength of the involved arm was compared with the opposite side. The grip strength fraction was presented as a percentage of the strength of the uninjured side.

Active Range of Motion. Universal goniometers were used to measure range of motion of wrist flexion and extension, radial and ulnar deviation, and forearm supination and pronation in the injured limb. A standardized technique was used (MacDermid et al., 2015). With respect to the reliability of goniometric measurements of active wrist movements, the values ranged from 0.78 to 0.9 (ICC) (Horger, 1990).

Pain, Tingling, and Sleep. These variables were assessed using three self-report items from the Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) questionnaire (Beaton et al., 2005). The QuickDASH has a Cronbach alpha of >0.9 and good test-retest reliability (ICC >0.9). Evidence of convergent construct validity was established ($r \geq 0.6$ with pain and function measures) (Beaton et al., 2005). Developed to measure upper limb physical function in people with musculoskeletal disorders, each item is graded on a 5-point Likert scale. The severity is rated from 1 (none) to 5 (extreme) on the pain and tingling items. Sleep difficulty is rated from 1 (no difficulty) to 5 (so much difficulty that I can't sleep).

Data Analysis

The changes in the outcome measures, defined as the difference between the final score and the baseline, were calculated. The changes between T1 and T2 were tested for significance by means of the paired sample *t*-test for the normal variables and Wilcoxon's signed-rank test for the other variables. Effect sizes for the *t*-tests were calculated using Cohen's *d* statistic: $d > 0.8$ is indicative of a large effect. The effect size (r) (ES(r)) for Wilcoxon's tests was calculated (Cohen, 1988): .10 constitutes a small effect, .30 is medium, and .50 is large. Additionally, the relationships between changes in outcome measures and two occupational therapy-related factors (time from fracture to occupational therapy and number of sessions) were tested using Spearman's *rho* or Pearson's correlation, as appropriate. A correlation coefficient of .10 constitutes a weak relationship, .40 is moderate, and .70 is strong (Dancey & Reidy, 2007). Statistical analyses were conducted using IBM SPSS 25.0. All tests used a $p < .05$ (two-sided).

Results

During the studied period, 38 individuals with a DRF were admitted to occupational therapy. These individuals served as the participants in this study (ages 31–75 yr.; 81.6% female). The Supplementary Material presents descriptive information (see table S3). Table 1 shows changes in the outcome measures.

Functional Status at Baseline. On the CHFS, the mean score was 33.13 points, representing difficulties in performing hand-related daily activities. On the PSFS, regarding the functional problems, the percentages of participants who selected at least one IADL, an ADL, a leisure/social participation activity, and a work activity were 89.5%, 60.5%, 26.3%, and 7.9% respectively. For IADLs, the number of activities chosen per participant was 2 (*Mdn*; range 0–3, IQR=1–2). This number was 1 (*Mdn*) in the ADLs group (range 0–2, IQR=0–1).

Occupational Therapy. For all participants, occupational therapy was the only rehabilitation treatment provided during the study period. The mean duration of this intervention was 14.95 sessions (*SD* 7.98). After completing this intervention, the degree of satisfaction with the occupational therapy was maximal (*Mdn*) (range 5–10, IQR=9–10).

Primary Outcome

CHFS instrument. Statistically significant differences were found when comparing the CHFS scores obtained before and after the intervention. These changes reflect an improvement in functional status, with an ES(*r*) greater than .6.

PSFS instrument. There was a statistically significant change in the PSFS score between T1 and T2. The score improved by 2.8 points, which corresponds to a decrease in the difficulty in performing the daily activities selected by the participants, with an ES(*r*) greater than .5.

Secondary Outcomes

Grip Strength. One participant did not complete this measurement due to severe pain. The paired sample *t*-test showed a statistically significant change in the grip strength fraction from T1 to T2. This percentage increased by more than 20%. Cohen's *d* exceeded a value of 1.

Active Range of Motion. Regarding the six wrist and forearm movements analyzed, Wilcoxon's test showed a statistically significant increase in five; in two of these movements (wrist extension and flexion), the ES(*r*) was greater than .5. No significant change was found in pronation.

Pain, Tingling, and Sleep. Difficulty sleeping decreased significantly between T1 and T2. There was a statistically significant improvement in pain severity. In these two items, the ES(*r*) was greater than .4. In tingling, no significant change was found.

