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**Specifying the treatment targets of exercise interventions: do we?**

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**INTRODUCTION**

Persistent non-specific low back pain (NSLBP) is the leading cause of disability worldwide. (1) Although exercise is the most recommended intervention for NSLBP, (2) the effects are small to moderate. (3) Researchers who conduct and publish exercise-focused randomised controlled trials (RCTs) (clinicians/scientists) are doing a ‘poor to moderate’ job reporting. (4) Gaps in reporting limit evidence synthesis and the ability of clinicians to replicate the exercises in a clinical setting.

The CONSORT statement and the Template for Intervention Description and Replication (TIDieR) checklist aim to improve minimum reporting standards. More recently, the Consensus on Exercise Reporting Template (CERT) was developed to work alongside the existing RCT checklists. Authors and journal editors need to embrace these standards to ensure a high quality of research conduct and implementation. If you work in exercise medicine/science and do not yet know ‘CERT’, we encourage you to study it and use it.

Despite CERT adding value for our community, it fails to address the aim or target of the exercise intervention. (5) Related to the content of this discussion—low back pain—our call to action is that researchers should be clear on the purpose of exercise treatment. For example, is the purpose of exercise therapy to reduce pain, to make the patient stronger, or to improve function? Understanding the aim of the exercise therapy will impact the selection of the exercise intervention and RCT design. (5) Clearly specified target(s) of exercise are helpful—yoga, may aim to increase strength and flexibility, as well as improve mood and reduce stress. (6) Depending on the type of yoga, it may focus more on strength and flexibility, or stress reduction and mood improvement. If we, as researchers, understand the exercise targets, the appropriate comparator intervention can be selected to maximise the contrast between the ‘active’ and control group; by focusing on the target, researchers will select the most appropriate outcome measures to detect the desired change. (5)

How can we justify these bold claims—that treatment targets are poorly described in exercise intervention studies of persistent NSLBP? In this discussion, we share what proportion of NSLBP exercise RCTs adequately specify the aim(s) of their intervention(s), and describe the common types of treatment targets. In the figure below, we show how well published RCTs agree with the identified mechanisms (mechanical, neurological, cognitive, functional, pain and health-related quality of life (HRQoL) as recommended in the LBP core outcome set (7)). Details of our methods and additional results are presented in the web appendix for this discussion. The key points are that we carefully examined 403 exercise treatment arms from 265 RCTs of exercise therapy for persistent NSLBP. Over 40% of these did not specify the target of the exercise. The research community would not tolerate 40% of cancer chemotherapy trials not specifying their target. Strength, flexibility, re-establishing normal control and function were the four most frequently reported treatment targets specified in these RCTs.

**Figure 1: Specified treatment targets in 238 exercise intervention arms of trials for NSLBP (count)**

Our investigation highlights the absence of identified treatment targets in exercise RCTs for persistent NSLBP; only 36% of RCTs clearly specified a treatment target. Of those inferred or specified, most target strength or flexibility (45% of reported targets), despite strong evidence to suggest poor correlations between strength or flexibility and pain and disability outcomes. (10)

How does exercise act to change significant outcomes such as pain, disability and HRQoL in NSLBP? Existing mediation studies (studies of mechanisms of action) of exercise for pain suggest researchers and clinicians do not understand how exercise helps, but it is unlikely to be through the presumed means (such as strengthening or flexibility changes). Rainville et al., (9) hypothesised that exercise may target three distinct components of persistent NSLBP: **impairments** in back function (mechanical); reducing low back **pain;** and reducing low back pain related **disability** (function). Helmhout et al., (8) suggested three possible exercise mechanism frameworks: a mechanical, neurological or cognitive framework. There is a need to better understand how the patient-oriented and prioritised core outcomes of pain, physical function and quality of life are affected through exercise. Researchers in the field of NSLBP should consider: what do we think we are changing with exercise therapy and how; and measure patient-relevant outcomes likely to capture the desired impact.

In persistent NSLBP, there is no clear exercise type, dosage, intensity or frequency to obtain an optimal effect on core outcomes. We recommend that trial designers use conceptual frameworks to underpin the rationale behind their selected intervention(s). Intervention mapping (such as logic models) (11) and the behaviour change wheel, (12) are two leading frameworks to consider today. Identifying the ‘active ingredients’ and the intended treatment targets in conceptual models, will help us understand the mechanisms of action of exercise. This may inform future RCTs, such that planned mediation analyses may be possible with a greater proportion of RCTs.

Researchers, clinicians and people using exercise need to be involved in the identification of treatment targets of exercise for NSLBP. It is unlikely exercise interventions will be as effective if we do not tailor our interventions to target these goals. Researchers need to specify treatment targets of exercise in both the delivery and design of exercise interventions in trials for persistent NSLBP. We recommend that the next version of the CERT includes a description of the exercise treatment targets.

**Take Home Bullet Points:**

* Most exercise trials for non-specific low back pain do not identify the aims of their exercise treatment.
* There is a gap between the mechanisms of action of exercise for non-specific low back pain and the treatment targets used by authors of exercise trials for non-specific low back pain.
* We encourage researchers and clinicians to consider mechanisms and targets in planning exercise interventions, and to measure the outcomes likely to be impacted by the intervention.
* Researchers in the field should consider: what matters to patients; what do we think we are changing with exercise therapy and how; measure patient-relevant outcomes likely to capture the desired impact.

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**Competing Interests:**

There are no competing interests.

**Web Appendix:**

**The below appendix describes the full methods and results for the data supporting the discussion article: Specifying the treatment targets of exercise interventions: do we?** Wood, Lianne; Ogilvie, Rachel, Hayden, Jill A.

**METHODS**

We reviewed trials included in an ongoing update of the Cochrane review of exercise for chronic NSLBP (electronic search updated on August 1, 2019)*.* Data extraction was performed by two independent reviewers. Treatment targets were defined as the aim of the intervention and were restricted to exercise interventions only or interventions that combined exercise with other conservative care. We assessed descriptions of the exercise targets provided in the trial reports as ‘specified’, ‘inferred’, or ‘none’. Treatment targets were classified as clearly specified when the authors stipulated, for example, “The intervention aimed to…”. Targets were categorised as “inferred” when the hypothesis of the trial implied the treatment targets of the intervention (“inferred hypothesis”) or when the study introduction implied mechanisms by which the intervention may work, without direct reference to the link between the intervention and treatment target (“inferred background”). Studies where no treatment target was described or implied were classified as “none”. We extracted detailed information about the specific treatment targets when they were specified or inferred.

**RESULTS**

A total of 265 trials were available for inclusion, of which data were extracted from 403 exercise arms. The majority of treatment arms in trials, 165 (41%) did not state a treatment targets, 145 (36%) clearly specified their target, while 93 included inferred targets (16% general, 7% hypothesis). The most frequently reported treatment targets [specified or inferred (n=238)] were: improving strength (n=83; 35%), improving flexibility (n=58; 24%), re-establishing normal control (n=48; 20%) and improving function (n=47; 20%). Thirty-five different treatment targets were identified and were predominantly classified as mechanical (31%), neurological (23%) and cognitive (26%) mechanisms, as seen in Figure 1. Nine targets (26%) were reported by only one or two trials.

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