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RESEARCH PAPER



# “The more I do, the more I can do”: perspectives on how performing daily activities and occupations influences recovery after surgical repair of a distal radius fracture

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## ABSTRACT

**Purpose:** The study aimed to explore perceptions and experiences about how engaging in daily activities and occupations influenced recovery in the first eight weeks after surgical treatment of a distal radius fracture.

**Methods:** Twenty-one adults completed an online activity and exercise log then participated in a semi-structured interview between weeks 6 and 8 postoperatively. Interviews were transcribed and analysed using reflexive thematic analysis.

**Results:** Daily activities and occupations were highly influential in facilitating recovery of movement and function of the operated limb. Five themes provided an understanding of how occupation operated to promote recovery. Occupation was (i) a primary driver of the rehabilitative process, providing an impetus for recovery, (ii) offered ready-to-hand challenges for opportunistic, automatic movement, (iii) invited intentional use of the affected wrist, (iv) habituated the wrist to movement through repetition and confidence-building, and (iv) drew on psychosocial resources to enable reengagement with life activities and roles.

**Conclusions:** Incorporating the performance of graded, modified activities during the early weeks of rehabilitation creates opportunities for wrist movement, enhances wellbeing, and assists in the habituation of wrist movement. Activities and occupations can be used as a therapeutic strategy to promote recovery from surgical treatment of a distal radius fracture.

## ARTICLE HISTORY

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## KEYWORDS

Distal radius fracture; occupation; qualitative interpretive description; rehabilitation; activities of daily living; reflexive thematic analysis

## ► IMPLICATIONS FOR REHABILITATION

- Rehabilitation after surgical repair of distal radius fractures has traditionally focused on exercise routines.
- Daily activities and occupations can also be used to promote wrist movement and function during the early weeks of rehabilitation.
- Occupation is a naturally occurring source of wrist movement, motivation, and wellbeing that can be harnessed for therapeutic advantage after surgical repair of distal radius fractures.
- Therapists can collaborate with patients to select and modify daily activities and occupations to incorporate into early postoperative therapy programmes.


## Introduction

A fracture of the distal radius is a common upper extremity injury frequently treated by surgical repair, followed by wrist mobilisation within two weeks of surgery [1]. Wrist stiffness, pain, and functional or sensorimotor impairment can persist after surgery [2–4] and rehabilitative strategies that address impairment and promote early recovery are needed. Wrist and forearm exercises are routinely used during early rehabilitation to promote movement [1,5]. Performance of daily activities can also be used but is poorly defined as a rehabilitative strategy and not as widely promoted as exercise interventions [6]. One of the barriers to occupation-based interventions is a lack of knowledge about how occupation facilitates recovery from injury [7,8]. Without such

understandings it is difficult to design interventions that capitalise on the benefits of occupation.

In this study, occupation refers to the broad categories of daily life engagements by which people occupy themselves: daily living activities, rest, education, work, leisure, and social participation [9]. Occupation assumes meaning, purpose, intentional engagement and that occupation is contextualised within daily life [9]. The term activity is used differentially to refer to the smaller actions or sets of day to day living tasks that occupations are constructed from [9,10]. Performance of activities and occupations may facilitate recovery in ways distinct from exercise routines such as augmenting movement quantity and quality [8,11], enhancing motivation, and facilitating functional movement [8].

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 Supplemental data for this article can be accessed [here](#).

This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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It was considered that performing daily activities may be an underutilised rehabilitative strategy. The questions were raised: what role does activity and occupation play in the recovery from distal radius fracture surgery, and how might occupation be harnessed to form a therapeutic intervention?

The Medical Research Council recommends that intervention development may require primary research to identify how that intervention is likely to produce change [12]. A study was therefore designed to explore the perceptions and experiences of people about how engaging in daily activities and occupations influenced recovery in the first eight weeks after surgical treatment of distal radius fracture.

## Methods

A qualitative study using interpretive description methodology [13] and underpinned by a critical realist perspective, was undertaken. The Standards for Reporting Qualitative Research (SRQR) [14] were used to inform the design of the study. The study was approved by the Auckland University of Technology Ethics Committee (AUTC) on 29 July 2019, number 19/224. In this paper, the term “therapist” refers to an occupational, physical, or hand therapist involved in the rehabilitation of upper extremity injuries.

Interpretive description is a qualitative methodology where researcher and participant work together to generate knowledge about clinical phenomena [15,16]. Critical realism guided the philosophy of the study by accepting that an objective, knowable reality exists but rejecting that the notion that observed phenomena can be understood exclusively through stringent scientific methods [17,18]. The imperative for researchers guided by critical realism is to explore mechanisms and contexts, to understand not only if something works, but how it works [17,19]. Interpretive description focused the study firmly on clinical practice and critical realism provided a cohesive overarching framework.

### Study setting and participants

Participants were recruited through private and public hand therapy clinics in Auckland, New Zealand. Figure 1 details the recruitment procedures. Potential participants were selected based on predetermined inclusion criteria (Table 1) and purposive sampling criteria (age, gender, ethnicity, pain, kinesiophobia, and finger stiffness), in order to obtain maximum variation of participant characteristics. A sample of 20–30 was estimated based on the concept of information power, where fewer participants are needed in a study with high information power [20]. We achieved high information power through a tightly defined aim, targeting participant characteristics, applying established theory, and rich dialogue and analysis [20].

