**Author’s response to reviews**

**Title:** Positive recovery for low-risk injuries screened by the Short form - Örebro Musculoskeletal Pain Screening Questionnaire following road traffic injury: evidence from an inception cohort study in New South Wales, Australia

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**Author’s response to reviews:**

We would like to thank the Editorial office for their arrangement of reviewers for our manuscript and reviewers for their valuable time and efforts to review and provide feedbacks for our paper. Our responses to reviewers’ comments are presented below.

Reviewer reports:

Jessica J. Wong (Reviewer 1): Thank you for the opportunity to review this interesting manuscript. I have followed the STROBE Statement to help assess the reporting for this cohort study.
The authors aimed to assess whether high risk for non-recovery (compared to low risk) as measured on the OMSPQ was associated with recovery, return to work, and health-related quality of life among those with common MSK injuries (neck, low back, lower limb) at 6 months after a road traffic injury.

COMMENTS

Research objective:
- The research objective is not consistently reported throughout the manuscript (i.e., abstract, introduction, and first paragraph of discussion). For example, at times health-related quality of life is included; also exposure and comparator not clearly specified in the objective in the introduction). Please revise and ensure PICOT format is followed.

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Response:

We revised the study aim following the PICOT format and update the text in the Abstract (page 2, the first paragraph), the Introduction (page 5, the first paragraph) and the Discussion (page 12, the first paragraph).

Methods section:
The exposure was assessed using an adapted version of the OMSPQ. Has this adapted version been validated? Were the thresholds used to define low versus high risk established in the literature?

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Response:

The adapted version of the SF-OMSPQ in the current study was also used in earlier published studies conducted by our Research centre:


We revised the text in the “Method/ Risk stratification at baseline” section (page 6, the last paragraph and page 7, the first paragraph) to clarify that this adapted version of the SF-OMSPQ was used in previously published studies. While these studies were not validation studies of the adapted version of the SF-OMSPQ, the cut off score at 50 (low risk of poor recovery = score ≤50; and high risk = score >50) had shown its ability to discriminate low risk people, who would be more likely to return to work or have higher quality of life score after injury, from those of high risk of poor recovery.
In addition, are the thresholds for recovery (using the GPE) previously validated/established in the literature? If not, consider discussing this as a limitation (potential source of bias, discussing direction and magnitude of any potential bias if possible) or any sensitivity analyses to explore the impact on results.

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Response:

The threshold for recovery (using the GPE $\geq 4 = \text{Recovered}$) was previously established in the literature:


We added these references into the “Method/Measurements of outcome” section (page 7, the second paragraph).

- The outcome of return to work was defined as paid-work at the same level prior to the injury. Please define the method of assessment/measurement for this outcome (e.g., was it self-reported? If yes, what question was asked?)
Participants’ return to work was defined by asking participants “Whether they had returned to work since the accident?”. If they were working, “what was their employment status?” with response options being, for example, paid work, self-employed or non-paid work; and whether it was “full duties” or “modified duties, e.g. lifting restrictions, reduced hours”.

We added the above description in the “Method/ Measurements of outcome” section in the Method (page 7, the third paragraph).

- Clearly define all covariates/potential confounders, including methods of assessment/measurement. Describe which groupings were chosen (e.g., category boundaries for continuous variables, if applicable) for the analyses.

Response:

We added into the “Method/ Statistical analyses” section (page 7 and 8) the list of variables being assessed as covariates/potential confounders to be included in the multi-variable analyses of the association between risk of poor recovery and outcomes of interests. They were essentially participants’ characteristics presented in Table 1 and Table 2:
The following text was added: “Participants’ characteristics to be adjusted were those found to be statistically significantly associated with the outcomes of interest (i.e. being recovered or returning to work at 6-month after the injury) in univariable analyses. Characteristics that were assessed for association with outcomes sex, categories of education level (secondary and post-secondary), occupation (white and blue collar), paid work status (yes and no), annual income (loss or more than AU$ 65,000 per annum), smoking status (yes and no), alcohol use (weekly or more and monthly/never), BMI (obese/overweight and normal), pre-injury chronic illness (yes and no), road user group at the time of accident. We also included characteristics which were statistically significantly associated with recovery in prior studies [14, 26, 27, 34], such as age (in year), self-rated general health and hospital admission status following injury.”

Were there any missing data; if yes, how were they addressed? In the results, indicate the number of participants with missing data for each variable if interest, if applicable.

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Response:

There were missing data in our study. The level of missingness varied by variables. In Table 1 and 2, the “Not known” category that we listed under specific participants’ characteristics was actually the missing. The “not known” was replaced by “missing” for clarity.

