



## Research

## A progressive exercise and structured advice program does not improve activity more than structured advice alone following a distal radial fracture: a multi-centre, randomised trial

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## KEY WORDS

Distal radial fracture  
Exercise  
Advice  
Rehabilitation  
Physical therapy



## ABSTRACT

**Question:** Does a program of exercise and structured advice implemented during the rehabilitation phase following a distal radial fracture achieve better recovery of upper limb activity than structured advice alone? **Design:** A phase I/II, multi-centre, randomised, controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis. **Participants:** Thirty-three adults (25 female, mean age 54 years) following distal radial fracture managed in a cast. **Intervention:** The experimental intervention was a 6-week program of progressive exercise and structured advice implemented over three consultations by a physiotherapist. The control intervention was a program of structured advice only, delivered by a physiotherapist over three consultations. **Outcome measures:** The primary outcome was upper limb activity limitations, assessed by the Patient-Rated Wrist Evaluation and the shortened version of the Disabilities of the Arm, Shoulder and Hand outcome measure (QuickDASH). The secondary outcomes were wrist range of movement, grip strength and pain. All measures were completed at baseline (week 0), after the intervention (week 7) and at 6 months (week 24). **Results:** There were no significant between-group differences in upper limb activity as measured by the Patient-Rated Wrist Evaluation at week 7 and week 24 assessments (mean difference –4 units, 95% CI –10 to 2; mean difference 0 units, 95% CI –3 to 3, respectively), or QuickDASH at week 7 and week 24 assessments (mean difference –5 units, 95% CI –16 to 6; mean difference 0.3 units, 95% CI –6 to 7, respectively). The secondary outcomes did not demonstrate any significant between-group effects. **Conclusion:** The prescription of exercise in addition to a structured advice program over three physiotherapy consultations may convey no extra benefit following distal radial fracture managed in a cast. **Trial registration:** ACTRN12612000118808. [Bruder AM, Shields N, Dodd KJ, Hau R, Taylor NF (2016) A progressive exercise and structured advice program does not improve activity more than structured advice alone following a distal radial fracture: a multi-centre, randomised trial. *Journal of Physiotherapy* 62: 145–152]

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## Introduction

Distal radial fractures are a common upper limb fracture,<sup>1,2</sup> with a greater incidence in older women who have been diagnosed with osteoporosis and have a history of falling.<sup>1–3</sup> Ongoing problems after distal radial fracture can include pain, stiffness and weakness, which can lead to difficulty completing everyday functional tasks<sup>4,5</sup> such as preparing meals, housework and shopping.<sup>6</sup> People who have had a distal radial fracture are regularly referred to physiotherapy for rehabilitation to restore full joint range of movement and regain functional ability.<sup>7</sup> Exercise and advice are the most commonly used interventions by physiotherapists during rehabilitation after distal radial fracture.<sup>8</sup>

Prescription of exercise by a physiotherapist after distal radial fracture focuses on promoting movement, which is a key principle of fracture management.<sup>9</sup> Adherence to prescribed exercise has

been found to be moderately-to-strongly associated with short-term improvements of impairment and activity following this type of fracture.<sup>10</sup> Exercise prescription and advice to encourage movement in usual tasks of daily living are interventions that promote patient independence through the use of a self-management approach.<sup>11</sup> Self-management programs typically focus on equipping patients with chronic illnesses with the knowledge and skills needed to manage their conditions,<sup>12</sup> including decision-making, symptom management, expected trajectory of recovery, and self efficacy.<sup>13</sup> The application of these self-management principles may also be appropriate in distal radial fracture rehabilitation.

Despite their widespread use,<sup>8</sup> the interventions of exercise and advice have never been independently evaluated as programs of treatment for this patient group in a randomised, controlled trial.<sup>14</sup> A high-quality trial has compared a single session of

physiotherapist-led advice and exercise compared with no physiotherapy intervention, and identified short-term benefits in pain and activity.<sup>15</sup> That trial suggested that exercise and advice could be useful in people after distal radial fracture; however, it was unclear how much benefit was contributed by each intervention. Given this, there was a need for a randomised, controlled clinical trial to find out if a progressive exercise program prescribed by a physiotherapist could improve activity and decrease impairment after distal radial fracture. Such a trial would provide evidence for clinicians about the effectiveness of prescribing a progressive exercise program, with a possible medium-term impact on older adults following a distal radial fracture.

Therefore, the research question for this randomised trial was:

Does a program of exercise and structured advice implemented during the rehabilitation phase following a distal radial fracture achieve better recovery of upper limb activity than structured advice alone?