### Data generation

Data were generated via an activity and exercise log and a semi-structured interview. Participants were visited on two occasions (see Figure 1). The clinical features of pain severity and kinesiophobia were measured by the patient rated wrist and hand evaluation (PRWHE) [21] and the Tampa scale of kinesiophobia-11 (TSK-11) [21,22], respectively. The TSK-11 has a score range between 11 and 44 with a score of  $\geq 35$  delineated as high kinesiophobia [23]. Wrist stiffness was scored as:  $>50\%$ ,  $20\text{--}50\%$ , or  $<20\%$  of the contralateral side [24]. Finger stiffness was a fingertip to distal palmar crease measurement  $> 1\text{ cm}$  [2].

### Activity and exercise log

Between weeks two and six postoperatively, participants were asked to complete an online activity and exercise log (supplementary file 1). The purpose of the log was as a prompt for discussion during the interviews and to observe the types and range of activities that individuals performed. The log was developed from research that defined valued occupations and functional problems for people with hand injuries [25–27]. Initially, participants were asked to complete the log daily; this was amended to two to three times per week as the first few participants indicated that daily completion was repetitive.

### Semi-structured interview

The interview was conducted between weeks six and eight postoperatively. The interviews were a semi-structured exploratory style [28]. An interview guide was developed around four broad areas: experiences of daily activities, perceptions on the influence of daily activities on recovery, advice/education received about activities and the pragmatics of activity performance. The questions were open-ended and provided a framework only for the interviews. This approach allowed the interviewer to probe and to explore responses at a deeper level in accordance with interpretive description research [29].

### Data processing and analysis

All interviews were audio-recorded and transcribed verbatim by a professional transcriber and checked for accuracy by the first author (JC). The data were analysed using reflexive thematic analysis, a six-phase inductive style of analyses that draws themes from the data [30,31]. Familiarisation was conducted by the first author through reviewing the audio recordings and transcripts. Codes were then generated inductively from the data, by (JC), using both descriptive and interpretive labels. NVivo 12 was used for the coding process. Following the completion of coding, theming commenced. First, candidate themes were developed, then discussed and finalised, based on agreement between all authors. Themes were subsequently named and defined.

### Study rigour

The research team consisted of experienced therapists and academics. The first author (JC), an occupational and hand therapist, led data generation, coding, and development of themes and was not involved in the clinical care of any participant. Cross-verification was achieved through the research team reviewing sections of data and confirming codes and final themes. Quality and rigour were promoted through a collaborative, reflexive approach. Epistemological integrity was achieved by framing the study within a critical realist ontology and interpretive description method. The steps of reflexive thematic analysis were followed to ensure a rigorous analytic process. It was acknowledged that the primary researcher may bring theoretical allegiances or professional assumptions that could influence the research [14,31]. A presuppositions interview was conducted by senior researchers (VW and NS) prior to data collection. During the interview, the primary researcher was questioned about assumptions and challenged to remain reflexive and alert to narratives that may reveal hidden meanings.