Relationships Between Changes in Outcome Measures and Occupational Therapy-Related Factors

Time from Fracture to Occupational Therapy. Table 2 shows the correlations between the changes in the outcome measures and the time elapsed between the DRF and the start of occupational therapy. Changes were significantly associated with the number of days between the fracture and the start of occupational therapy in three of the outcome measures studied: CHFS instrument, grip strength, and pain. A shorter delay in the start of occupational therapy was associated with better outcomes in relation to functional status (CHFS), grip strength fraction, and pain severity.

No. of Occupational Therapy Sessions. The number of sessions was significantly associated with changes in four of the outcomes: grip strength and three movements (wrist extension, ulnar deviation, and radial deviation) (table 2). The likelihood of achieving better outcomes was significantly higher in participants who attended more sessions.

Discussion

Since the effects of occupational therapy in people with a DRF remain uncertain, the main contribution of this study was to quantify the outcomes in an outpatient rehabilitation service. Changes were quantified using effect sizes. Effect size is the magnitude of the impact of the treatment on an outcome measure (Peyton, 2005). We found evidence that this program was effective, revealing high satisfaction and significant improvements. Large improvements were found for the functional status scales (primary outcome), grip strength, and wrist extension and flexion movements. The improvements with medium to large effect sizes found are encouraging, suggesting a possible intervention effect on performance in daily activities and several body functions.

Comparisons between our findings and preexisting literature are complicated due to the considerable differences in the study samples and the heterogeneity of settings, interventions, and outcome measures (Handoll & Elliott, 2015; Roll & Hardison, 2017). Most previous studies have excluded people with serious injuries, complicated cases, or limited functional status (Handoll & Elliott, 2015). However, our research focused on the needs of the typical profile of occupational therapy outpatients in clinical practice, so it included a sample of individuals with marked motor impairments, severe pain, and difficulties in daily activities. More than half of the participants underwent surgery, which is usually necessary for unstable, comminuted, and/or intra-articular fractures (Aiello & Laseter, 2016). Nearly 40% had distal ulna injuries, associated with poorer health outcomes (MacIntyre & Dewan, 2016), and a high proportion had complex regional pain syndrome (type 1) (18.4%) or other hand-related conditions. Furthermore, while literature on DRFs prioritizes exercise interventions (Takata et al., 2019), to our knowledge this is the first longitudinal study exploring the results of a multicomponent occupational therapy strategy, characterized by combining supplementary techniques and activity-based interventions, with a flexible protocol based on the interests and abilities of each individual. Hand therapy literature has postulated that graded use of meaningful activities and occupations optimizes the return to daily activities, since these meaningful activities increase the patient's motivation and self-confidence and promote repeated, automatic, and naturally occurring movements of the injured hand, avoiding learned non-use, which can improve stiffness, proprioceptive and strength deficits, and participation restrictions (Colaianni & Provident, 2010). In line with accumulated evidence in the treatment of orthopedic upper-extremity conditions, we believe that the selection of interventions that focus on activity level may relatively explain our positive outcomes.

The use of patient-reported outcome measures of functional status was another strength of this study, combining self-assessment of a predefined set of activities (CHFS) with the selection of the most important functional problems for the participants (PSFS), which provided a comprehensive view of the primary outcome. At the baseline, IADLs were the most compromised occupations, followed by ADLs, consistent with a recent literature review that has revealed a paucity of studies on recovery regarding daily activities in this population (Halim et al., 2021). On the PSFS instrument, the notable improvement exceeded the minimal important difference established for people with upper-extremity musculoskeletal conditions (Hefford et al., 2012). The positive impact on functional status was in line with two studies on occupational therapy programs in conservatively treated women (Dahlqvist & Rosén, 2016; Nielsen & Dekkers, 2013). However, two trials did not find a significant functional improvement, although it should be noted that they exclusively analyzed exercise interventions supervised by occupational therapists (Filipova et al., 2015; Souer et al., 2011). Regarding secondary outcomes, the improvement in grip strength identified in this study was faster than the typical recovery period established in the literature, which is between six months and one year after a DRF (Halim et al., 2021). In line with our findings, one study showed that focusing strengthening exercises on performing functional movements significantly increased grip strength in a sample of conservatively treated occupational therapy patients (Filipova et al., 2015). Although one scoping review indicated that range of motion is the most difficult body function to recover after a DRF (Halim et al., 2021), the findings showed an improvement in all the movements evaluated except pronation. Moreover, the wrist range of motion needed by the general population to perform most daily activities was achieved (Ryu et al., 1991). The greatest improvement was found in wrist extension, this being the movement most strongly associated with functional status in a longitudinal study of adults with a DRF (Yang et al., 2018). Since most patients commonly regain pronation quickly and easily (Aiello & Laseter, 2016), this movement already showed a normal range at the baseline. Similar to previous research findings on occupational therapy (Nielsen & Dekkers, 2013), participants perceived significantly less pain after the intervention. However, a high proportion continued to have pain problems at the time of the final assessment. This result is consistent with previous literature, which has suggested that pain can persist beyond the first year (Roll & Hardison, 2017). Finally, the participants perceived significantly fewer sleep problems. No studies have been found about the impact of occupational therapy in the sleep domain.

