Author's response to reviews

Title: Does Physical Activity Change Predict Functional Recovery in Low Back Pain? Protocol for a Prospective Cohort Study

Authors:

Paul A Hendrick (paul.hendrick@otago.ac.nz)
Stephan Milosavljevic (stephan.milosavljevic@otago.ac.nz)
Melanie L Bell (melanie.bell@otago.ac.nz)
Leigh Hale (leigh.hale@otago.ac.nz)
Deirdre A Hurley (deirdre.hurleyosing@ucd.ie)
Suzanne M McDonough (S.McDonough@ulster.ac.uk)
Markus Melloh (markus.melloh@otago.ac.nz)
G. David Baxter (david.baxter@otago.ac.nz)

Version: 2 Date: 13 August 2009

Author's response to reviews: see over
August 13th, 2009

Coordinating Editor

BMC Musculoskeletal Disorders

Dear Editor

**Re: Does Physical Activity Change Predict Functional Recovery in Low Back Pain? Protocol for a Prospective Cohort Study**

We are pleased to re-submit this manuscript to the *BMC Musculoskeletal Disorders* for consideration and review as a research publication. Thank you for your original review and comments regarding our manuscript and its potential for publication in your journal. We have now addressed each of the reviewers’ points and in so doing considerably improved the strength of the paper.

The response to each of the reviewers’ comments are outlined below

**Reviewer:** Kate Dunn  
**Reviewer's report:**  
Major Compulsory Revision

Your sample size may be big enough for the main outcome - to detect a clinically meaningful change in RMDQ - but it is probably not big enough to support your planned adjusted analyses, (nor your planned subgroup analysis of occupational type). –

**Response:** Many thanks for these comments: – the primary analyses will investigate the potential confounding effects of 7-8 explanatory variables on the relationship between activity change and change in disability within a cohort of patients with ALBP. Therefore the study was powered based upon both the detection of a MCID of 4 in the RMDQ and the inclusion of these potential confounders. It is therefore anticipated that the sample size of 65 will be sufficient for the adjusted analyses.
The following details have been added to the Analyses to clarify the statistical approach (page 15)

We plan to analyze each of the explanatory variables univariately initially to assess the relationship with the dependant variable (RMDQ change). We will include factors in the model which in univariate analyses have a $P$-value <0.10. The significant explanatory variables contained in the separate models will then be combined and re-examined using further modeling. We plan to use multiple linear regression to assess which of the included explanatory variables and/or their interactions with PA change predict change in RMDQ. For those variables which remain in the final model, an examination of their significance ($p< 0.05$) will be undertaken to evaluate their contribution to the final model.

Many thanks for the comments on the sub-group analyses: we agree that these analyses would require a higher sample size than the ones for main effects, and our inclusion of all the confounders probably means we are asking too much from the data for the proposed sub-group analyses for the adjusted case and therefore this section has now been removed.

Minor Essential Revisions

1. Why did you choose change in physical activity as your primary predictor? Surely absolute physical activity levels are important too? Concurrent change in physical activity and back pain disability may just be a pattern of recovery, rather than physical activity predicting recovery.

Response: We chose change in physical activity (PA) as our primary dependant variable to assess whether a relative increase or decrease in the various dimensions of PA predict recovery; as this reflects the primary aim in rehabilitation and in international guidelines for the management of acute LBP to encourage an increase and/or a normalization of a patient’s activity levels. Thus the aim was to assess whether patient’s activity levels do change over time during the rehabilitation process and whether such changes predict functional recovery. However, we recognize that absolute activity levels may be an important factor and plan to include activity levels at 3 months in the adjusted analyses selection procedure with a cutoff of $p = 0.1$.

2. There is some confusion in your use of language around confounders, effect modifiers and moderators. These are not the same thing. It appears that you are
planning to adjust for a number of confounders, but also investigate potential
effect modification of occupational type. The whole manuscript should reflect this
clearly.

**Response:** We have changed the hypotheses (Methods, number 2, Page 7) to correctly
reflect that we are investigating the potential confounding effects of the included
variables on the relationship between PA change and disability. The section on
secondary analyses which referred to the investigation of the potential effect
modification of occupation on the relationship between activity and functional
recovery (∆RMDQ) has been removed.

**Hypotheses**

Three specific hypotheses will be tested:

1. Positive changes in PA levels of participants with acute LBP (from baseline to 3
months) are a positive predictor of recovery (defined from change score in *Roland
Morris Disability Questionnaire*) [54] at 3 months and at 1 year;

2. Psychosocial factors including levels of fear avoidance beliefs, depression and
anxiety and occupational factors including types of occupation and levels of
manual or sedentary work **act as confounders in the relationship** between
activity change and the course of LBP over a 1 year period;

3. Restoration of “normal” levels of PA at baseline and at 3 months is a positive
predictor of functional recovery over a 1 year period.