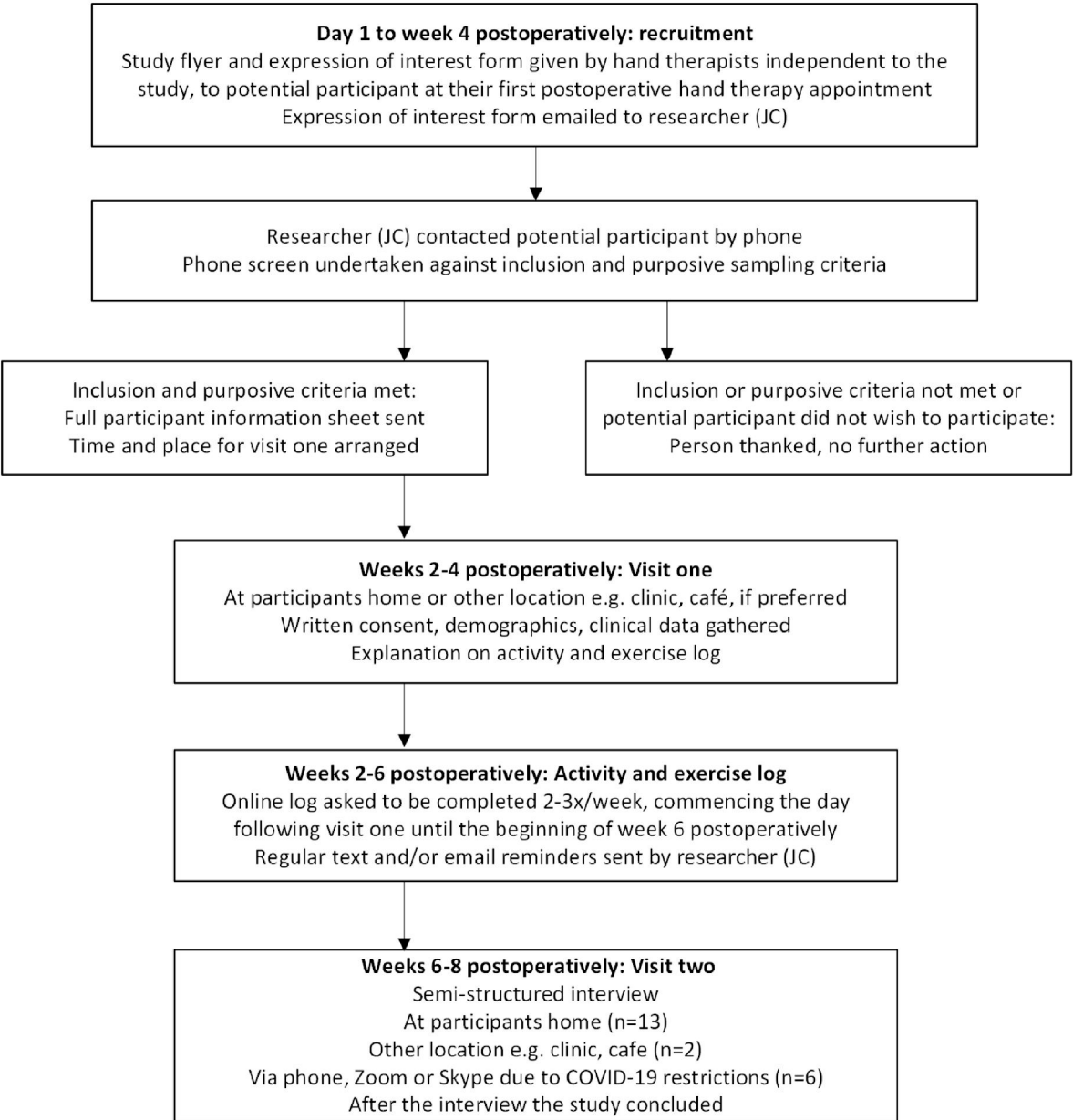


Figure 1. Study flowchart.

Table 1. Eligibility criteria.

|  |
|--|
| <i>Inclusion</i>   |
| Aged over 18 years   |
| Surgical fixation of distal radius fracture, all fracture AO types A, B, or C      |
| Less than four weeks postoperative at time of recruitment                          |
| Stable fixation, deemed by surgeon to be suitable for mobilisation by four weeks   |
| Conversational English   |
| <i>Exclusion</i>   |
| Concomitant fracture of another bone (excepting ulnar styloid)                     |
| Concomitant surgery for injury of other tissues: tendon, muscle, nerve             |
| Any condition or injury that significantly affects normal use of the operated limb |
| Patients undergoing hand therapy by primary researcher                             |

Results

During 2019 and 2020, 21 adults participated in the study. Participant characteristics are summarised in Table 2 and detailed in Table 3.

The activity log was completed an average of nine times (range 3–23). The majority of participants commenced the log by the end of week three ( $n = 14$ ) and the remainder during the following two weeks. The log and interviews revealed a broad range of activities performed without a splint during the first six weeks (Table 4). All participants were provided with a removable wrist splint (custom thermoplastic or off-the-shelf) at the time of mobilisation. The log showed that by the end of week three postoperatively most participants (14/21), were using their wrist during activities such as eating, showering, or grooming. Of those 14, many were also using their wrist during meal preparation, or household tasks. By the end of week, six all participants were performing some personal, home, work, or leisure activities involving their operated wrist without a splint.

Interviews revealed that for most participants, daily activities and occupations were highly valued for facilitating recovery of movement and function of the affected limb. We generated five themes that elucidated how occupation acted as an agent of

Table 2. Summary of participant characteristics.

| Variable   | Number (percentage) or mean (range) |
|--|-------------------------------------|
| Gender: female   | 14/21 (67%)                         |
| Age  | 53 (28–74)                          |
| Ethnicity: Māori   | 3/21 (14%)                          |
| New Zealand European   | 14/21 (67%)                         |
| Other (Indian, Russian, Afghani)                               | 4/21 (19%)                          |
| Dominant hand injured  | 10/21 (48%)                         |
| Finger stiffness at visit one (>1 cm ADPC)                     | 11/21 (52%)                         |
| Wrist stiffness at visit one (moderate or severe) <sup>a</sup> | 16/21 (76%)                         |
| Pain at visit one (PRWE pain sub-scale)                        | 25/50 (10–41)                       |
| Kinesiophobia (TSK-11)   | 25/44 (12–42)                       |
| TSK-11 ≥ 35 <sup>b</sup>                                       | 2/21 (10%)                          |
| Fracture type: comminuted, intraarticular                      | 19/21 (90%)                         |
| Ulna styloid fracture  | 8/21 (38%)                          |
| Volar locking plate  | 20/21 (95%)                         |
| Fragment-specific fixation                                     | 1/21 (5%)                           |
| Additional surgical procedure (2× carpal tunnel release)       | 2/21 (10%)                          |
| Number of days from surgery to mobilisation                    | 13 (7–27)                           |
| Number of days from surgery to interview                       | 53 (44–64)                          |
| Number of activity log entries                                 | 9 (3–23)                            |

ADPC: active distal palmar crease; PRWE: patient rated wrist and hand evaluation; TSK: Tampa scale of kinesiophobia.

<sup>a</sup>20–50% (moderate), <20% (severe) range of movement of the contralateral side [31].

<sup>b</sup>A TSK score of >35 is indicative of high kinesiophobia [30].

Table 3. Characteristics of participants.