Two factors were associated with better outcomes: early initiation of therapy and a higher number of occupational therapy sessions. The strength of the relationships ranged between weak and moderate. Significant differences were found in changes in grip strength, pain, and functional status based on the delay in starting occupational therapy. These results in favor of early intervention are consistent with the conclusions of a systematic review of occupational therapy studies (Roll & Hardison, 2017). Similarly, a meta-analysis has shown that early initiation of movement after open reduction and internal fixation leads to significant improvements in the domains of functional status, strength, and pain (Ghaddaf et al., 2021). On the other hand, this is the first study to confirm a significant relationship between increasing the number of sessions and greater recovery of grip strength and of some active movements after a DRF. The structured and repeated practice of therapeutic activities, with an individualized graduation according to parameters such as the objects required or the level of difficulty and resistance, seem to be key to improving these objectively evaluated study variables.

We noted several limitations. The sample size was relatively small, thus reducing the statistical power of the calculations and increasing the risk of not detecting significant associations. Additionally, potentially important factors, such as type of fracture (e.g., extra/intra-articular and comminution) or comorbidity, were not recorded. The participants were recruited using a non-random technique from a single rehabilitation center. Therefore, our outcomes may not be generalizable to the overall population of people with a DRF. Since referral was based on the rehabilitation physician's clinical judgment, in the context of public health care services, the results may be more representative of adults with a specific needs profile characterized by a greater need for rehabilitation interventions and more severe functional limitations. Lastly, it is not known whether the positive effects remained beyond the period studied. Although this study has its limitations, we believe that its findings provide a great deal of information as a basis for further research. Future replication research should include a larger sample of participants and more facilities. A recommended step is validating these results through a large-scale intervention trial, including a comparison group, random sampling procedures, and long-term monitoring. In addition to the total number of sessions, future research should also explore the influence on outcomes of other factors related to occupational therapy (e.g., frequency and number of days between the first and last session) to provide more information on the ideal intensity and optimal dosage of intervention for this population. Another recommendation for future studies is to analyze the impact of personal factors related to therapists, such as education, degree of specialization or years of professional experience.

Implications for Occupational Therapy Practice

This study has the following implications for occupational therapy practice:

- An outpatient occupational therapy intervention that integrates adjunctive methods and activity-based interventions has the potential to provide positive outcomes for people with a DRF in the areas of return to independent competence in daily activities and body functions, so occupational therapy services are suggested to mitigate functional problems and impairments resulting from these fractures.

- Two intervention-related factors significantly increase the effectiveness of occupational therapy after a DRF: early initiation of therapy and a higher number of sessions. Consideration of these factors should be present in the decision-making process related to the planning of occupational therapy programs in clinical settings.

Conclusion

Although the effectiveness of this intervention approach remains to be tested in a controlled clinical trial, the findings extend the evidence base for this occupational therapy practice. This longitudinal study showed clinically and statistically significant improvements in almost all outcome measures. Our research supported the proposition that these occupational therapy services have an important role to play after a conservatively or surgically treated DRF in terms of returning to daily activities and reducing impairments in body functions. The results may be useful in developing more effective strategies by identifying two factors associated with better recovery: Earlier intervention and a higher number of occupational therapy sessions are likely to further improve these outcomes.