Response: The response for the VAS is within the last 7 days

The following amendment to the text has now been added to Research protocol and timetable (Page 10, paragraph 2)

Secondary outcomes will be the Visual Analogue Scale (VAS) measure of pain over the past 7 days which has been shown to be a valid and reliable clinical measure of pain in LBP populations [60]

4. In your analysis section the Nordic Questionnaire is suddenly introduced. This is not included in the methods. Please clarify.

Response: Many thanks for this: The Nordic Questionnaire was introduced in the Method section (please see Physical Activity Measurement Page 13, paragraph 2)

“At 1 year each participant will be sent the following questionnaires: VAS, FABQ, RMDQ, the BPAQ, GHQ12 and a modified Nordic LBP Questionnaire [73] with a self return envelope. The Nordic LBP Questionnaire has been previously employed as a measure of LBP recovery in an occupational setting [74] and as a measure of incident LBP, for assessing the associations between physical activity and incidence of LBP [75]. The BPAQ will be used to record current levels of PA at the 1 year point. The estimated duration of the study will be approximately two years to complete recruitment and 1 year follow-up (Figure 1).”
**Reviewer's report**

**Reviewer:** Nadine Foster

**Reviewer's report:**

This protocol summarises the plans for a new cohort study of people with acute low back pain, in which the role of physical activity is to be specifically studied. This is an important area of research as previous studies have not included robust measurement of actual physical activity.

**Minor Essential Revisions**

1. In the methods section, given that the plan is to advertise for volunteers for the cohort, from the general public and the staff and student population of a University, it will be important to compare the sample with other cohort study samples from more clinically orientated settings (eg. consultation cohorts). It is possible that the sample for this cohort will be more motivated to improve, and/or perhaps more educated about the importance of physical activity for health benefits. In order to address concerns about generalisability of the results of this cohort, a planned comparison of the sample with other large scale consultation cohorts (perhaps those from primary care studies in Australia for example?) would be a useful addition to the plan.

**Response:** Many thanks for this suggestion: we think that this would be a valuable exercise to do and plan to do so and as such the following paragraph has been added to the Discussion (page 16)

It must also be acknowledged that this specific cohort, collected from physiotherapy practices, may differ in its activity levels; its view of activity and the advice it is given regarding activity when compared to all other community dwelling populations with acute LBP. It is therefore planned to assess the generalisability of the results from this study by comparing this cohort to other primary care cohorts investigating ALBP within Australasia.
Major Compulsory Revisions

2. In the methods section, it seems to suggest that everyone will see a physiotherapist but it is not clear why. This might also influence the physical activity levels of participants, given that most physiotherapists will recommend physical activity as part of the patient’s management plan. The authors need to justify why these participants need to see physiotherapists, given the need for an observational study to assess the predictive role of physical activity on outcome.

Response:

Many thanks for this: The requirement that all patients be seeing a physiotherapist to be included in the study was to specifically study the population that attends for physiotherapy i.e. has reached a threshold where they seek clinical intervention. Physiotherapy is a main provider of primary health care within New Zealand and such represents the first point of contact for people with ALBP. We decided that the threshold be set at physiotherapy intervention to focus the research and generalizability of our research findings to this specific population.

We recognize the potential that this cohort may differ from other ALBP cohorts within primary care research and have therefore added the following paragraph to the Discussion (page 16)

It must also be acknowledged that this specific cohort, collected from physiotherapy practices, may differ in its activity levels; its view of activity and the advice it is given regarding activity when compared to all other community dwelling populations with acute LBP. It is therefore planned to assess the generalisability of the results from this study by comparing this cohort to other primary care cohorts investigating ALBP within Australasia

3. The team need to consider adopting international recommendations about a core set of variables to include in prognostic cohort studies – see the work of Pincus T (the MIMICS study) and consider whether all of the key domains and measures have been included in the plan for this new cohort. Ref: Pincus T, Santos R, Breen A, Burton AK, Underwood M. A review and proposal for a core set of factors for prospective cohorts in low back pain: a consensus statement. Multinational Musculoskeletal Inception Cohort Study Collaboration. Arthritis Rheum. 2008 Jan 15;59(1):14-24.

Response:

Many thanks for this: while the manuscript of Pincus et al (2008) is of considerable help for understanding prognostic studies – it is essentially a consensus statement for proposals. The recommended protocols have yet to be validated. The purpose of the study was not to assess for all the prognostic factors that have been putatively associated with LBP chronicity and recovery by Pincus et al (2008) but to assess whether activity level change predicts recovery from LBP. As such, we endeavored to
include sufficient variables in the model which have been shown by previous research, to have the strongest levels of evidence to be potential confounders to this relationship. Our adjusted analyses will thus include the following variables, shown to be putatively associated with both PA and functional recovery in LBP: age, gender, occupation, baseline pain level (pain questionnaire), functional status and baseline measurements of depression, anxiety, emotional distress and fear avoidance (GHQ12 and FABQ).