| Participant | Gender | Age | Injured side | Occupation                 | Intra-articular fracture | Surgical procedures   | Finger stiffness <sup>a</sup> at visit 1 |
|-------------|--------|-----|--------------|----------------------------|--------------------------|---|--|
| Paul        | Male   | 55  | Non-dominant | Handyperson, builder       | Y                        | Fragment-specific fixation (radial, dorsal, ulna plates); CTR | Y  |
| Farida      | Female | 50  | Non-dominant | Storeperson                | Y                        | Volar plate   | N  |
| Graeme      | Male   | 46  | Dominant     | Plumber                    | Y                        | Volar plate   | N  |
| Angela      | Female | 51  | Dominant     | Homemaker                  | N                        | Volar plate   | Y  |
| Natalya     | Female | 59  | Non-dominant | Homemaker; administrator   | Y                        | Volar plate and interfragmentary screw                        | Y  |
| May         | Female | 32  | Dominant     | Landscape gardener; parent | Y                        | Volar plate   | N  |
| Ian         | Male   | 55  | Dominant     | Manager; administrator     | Y                        | Volar plate and radial pin plate                              | N  |
| Layla       | Female | 34  | Dominant     | Parent                     | Y                        | Volar plate   | N  |
| Awhina      | Female | 49  | Dominant     | Driver                     | Y                        | Volar plate   | Y  |
| Zoe         | Female | 68  | Non-dominant | Retired                    | Y                        | Volar plate   | Y  |
| Bill        | Male   | 72  | Non-dominant | Retired                    | Y                        | Volar plate   | Y  |
| June        | Female | 74  | Non-dominant | Retired                    | Y                        | Volar plate   | N  |
| Kukurei     | Female | 56  | Non-dominant | Music teacher              | N                        | Volar plate   | N  |
| Karen       | Female | 57  | Non-dominant | Nurse                      | Y                        | Volar plate   | Y  |
| Santosh     | Male   | 30  | Dominant     | Driver                     | Y                        | Volar plate   | N  |
| Marie       | Female | 71  | Dominant     | Retired                    | Y                        | Volar plate   | Y  |
| Silky       | Female | 71  | Non-dominant | Retired                    | Y                        | Volar plate   | N  |
| Dina        | Female | 28  | Non-dominant | Parent                     | Y                        | Volar plate and ulna styloid screw                            | Y  |
| Alexa       | Female | 36  | Dominant     | Parent; manager            | Y                        | Volar plate and radial pin plate; CTR                         | Y  |
| Trent       | Male   | 62  | Dominant     | Handyperson                | Y                        | Volar plate   | Y  |
| Nick        | Male   | 55  | Non-dominant | Designer                   | Y                        | Volar plate and dorsal pin plate                              | N  |

CTR: carpal tunnel release.

<sup>a</sup>Fingertip to distal palmar crease measurement > 1 cm.

change in promoting recovery from surgical treatment of distal radius fracture. Quotes that are highly illustrative of the themes are presented. They are identified by participants' pseudonyms, ages and whether they injured their dominant (DHI) or non-dominant hand (NDHI). An overview of the themes is given in Table 5.

### Theme one: occupation is a driving force of recovery

I just want life to go back to how it was. To be able to take the boat out and go fishing and ride my bike and stuff like that. Graeme, 46, DHI

Theme one describes how the desire to return to valued occupations and life roles provided a potent impetus and focus for the recovery process. The disruption to daily life and usual activities and occupations was unwelcome. Participants expressed a strong

need to reclaim independence, participate in usual life roles and return to valued occupations. Engaging in daily activities helped to reclaimed normality and wellbeing.

### Experiencing disruption

Like I said, it's not until it didn't function, you realise how much you do use your hand. Awhina, 49, DHI

Most participants talked about how routine activities previously carried out with little thought, such as getting dressed or making breakfast, were suddenly noticed and became sources of frustration, discomfort, and challenge. Many people expressed feelings of being lazy, or a burden. Others missed the "ordinariness" of daily life and described the sudden loss of "doing" as making them feel bored or lost.



**Table 4.** Activities and occupations performed by participants in the first six weeks with the wrist splint off and involving at least partial use of the affected wrist.

|  |  |
|--|--|
| Applying make-up, face, or hand cream          | Opening cupboards, drawers, containers       |
| Baby care, e.g., diapers                       | Personal care, e.g., shaving, brushing teeth |
| Childcare: dressing, pushing a pushchair       | Pet care: feeding, grooming                  |
| Carrying light items, e.g., a plate, lunch bag | Playing a musical instrument                 |
| Chopping, peeling vegetables                   | Playing video games                          |
| Cooking, e.g., making breakfast or a salad     | Sewing, using a sewing machine               |
| Driving  | Showering – washing and drying self          |
| Eating, drinking                               | Swimming                                     |
| Gardening, e.g., weeding                       | Tidying up children's toys                   |
| Getting dressed, doing up shoelaces            | Turning controls on kitchen appliances       |
| Handcrafts                                     | Unpacking and putting away shopping          |
| Having a bath                                  | Using a keyboard and/or computer mouse       |
| Housework, e.g., tidying, making beds          | Using a remote control                       |
| Laundry: hanging up, folding, putting away     | Vacuuming                                    |
| Loading, unloading the dishwasher              | Washing and drying dishes                    |
| Making a cup of tea or coffee                  | Washing, doing hair                          |
| Making roti                                    | Watering the garden                          |
| Mopping the floor                              | Wiping benches                               |

**Table 5.** Five themes showing how activities and occupation influenced recovery from surgical treatment of a distal radius fracture.

|                     |   |   |
|---------------------|---|---|
| Occupation operated | As a driver of recovery                   | Disruption to daily activities was experienced negatively<br>Disruption motivated reengagement  |
|                     | Through offering ready-to-hand challenges | Daily activities were used to reclaim normality and enhance wellbeing<br>Daily activities were a ready source of automatic movement<br>Daily activities had built-in gradations and challenges              |
|                     | By inviting intentional doing             | Intentional, conscious “doing” was needed<br>Mindful strategies were used to enable performance of activities   |
|                     | To habituate the wrist to movement        | Initial movement felt unnatural<br>Activity performance normalised wrist movement   |
|                     | Through drawing on psychosocial resources | Self-efficacy and confidence were enhanced by engaging in occupation<br>Strength was gained from psychosocial resources<br>Wellbeing practices were used to facilitate reengagement with valued occupations |

Yeah, I'd get frustrated. Very frustrated. I'm not used to sitting still. I'm used to getting up and going. Silky, 71, NDHI

There was a common experience that the interruption to everyday “doing”, negatively affected mood and wellbeing and some participants expressed fears about the future.