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Table 1. Changes in outcome measures

	T1[a]	T2[a]	p^{b}	ES
Functional status				
Cochin Hand Functional Scale				
M (SD)	33.13 (20.17)	14.76 (13.34)	<.001[c]	.62
Patient-Specific Functional Scale				
M (SD)	3.31 (2.03)	6.16 (2.08)	<.001[c]	.55
Body functions				
Grip strength (n = 37)				
Fraction: *M (SD)*	44.34 (27.81)	65.08 (19.71)	<.001[c,d]	1.03[e]
Range of motion				
Wrist extension	40 (30–50)	55 (50–60)	<.001[c]	.59
Wrist flexion	37.5 (30–50)	50 (40–55)	<.001[c]	.56
Supination	77.5 (60–90)	90 (85–90)	<.001[c]	.48
Ulnar deviation	30 (20–30)	40 (30–40)	<.001[c]	.47
Radial deviation	20 (15–25)	25 (20–30)	<.001[c]	.45
Pronation	90 (90–90)	90 (90–90)	.10	-
Symptoms				
Sleep	2 (1–3)	1 (1–2)	<.001[c]	.42
Pain	3 (2–4)	2 (2–3)	<.001[c]	.41
Tingling	2 (1–3)	2 (1–3)	.06	-

Note. ES: effect size.

[a]Data are presented as *Mdn (IQR)* unless otherwise stated.

[b]Wilcoxon's signed-rank test unless otherwise stated.

[c]Indicates significant finding ($p < .05$).

[d]Paired t test; $t(36) = -6.24$

[e]Cohen's d.

Table 2. Correlations between the changes in outcome measures and occupational therapy-related factors

	Time from fracture to occupational therapy		*No. of occupational therapy sessions*	
Changes in outcome measures[a]	Spearman's ρ	*p*	Coefficient[b]	*p*
Functional changes				
Cochin Hand Functional Scale	.32	.04[c]	-	.16[d]
Patient-Specific Functional Scale	-	.55	-	.39[d]
Changes in body functions				
Grip strength: fraction (n = 37)	-.40	.01[c]	.52	p <.001[c,d]
Range of motion				
Wrist extension	-	.83	.44	.005[c]
Wrist flexion	-	.85	-	.71
Supination	-	.63	-	.14
Ulnar deviation	-	.35	.37	.02[c]
Radial deviation	-	.31	.32	.04[c]
Pronation	-	.94	-	.32
Symptoms				
Sleep	-	.06	-	.06
Pain	.35	.02[c]	-	.43
Tingling	-	.86	-	.07

Note. [a]Changes in outcome measures were defined as the difference between the final score and the baseline score.

[b]Spearman's ρ unless otherwise stated.

[c]Indicates significant finding (p <.05).

[d]Pearson correlation coefficient (r).

Supplementary Material

Table S1. Occupational therapy intervention: overview of the major adjunctive methods

1. Splinting	Orthotic design/selection Fabrication of an orthosis. Examples: - Temporary static wrist orthosis for functional activities - Dynamic/static progressive splinting Comfort and appropriate positioning Adaptation: orthosis adjustment as necessary Wear schedule Advice and education on proper use
2. Edema control	Positioning and elevation Light compression wraps as tolerated: coban wrap Contrast baths Active movements and functional activities
3. Sensory re-education	Sensory skills and needs assessment Proprioceptive training Graded motor imagery: laterality training, explicit motor imagery, and mirror therapy Sensory stimulation activities as needed
4. Therapeutic exercise	Physician´s prescription: follow the physician´s specific guidelines. - For example, in the early postoperative period, the physician may prescribe the initiation of very gentle exercises: *initiate pain-free forearm and wrist active ROM. Perform all movements to a tolerable end range, 10 times each, two to three times per day.* Progressive and pain free Home program: education in a ROM training - Guidance and practical instruction concerning self-rehabilitation - Active ROM of uninvolved joints - Dart-throwing motion - Gradual active ROM of involved joints and active-assisted ROM - Occupational-focus: incorporate exercises into occupation, as much as possible Passive ROM as needed Graded functional strengthening if approved by the treating physician
5. Other adjunctive methods	Scar management - Educate patient on signs of infection - Scar massage - Silicone gel application - Desensitization program Tendon gliding Modalities: contrast bath and paraffin bath treatment

ROM: range of motion

The conceptualization of the occupational therapy intervention was based on the Occupational Functioning Model (Trombly, 2014).