## Method

### Design

A multi-centre, two-group, randomised, controlled trial was conducted, incorporating concealed allocation, blinding of outcome assessors where possible, and intention-to-treat analysis of repeated measures. The trial was conducted across two hospital-based physiotherapy departments between June 2012 and July 2013. The trial is reported here according to the CONSORT guidelines.<sup>16</sup>

Participants were randomly allocated to either the experimental or control group after baseline assessment. A researcher, who was not involved in patient recruitment, assessment or treatment, used a web-based system (randomization.com) to generate the random allocation sequence in permuted blocks of six. The permuted blocks were stratified for location and hand dominance. Allocations were sealed in sequentially numbered, opaque envelopes, which were kept off site. After the assessor had completed the baseline assessment, the next envelope in the sequence that matched the participant's department location and hand dominance was selected and assigned by the treating physiotherapist.

The treating physiotherapists were provided with an information sheet for each consultation, which outlined the advice that should be given to both groups, and an information sheet with diagrams and explanations for each of the exercises that should be prescribed to the experimental group. At the end of each consultation, the treating physiotherapist recorded the following details: whether the participant attended, the duration of the session in minutes, whether the participant reported any adverse effects, any changes made to the prescribed program, and comments about the participant's adherence to the intervention.

All participants completed assessments at baseline (week 0), immediately following the intervention phase of the study (week 7) and at 6 months (week 24). These assessments were conducted by an assessor who was unaware of group allocation and was not involved in administering treatment.

### Participants, therapists and centres

Adults with a distal radial fracture and who were referred to physiotherapy for rehabilitation after removal of their cast were invited to participate if they were: aged  $\geq 21$  years; able to follow simple written and verbal instructions in English; and willing and able to provide informed consent to participate. Volunteers were excluded if they had: a history of a pre-existing inflammatory joint condition; signs and symptoms of complex regional pain syndrome; a previous wrist fracture on the affected side; or bilateral wrist fractures.

Three senior musculoskeletal physiotherapists with experience in outpatient services ranging from 5 to 17 years delivered all

interventions. These same physiotherapists were involved in the design of the program of structured advice that was administered to both groups, and assisted with the selection of exercises prescribed to the experimental group. None of the treating physiotherapists were involved in randomisation or participant assessment. Given that the treating physiotherapists were responsible for providing the intervention (advice only or advice and exercise), they could not be blinded to group allocation.

### Intervention

The experimental group received a program of exercise and structured advice over three physiotherapy consultations (approximately 20 to 30 minutes each) in weeks 1, 3 and 5 (from removal of cast) as shown in Table 1. This was in addition to their usual activities. In week 1, the patient received structured advice<sup>15</sup> and seven exercises<sup>15,17</sup> that were outlined in a home exercise diary and an exercise program instruction booklet (see appendix 1 on eAddenda). Participants were asked to record the number of sets and repetitions they completed for each exercise in their home diary. At the end of each week the participants were asked to return their exercise diary to the researchers using a reply paid envelope. In week 3, the participant received further advice on sleep, relaxation and work strategies, as necessary. The seven exercises were reviewed and progressed by the physiotherapist, by either adding an exercise with an increased challenge or increasing the resistance of an existing exercise. In week 5, the participant received advice on medium-term goal setting and discharge planning, and had their exercises progressed to heavier loads and/or increased weight-bearing.

The control group received three physiotherapy consultations of similar duration to the experimental group in weeks 1, 3 and 5, but received only the program of advice. All participants were provided with an elastic threaded compression sleeve for the wrist and forearm, and educated on its application to help control swelling.

### Outcome measures

#### Primary outcome

The primary outcome was upper limb activity, as measured by the Patient-Rated Wrist Evaluation<sup>18</sup> and the shortened version of the Disabilities of the Arm, Shoulder and Hand outcome measure (QuickDASH) questionnaires.<sup>19</sup> Participants completed the 10-item activity-specific section of the Patient-Rated Wrist Evaluation (sections 2A and 2B), in which they rated wrist-related activity limitations from 0 (no difficulty with the activity) to 10 (unable to perform the activity). An overall score was calculated out of 50 by adding the scores for the 10 items and dividing by two. This questionnaire was developed to assess people with wrist pathology and has been used in previous trials involving participants with distal radial fractures. It has been shown to be a sensitive, valid and reliable assessment tool.<sup>20</sup> The 19-item QuickDASH questionnaire<sup>19</sup> (including one compulsory 11-item disability module, and two four-item optional work and sports modules) asked participants to rate their ability to perform upper limb tasks from 1 (no difficulty) to 5 (unable to perform). The score was calculated by adding the total number of all the responses, dividing it by the number of answered responses and subtracting 1 from the result. This score was then multiplied by 25 to give a QuickDASH disability score out of 100 for the 11-item module, and for the optional work and sports modules. The QuickDASH measures disability in people with upper extremity musculoskeletal disorders and has been shown to have good psychometric properties.<sup>21</sup> The minimum clinically important difference on the Patient-Rated Wrist Evaluation and QuickDASH have been determined as 14 points out of 100<sup>22</sup> and 15 points out of 100,<sup>23</sup> respectively.

#### Secondary outcomes

The secondary outcomes measured impairments: wrist range of movement, grip strength and pain. Range of movement of wrist

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