I was worried about what am I gonna be able to do again. I did ballroom dancing and I was like always one day I thought to get back into it again and I was like, “Am I gonna be able to do it again?” “What am I gonna be able to do?” “How much movement am I gonna have?” Just those sorts of things. “What is my life gonna be like?”. “When can I pick up my son?”. Alexa, 36, DHI

**Reclaiming normality**

The difficulties experienced motivated people to begin “doing” again and use their affected hand. Initially, this was often for simple functional activities, then later for work and recreational pursuits.

When I first tried to do it, it was like, “Oh my god, I can't even hold a cup of coffee.” And it frustrated me so I got to the stage where I slowly built up so I could, over five days hold it and lift it. Graeme, 46, DHI

We enter in a lot of things. Netball. Iron Māori. Amazing Race. But I couldn't even do the training. They wouldn't have me. It's like you've been outcasted ... but it made me work harder. It made me wanna hurry up. Awhina, 49, DHI

The need to re-establish normal routines and independence was expressed strongly. Some people described inactivity as being so foreign that the natural thing to do, was “do”. Even if it meant taking more time or finding alternative methods, the very act of doing seemed to help combat the disorienting effect of the injury.

I think being able to do those things such that you are functioning in some degree of independence, I think that's important. Yeah, I think

that's hugely important. Well it was for me anyway. I hated the dependency. Absolutely loathed it. So, to be able to do those things and even if it took me forever, on simple tasks to start with, those kind of things were important. Zoe, 68, NDHI

Engagement in meaningful occupations was seen to boost mood and wellbeing. Participants described feeling more settled when “doing”, that gardening lifted mood, or helping with household management negated feelings of laziness and uselessness. For some, starting to perform daily activities shifted the focus from “I can't” to “I can” providing a sense of optimism and hope.

Just to see the light at the end of the tunnel, to know that I'm gonna be able to use my hand. And to know that things will ... come back to normal and ... I'm gonna get better and I will get stronger and I will be able to function properly again. Well maybe not function, but I'll be able to do the things I want to do. Nick, 55, NDHI

**Theme two: occupation offers ready-to-hand challenges**

I thought well ... I just have to work it out. You just have to work it out. There's nobody else here to do it for you, so you have to do it. If you don't do it, well you don't get any taties [potatoes] Silky, 71, NDHI

This theme describes how activities and occupations promoted recovery through being ready and available. Activities and occupations were an intrinsic part of daily life thereby offering a naturally occurring source of movement and challenge. Activities were observed to have inbuilt gradations that created stepwise challenges for wrist movement.

**A ready source of movement**

The thing is that if I do anything, it's not that I think of it, it's just that I do it. That's just offhanded probably. You need to do it, do it. You don't even think like that, it's just such a natural thing. Bill, 72, NDHI

The embedded existence of occupation in daily life was perceived to create a naturalistic opportunity for movement; in a sense,

movement was a by-product of “doing”. Occupation offered challenge in ways different from exercise routines. Exercises were done at specified intervals during the day and performed with focus. Activities and occupations, on the other hand, were thought to promote a more automatic type of movement that occurred opportunistically throughout the day as tasks that needed to be done presented themselves.

So, when I go to change dishwasher, I need to do it. I don't think it will develop my hand, I just set my mind that I need to come back to my usual duties and I think it's a normal thing. I don't think that it will be bending better ... I do duties ... and hand develop. Natalya, 59, NDHI

Some participants noticed a naturally occurring rhythm of movement during activity that took their focus away from pain or discomfort.

Once you start doing what you enjoy, even if you do get little twinges here and there, you totally forget about it. You don't really pay any attention to it. If you keep doing whatever you enjoy and keep using your wrist, after a while you don't pay any attention to any little pain you get. Farida, 50, NDHI

### *A natural stepwise challenge*

Daily activities were perceived to offer challenges for movement that happened in a stepwise process. Participants started with simple tasks that involved minimal load or demand on wrist motion and progressed to greater challenge over time. Frequently people started activity performance by just using the fingers of the affected hand.

Even if I had the brace on and I wasn't confident with what was going on in my wrist, I'd still very much use my fingers. I was typing. Using the mousepad on my computer. Using my fingers to open, trying to open packets and yeah definitely using my fingers. Trent, 62, DHI

Over time the wrist would be included for more of the activity and a broader range of activities were introduced. Sometimes, this was a conscious process but often occurred with little thought, people simply noticed that they were using their wrist for increasingly challenging tasks.

I was conscious that it was changing very quickly day by day to sort of add a little bit more on each day and try something different. Maybe I couldn't do something one day, but I could do it the next day. Opening the shampoo bottle. I couldn't do it one day. Could do it the next day. Did it every day after that. Just things like that, you just kind of add what you can do to your repertoire and then just look for other things that you can do with it. Ian, 55, DHI

### *Theme three: occupation invites intentional doing*

I want to get back to automatically using my right hand without thinking. And I think that to do it consciously, first of all, is the first step in doing that. Marie, 71, DHI

In this theme, the influence of occupation on recovery is by intentional engagement. In contrast to theme two where movement occurred instinctually, it was perceived that deliberate choices were made to perform activities in order to promote movement, strength, and function. Mindful decisions were made about how to perform an activity.

### *Intentional use of affected wrist*

Participants for the most part perceived that they needed to make a conscious choice to use their affected hand in order to make progress. There was a common perception that daily activities played a significant part in restoring movement and strength.