Reference: Trombly, C. A. (2014). Conceptual foundations for practice. In M. V. Radomski & C. A. Trombly, *Occupational therapy for physical dysfunction* (7th ed., pp. 1–23). Lippincott Williams & Wilkins.

Table S2. Occupational therapy intervention: overview of the activity-based interventions

1. Therapeutic use of everyday activities and meaningful activities/tasks	*Occupation-as-means*: use of activities/tasks as a method of intervention to activate and improve sensorimotor abilities and performance skills (e.g., combined motions and control motor, dexterity, activity tolerance, and strengthening) Client-centered approach: use of valued tasks and meaningful activities Needs assessment - Performance skills - Occupational history. Previous roles and values - Individual interests and priorities Therapeutic activities and purposeful tasks - Meaningful activities - Significant games - Crafts/arts - Simulated occupations - Writing and typing Everyday activities: ADL, IADL, work, and leisure. Components of occupations Individually designed activities focused on the patient´s functional goals Structured activities/tasks - Adaptation and simplification, as appropriate - Grading (e.g., level of difficulty, motor demands, resistance, number of steps required, and objects) Repeated practice
2. Assistive devices and environmental modifications (home and work)	Environmental assessment: barriers and enablers Unmet needs: advice Home and work environment: advice on adaptations/modifications Assistive devices: needs assessment Recommendation of assistive devices/adaptive equipment Advice on assistive technology Training with assistive devices
3. Daily living skills training and return to occupations	*Occupation-as-end*: return to occupations as the primary goal of the occupational therapy intervention. It is an intervention that enables patients to engage in occupations Client-centered approach: performance of desired activities Needs assessment - Occupational history - Interests and individual priorities - Valued tasks and meaningful activities - Performance patterns (habits, routines, rituals, and life roles) Functional independence in daily activities and engagement in occupations - One-handed methods as needed (immobilization stage) - Use of the involved extremity as much as possible - Activity adaptation/simplification: recommendations to perform daily activities. Adapt objects, tools, and equipment - Patient education: adapted/compensatory methods - Energy conservation strategies - Use of ergonomics. Joint protection - Practical training of daily life skills and use of "activity kits", as appropriate. These kits are made up of the objects and utensils necessary to carry out a certain activity Return to occupations - Progressive and pain-free - Graded activities - ADL and IADL - Work activities: specific work tasks and work conditioning - Leisure activities and sports

ADL: activities of daily living. IADL: instrumental activities of daily living.

The conceptualization of the occupational therapy intervention was based on the Occupational Functioning Model (Trombly, 2014).

Reference: Trombly, C. A. (2014). Conceptual foundations for practice. In M. V. Radomski & C. A. Trombly, *Occupational therapy for physical dysfunction* (7th ed., pp. 1–23). Lippincott Williams & Wilkins.

Table S3. Descriptive characteristics (*n* = 38).

Characteristics	Value[a]
Sociodemographic data	
Age, yr., *Mdn (IQR)*	58 (50.25–63.25)
Female	31 (81.6)
Married	24 (63.2)
With children	29 (76.3)
Living alone	9 (23.7)
Education: <10 yr.	11 (28.9)
Work status	
Sick leave (unable to work due to injury)	20 (52.7)
Working	4 (10.5)
Homemaker/unemployed	7 (18.4)
Retired	7 (18.4)
Distal radius fracture	
Injury: low energy (fall from level)	30 (78.9)
Dominant hand injured	18 (47.4)
Surgery	
Yes	21 (55.3)
Interval from fracture until surgery (days, *n* = 21), *M (SD)*	12.95 (9.99)
Concurrent injury	
Distal ulna injuries	15 (39.5)
Other hand-related health conditions	
Complex regional pain syndrome-type 1	7 (18.4)
Carpal tunnel syndrome	1 (0.03)
Dupuytren's disease	1 (0.03)
Trapeziometacarpal osteoarthritis	1 (0.03)
Rehabilitation	
Physiotherapy prior to occupational therapy	
Yes	7 (18.4)
No. of sessions (*n* = 7), *Mdn (IQR)*	10 (10–20)
Occupational therapy	
Time from fracture to occupational therapy (days), *Mdn (IQR)*	98 (75.75–118)
Time from surgery to occupational therapy (days) (*n* = 21), *M (SD)*	81.24 (28.7)

Note. [a]Data are presented as *n* (%) unless otherwise stated.