4. The RMDQ change of 4 points as the smallest clinically important improvement is a topic of debate. Some authors suggest reduction of 30% of more (Jordan, Dunn), whilst others suggest 2.5 points. The team need to justify their selection of 4 points more carefully and the approach to their sample size calculation overall, given this is a cohort study testing the predictive ability of physical activity on back related disability at 12 months. The sample size suggested of 120 at baseline seems low, as many may be lost at follow-up and the planned multivariate regression analysis needs to meet the usual ‘rules of thumb’ eg. 10 or more participants per variable in the model (Tabachnick B:Using Multivariate Statistics 2007).

Response: It is acknowledged that the MCID of the RMDQ is a subject for debate. Various change scores have been found to be the MCID ranging from 38% (Lauridsen, Hartvigsen, Manniche, Korsholm, & Grunnet-Nilsson, 2006) to 10-15% (Grotle, Brox, & Vollestad, 2004) and a proposed change score of 5 points (Stratford, Binkley, Riddle, & Guyatt, 1998). It is also recognised that the change score is dependant upon the population under study, whereby acute populations have been shown to require a larger MCID value than chronic patients (Van Der Roer, Ostelo, Bekkering, Van Tulder, & De Vet, 2006). A recent study investigated the MCID for pain and disability in 1349 patients with subacute and chronic LBP patients and reported that the MCID for the RMDQ ranged from 2.5 to 6.8 RMQ points in those with baseline scores below 10 points, and from 5.5 to 13.8 in those baseline scores >=15 points (Kovacs et al., 2007).

Since we were investigating an acute LBP population we estimate that the mean baseline RMDQ score will be relatively high (10 – 14) (Kovacs et al., 2007; Stratford et al., 1998) and taking into account that a 30% change threshold score has recently been proposed as a meaningful change score for the RMDQ (Ostelo et al., 2008) we therefore set the MCID as a score of 4.
With regards to the sample size: – the primary analyses will investigate the potential confounding effects of 7-8 explanatory variables on the relationship between activity change and change in disability within a cohort of patients with ALBP. Therefore the study was powered based upon both the detection of a MCID of 4 in the RMDQ and the inclusion of these potential confounders.

The following details have been added to the Analyses to clarify the statistical approach (page 15)

We plan to analyze each of the explanatory variables univariately initially to assess the relationship with the dependant variable (RMDQ change). We will include factors in the model which in univariate analyses have a \( P \)-value <0.10. The significant explanatory variables contained in the separate models will then be combined and re-examined using further modeling. We plan to use multiple linear regression to assess which of the included explanatory variables and/or their interactions with PA change predict change in RMDQ. For those variables which remain in the final model, an examination of their significance (\( p < 0.05 \)) will be undertaken to evaluate their contribution to the final model.

5. Ultimately, although physical activity may predict outcome, the more important question which the team will be able to answer if they include the other key predictors of outcome, is ‘What further explanation of outcome (in terms of the extra percentage of the variance explained), over and above the already known predictors, does physical activity provide?’ This analysis would require several key predictors to be included in the model as well as physical activity, and thus the sample size would need to be sufficient for this.

Response: It is hoped that the results from this study will confirm or refute the “already well known predictors” firstly in a univariate format which will then allow us to build multivariate models dependent on the analysis of this. The purpose of the study is to assess whether activity level change predicts change in disability in a cohort of patients with ALBP. As such, we endeavored to include sufficient variables in the model which have been shown by previous research, to have the strongest levels of evidence to be potential confounders to this relationship. Our analyses will thus hopefully demonstrate whether PA change does predict outcome and recovery and or whether the other included explanatory variables alter or change this relationship.
Refs


This manuscript represents results of original work that have not been published elsewhere. This manuscript has not and will not be submitted for publication elsewhere until a decision is made regarding its acceptability for publication in BMC Musculoskeletal Disorders. If accepted for publication, it will not be published elsewhere. Furthermore, if there are any perceived financial conflicts of interest related to the research reported in the manuscript, we the authors have disclosed it in the Author’s notes.

My co-authors and I do not have any interests that might be interpreted as influencing this research, and APA ethical standards were followed in the conduct of the study.

I will be serving as the corresponding author for this manuscript. All of the authors listed in the byline have agreed to the byline order and to submission of the manuscript in this form. I have assumed responsibility for keeping my co-authors informed of our progress through the editorial process, the content of the reviews, and any revisions made. I understand that, if accepted for publication, a certification of authorship form will be required that all co-authors will sign.

Yours sincerely,

Paul Hendrick
MPhty (Otago), Dip Phty (London),
Centre for Physiotherapy Research
School of Physiotherapy
PO Box 56
Dunedin
New Zealand

+64 (0)3 4795428
paul.hendrick@otago.ac.nz