But yeah in terms of recovery, like I'm just very blown away by how well I've come along and yeah I certainly do believe that that bit extra that I've been doing with my wrist, changing nappies and chopping

things and a little bit of gardening and that, I definitely think it's helped to get me where I'm at now with that movement. May, 32, DHI

Many people spoke about how they looked for opportunities to use their affected hand. There was a conscious seeking out of bilateral, challenging or unfamiliar tasks in order to intentionally promote use.

But I made a real effort to try and do any fine stuff with my right hand. Your hand's been sitting around not doing anything for a while, it gets lazy, your left hand takes over. So there's a lot of things that I would try and do with my right hand. Making a cup of coffee. Maybe hold jars with my left hand and do the lid with my right hand and spoon it out with my right hand. Do the dials and knobs on the coffee machine with my right hand. Ian, 55, DHI

Most people noticed an immediate improvement in wrist movement and function once regular activity performance was initiated.

You take the brace off, you do your exercises... and then put the brace back on. So... you're actually not using it a lot the rest of the time... And it's actually better to be able to use it all the time. I think, becoming easier because I'm using it all the time, rather than having it in the brace and only using it for little bits of the time. Angela, 51, DHI

### *Developing strategies to determine level of activity*

Bounded by a desire to get better but not wanting to cause harm, participants used multiple strategies throughout the day to decide whether, and how to, perform an activity. People commonly used strategies such as tentatively trying an activity to test the wrist, simplifying an activity or only using their wrist as a support. Many times, participants discovered they managed better than expected thereby gaining confidence and a willingness to repeat an activity or try something harder.

Well I thought I'd try. I thought, “Okay, I'll try and bath the dogs. If it doesn't work they can airdry.” But they're pretty good so they just stand there. I don't have to really do a lot. So that was alright and then when I went to pull the weeds out, well if it wouldn't come and it just felt it wasn't going to come, I gave that away. I tried to do things and if it worked it worked. If it didn't it didn't. Silky, 71, NDHI

If an activity caused pain, discomfort, or fatigue this was taken as a cue to perform the activity in a different way or wait for a few days before trying again.

When it felt like it was aching or tired I would just put the splint back on again. It wasn't out of it for that long, but probably, yeah definitely more than what they had suggested. May, 32, DHI

For some participants who were more fearful of movement, functional activity often resulted in pain and was taken as a cue to rest and wait.

They [hand therapist] wanted me to start using it,” but it was just too sore. Because as soon as you move it, all this starts hurting ... I had it [the splint] off for a few hours, but man it hurt. And so after that I put it straight back on and kept it on. In my particular case it wasn't ready. Trent, 62, DHI

Many people relied on advice from health professionals to guide them about daily activities. While some participants received helpful education about daily activities, many said information was confusing, conflicting, or absent, and was perceived as an inhibitor of progress.

When I came home, I kept thinking can I do this, or can I do that, like for example, can I chop the onion or can I cook or can I get a shower properly and use my hand? ... I told myself to keep doing it anyway, 'cause no one told me to do it or not. They should explain if it's good for my wrist to do it, or if it's bad, then not to do it. Layla, 34, DHI, (paraphrased for understanding)

Some participants felt that using their wrist in the early weeks was too soon, others thought that everyday doing was an

expected part of rehabilitation over and above exercises. Several participants however said that more direct advice on activity performance would have been helpful for enabling reengagement in daily life and for enhancing their recovery.

I would say so. They pretty much just give you the hand exercises and that's it. And I think if they gave us on what we can do with that hand, where it's like if you're using your wrist you can flick your hand to make your bed or something. Something like that. I reckon that would help a lot. It'll make everyone's recovery faster. Dina, 28, NDHI

#### ***Theme four: occupation habituates the wrist to movement***

The more I do, the more I can do. Alexa, 36, DHI

Theme four describes how occupation facilitated recovery of automatic, instinctual wrist movement. Initial experiences with movement were often unpleasant and provoked apprehension. Performing daily activities acted to normalise wrist movement, build confidence, and progress the wrist toward unconscious use.

##### ***Experiences of moving and using***

When participants began forays into wrist movement there were common experiences of apprehension and fear of causing harm. While some people felt confident to use the affected hand, most were cautious and took a tentative approach.

Well it was a bit scary at first. The pain and that, yeah like I said it, didn't feel quite right to do, May, 32, DHI

Participants frequently described movement as feeling awkward, robotic, unnatural, or weird. Some people described that movement lacked spontaneity and had to be relearned. Other participants described unpleasant somatic sensations in the wrist.

It just feels, instead of having elastic bands in there [the wrist], it feels as if you've got cord. Tight cord ... it feels like there's, instead of nice stretchy rubber bands, someone's replaced those rubber bands with tight cords. Zoe, 68, NDHI

Many participants said that it required focussed effort to use the affected hand. There was a sense that the hand had become lazy and the non-injured hand would simply take over. Some were worried that if they did not force themselves to use the wrist, they might never recover full use.

There was a resistance you know initially when I would do a task and sometimes you just kind of like feel lazy, want to use the other hand, which is more in motion. Santosh, 30, DHI

Alongside these negative experiences participants also liked moving the wrist again. There was a sense of relief at being able to use the wrist, often associated with a feeling of moving forward with rehabilitation.

Once the brace was off, now it's just like, yeah instantly starting to, my brain was like, "Okay that is an available limb for use again." Alexa, 36, DHI

##### ***Activity performance normalised wrist movement***

Woven through the interviews was a common noticing that the more an activity was repeated the easier and more familiar movement became.

At first, I just couldn't do it. I was like oh my god, but then I just kept doing it and now I can. Karen, 57, NDHI

Participants often spoke about how initially they had to push themselves through some discomfort. There was an expectation that some degree of pain was inevitable but that by slowly pushing through pain, progress would occur.

Initially when I'm doing a task, it's a bit painful and the resistance is there, so ... I had to push myself a bit, so my wrist gets used to the situation. Like, if I brush my teeth or take shower ... or apply the moisturiser, the resistance was there. But if I ... overcame it with tolerating a bit of pain and pushing myself a bit ... next time the wrist was used to the situation and ... it was better than before. Not so hard, I would say a bit easier. Santosh, 30, DHI

Many participants expressed the idea that repeating everyday activities had a positive effect on their confidence and self-efficacy. There was a noticing that succeeding with a simple activity was empowering and built confidence to try something more difficult.

It seems to me that by finding out that you could do that, that you were kind of surprised and that you could do it, that builds a bit of confidence in terms of trying it again another time. Or trying something a little bit harder. June, 74, NDHI

#### ***Theme five: occupational reengagement draws on psychosocial resources***

I think it's a journey two ways. I think you've got a physical one and you've got a mental one. And if the mental one's not on board then you're not going forward either. Zoe, 68, NDHI

Theme five describes the concept that recovery required mental focus and a drawing on a range of psychosocial resources. Previous experiences, personal strengths, and wellbeing practices were harnessed to enable re-engagement with life activities. The theme encompasses the notion that both body and mind strategies were needed for the rehabilitation journey.

##### ***Personal strengths and previous experiences***

Many people spoke about how they used positivity and optimism to overcome apprehension about moving and using the wrist. Other people described how determination would make them persist even when things were difficult.

In some ways I think the recovery of my wrist is a lot to do with the attitude of stubbornness and pig-headedness. Bill, 72, NDHI

Many participants expressed a strong sense of self-belief about their ability to recover from the surgery. This often came from previous life experiences that had built hardiness and resilience such as growing up on a farm or being widowed. A number of participants spoke about their pragmatic, "just get on with it" attitude or a choice to focus more on the "can do's" and less on the "can't do's".

I used to be able to do this so I can jolly well do it now. June, 74, NDHI

Recovery was not all about pushing the boundaries. Some participants said they had to adjust expectations and allow their body to do the work of recovery, that overly high expectations about recovery was not helpful.

At the beginning I thought, "Why I cannot do this? It should be that I can do it". Now I stop thinking like that. Everything changed, I needed to reset my mind. And now it's much easier to accept what I can do and what I cannot do. I don't press myself. I have no expectations. I'm happier now. Natalya, 59, NDHI, (paraphrased for understanding)

##### ***Wellbeing practices***

Participants also used wellbeing practices to cope with the injury and disruption to daily life. Some people used gratefulness to affirm their progress, some looked for the "silver lining" and others challenged negative ideas about pain.

It was a little bit hard at first. The exercises were really sore, because I have to twist my hands everywhere. But I did it anyway because I was thinking, the more sore, the more it was good for me. After that I was



able to do stuff and everyone says to me your recovery is so fast, because I kept using my wrist and was doing. Layla, 34, DHI

Other people expressed that exercise, good diet, and maintaining social interactions were beneficial for healing. Some used mindfulness practices such as meditation or listening to music. These participants spoke about how such practices helped to maintain a positive energy to the healing process.

Absolutely. It has to be, doesn't it? If we're stressing about something and negative about it, then the healing's not gonna happen. And I kind of just intuitively know that with anything that we've really got to change our mindset, like I was doing meditations on healing and having a positive, sort of imagining it healed. I thought was very helpful. Kukurei, 56, NDHI

## Discussion

Our study explored how engaging in daily activities and occupations influenced recovery in the first eight weeks after surgical treatment of distal radius fracture. Participant narratives suggested that occupation is highly influential in promoting recovery of movement and function after such surgery. Informed by the data, we outline a novel framework to elucidate how occupation acts to improve movement through acting as a driving force, offering ready-to-hand challenge, inviting intentional use, habituating the wrist to movement, and by drawing on the psychosocial resources of individuals. Our study deepens understandings of the remediating effects of activity performance in the early postoperative period. Insights that may challenge the traditional focus on exercise as the predominant therapeutic intervention are offered.

The study suggests two areas of focus for clinical practice: understanding occupation as an agent of change and viewing occupation and exercise as synergistically beneficial.

### *Occupation as an agent of change*

We found that a key action of occupation in influencing recovery was by promoting both automatic and intentional wrist movement. While the idea that activities and occupation promoted wrist movement may seem an intuitive finding, we believe it provides a key to understanding occupation-based approaches. Unlike exercise routines which required focused attention and were performed intermittently, daily activities appeared to promote movement in low doses throughout the day. Participants also performed a broader range of activities than may be traditionally expected during the early weeks of recovery. The repeated wrist motion promoted through these activities may produce greater volume of movement than recognised and help to explain the benefits of approaches that include activity performance [6].

Some participants described a considerable wariness about activity due to advice about what they should not do rather than an enabling focus on what they could do. Recent literature has suggested that therapists may be more wary about daily activities than necessary after volar plating of a distal radius fracture [1], and the avoidance of activity early after surgery has been challenged [1,6]. In our study, participants performed a wide variety of activities, modifying the manner of performance according to postoperative timeframes and perceived capability. Participants made reasoned and agile decisions throughout the day about activity engagement, self-modulating their activity performance by using pain, fatigue common sense, and a "try-it-out" approach as a guide. Even participants that were less cautious, tempered their level of activity engagement in order to avoid pain and swelling.

It is important to remember that the risk of harm from underuse is likely much greater than that of overuse [32]. Poor self-efficacy and kinesiophobia are predictors of worse outcomes after distal radius fracture [32,33]. Interventions that promote self-efficacious behaviours are advocated as a way of avoiding disuse and fear-avoidance [32, 34]. Achieving mastery of small activities early after surgery may help to mitigate guarding and kinesiophobia [35], promote early self-efficacy, and create a platform for introducing progressively more challenging activities.

In our study, splint use was highly variable between participants and over time, and this may have influenced wrist stiffness and pain. Some participants reported that splints were appreciated for support and pain relief but many disliked splints because they impeded movement. Frequently, participants removed the splint simply to enable them to carry out daily activities and allow uninhibited wrist movement. The decision as to whether to remove a splint appeared to be based on varying postoperative advice and the degree of confidence of each participant. The relationships between postoperative advice, splint wear and wrist stiffness should be investigated in future research.

We observed that activity performance appeared to positively influence wrist movement through habituation. Habituation, a form of neuroplasticity, is a decreasing response to a repeated benign stimulus, whereby people can progressively filter out attention to irrelevant stimuli [36,37]. In our study, this appeared to occur through repetition. Participants frequently experienced initial movement as unpleasant, but repetition of a task or activity resulted in a reduction of unpleasant sensations and a normalisation of wrist movement. Habituation through occupation may work similarly to graded exposure where the incremental introduction of noxious stimuli reduces hypersensitivity or pain response [35,38]. Other actions of occupation may be through diversion from pain [8,39] or the greater efficiency of functional task performance versus exercise routines in promoting motor learning [40–42]. Educating patients that repetition of activity will lead to normalised wrist movement may help patients overcome the hurdle of initially unpleasant movement.

Our study also elucidated the scope of occupation in promoting recovery beyond that of inducing movement. There were psychological and social mechanisms at work. Fisher [43] discusses how engagement in occupation can have simultaneous actions of experiencing pleasure, productivity, and restoration, a finding supported by our study. Our participants experienced the restorative effect of joint movement through doing, while also feeling productive, optimistic and a welcomed sense of normality when doing. The desire to return to valued occupations acted as a strong driver during early rehabilitation constantly propelling people forward toward greater use of the affected wrist.

### *Occupation and exercise as synergistic interventions*

Occupation as a therapy may be underutilised as a therapeutic strategy in early surgical distal radius fracture rehabilitation. Currently, the predominant approach tends to endorse exercise, but constrain activity during the first six weeks [1,6]. We propose that occupation and exercise be advocated as synergistically safe and beneficial during the early weeks of recovery. It is suggested that such an approach would be empowering for patients, fostering earlier independence and wellbeing [44], and facilitate wrist movement beyond the scope of exercise routines.

Viewing activity performance as a means rather than merely an end goal [45], is likely to represent a reversal in the way daily activities are perceived by many therapists and indeed, patients.

Rather than solely perceiving daily activities as something patients do once they have regained sufficient capacity, purposeful activities can be seen as a remediator of movement. In order to make such a shift, occupationally positive language that advocates safe and beneficial performance of daily activities would need to be adopted.

Through a practical lens, performance of daily activities could be included in home programmes, framed as a structured part of rehabilitation. Patients could be educated on intentionally performing tasks and activities that will provide a “just-right” [45,46] level of challenge. Education should highlight how daily activities also promote automatic movement through being ready-to-hand. Activity grading and self-regulation of activity performance could be taught in order to ensure that activities are commensurate with the stage of healing [47].

In addition, clinicians could promote the use of psychosocial strategies that participants used in this study such as optimism or problem-solving skills. Other strategies were focussing on the “can dos” rather than the “can’t dos”, using resilience gained from previous experiences, determination, positivity, and wellbeing practices. Engaging in activities and occupations was also reported as improving mood and wellbeing. This finding links strongly with the principles of positive psychology, where the building of capabilities rather than a direct alleviation of anxiety or negative cognitions is the focus of treatment [48,49]. Therapists could incorporate positive psychology strategies by helping patients to identify and harness psychosocial resources that enhance recovery.

### Strengths and limitations

A key strength of this study is that participants were interviewed early after surgery, while still immersed in the recovery journey. A unique perspective situated in the social and health care context of Aotearoa, New Zealand was gained. The study brings a cross-disciplinary lens, propelling occupational and physio-therapists toward a greater understanding of the complimentary role of occupation and exercise. The study analysed narratives of 21 diverse participants but may not represent experiences of people from different social, cultural, or rehabilitation settings. Participants were not offered the opportunity to check the transcripts so the interview narratives must stand in their own right. Only one author conducted coding and initial theme development which may have resulted in a narrow interpretation of the data. This was mitigated by reflexive data analysis and regular author collaboration.

### Conclusions

The study explored the ways that activities and occupations influenced recovery from surgical treatment of distal radius fractures. Participants highly valued daily activities for promoting recovery in the first eight weeks after surgery. Activities and occupations were found, subjectively, to be a strong driver of the rehabilitation process, positively influencing recovery through promoting wellbeing, wrist movement, and habituation. The study challenges therapists to use activities and occupation as a rich source of movement that can be exploited for therapeutic advantage. A postoperative approach that promotes occupation and exercise as synergistic interventions has the potential to result in improved outcomes and an holistic rehabilitation firmly centred on the individual. Future research that evaluates wrist movement during purposeful activities is planned. Data from the current and future studies can inform development of occupation-based interventions.

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