We conducted complete case analyses. In other words, participants whose characteristics were missing were not included in the analyses.
For the analysis, paired t-tests were used to examine changes in health-related quality of life. However, these do not account for covariates/potential confounders. Consider conducting multivariable regression models to account for important covariates, or discuss these results as exploratory and acknowledge these limitations. This would involve revisions to the discussion section and potentially some tables and figures.

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Response:

It is true that we did not adjust for potential confounders in the paired t-tests to examine changes in health-related quality of life. This was added as one of the limitations acknowledged in the Discussion.

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Response:

For the analysis, it is unclear which covariates were considered to be included in the models, and eventually included if found to be significantly associated with the outcome. There are limitations to using statistical associations to identify confounders, which should be acknowledged.

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Response:
As responded to your comment above on “defining covariates/potential confounders”, those being assessed to be included in the models were added to the text in the “Method/Statistical analyses” section (page 7 and 8). Those eventually included in the multi-variable models were listed as notes under Table 3 and Table 4. They were participants’ age, self-rated general health prior to the injury, history of chronic illness prior to the injury and hospital admission status following the injury.

Results section:
- Consider using a flow diagram and report numbers of individuals at each stage of study (e.g. potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed), with reasons for non-participation at each stage.

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Response:
We added a flowchart of study participants at baseline (those with a non-fracture neck, lower back and lower limb injury from the FISH study), participants at 6 month follow-up and participants included in outcome analyses.

- Provide unadjusted estimates and 95% CI (results from unadjusted Modified Poisson regression models)
Response:

Results from unadjusted Modified Poisson regression model were added to Table 3 and 4.

Discussion:
- Consider a more cautious interpretation of results for health-related quality of life, given limitations discussed above. In addition, are some questions between OMSPQ and SF-12 targeting similar constructs?

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Response:

We added to the Discussion section acknowledging the limitations in the health related quality of life (page 13, the first paragraph). Of 12 items in the SF-12, there are two targeting similar concept areas in the SF-OMSPQ, including:

- **Pain**
  - **SF-12:** During the PAST 4 WEEKS, how much did PAIN interfere with your normal work? (Response options: Not at all – 1 to Extremely – 5)
  - **SF-OMPSQ:** How would you rate the pain that you have had during the past week? (Response: score from 0 to 10)
- **Distress**
SF-12: During the PAST 4 WEEKS, Have you felt calm and peaceful?? (Response options: All the time – 1 to None of the time – 5)

SF-OMPSQ: How tense or anxious have you felt in the past week (Response: score from 0 to 10)

- For limitations, potential for residual confounding was acknowledged. Consider discussing potential selection bias (given some differences in those who were lost to follow-up) and measurement error/bias, and how this might affect the results.

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Response:

Residual confounding was truly one of limitations in our study and this has been acknowledged in the Discussion section. We were unable to adjust for potential confounding variables what we did not collect. In addition, we also had limitations because of the lost to follow-up and missing data.

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Minor comments:

- Define acronyms in footnote of tables

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Response:
All acronyms were added to the footnote of all tables.

Venerina Johnston (Reviewer 2): Thank you for the invitation to review this paper. On the whole it is well written and described in sufficient detail to enable replication. With all the measures collected, I am curious as to why the authors chose to use the Orebro rather than use a data driven approach. A comparison of the predictors using a data driven approach with the Orebro would be interesting.

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Response:

Studies taken data driven approach to identify predictors of health and social outcome are well established in the literature, such as:


Given the increasing interest in prognostic screening tools to stratify patients into risk levels of recovery to direct care, the positive application of the SF-OMPSQ to direct care for workers with soft tissue injury which demonstrated clinically significant improvements in outcomes in The
Work Injury Screening and Early intervention (WISE) study, we specifically aimed to examine whether the SF-OMPSQ could be applied for soft tissue injuries following road traffic crash. We also described these in the Introduction section (page 4, the second paragraph).

This leads to the second query. In my opinion, a stronger rationale is needed for selecting the Orebro as a prognostic tool. Is there evidence to indicate that some of the domains included in the Orebro have previously been identified as prognostic of outcome?

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Response:

Yes, the SF-OMPSQ covers concept areas found to be associated with recovery, including self-reported level of pain, self-perceived function/disability, distress, fear avoidance and recovery expectation. These are also concept areas prioritised to be included in prognostic studies as discussed in Sterling and colleagues’ Discussion paper (Sterling M, Carroll LJ, Kasch H, Kamper SJ, Stemper B: Prognosis after whiplash injury: where to from here? Discussion paper 4. Spine (Phila Pa 1976) 2011, 36(25 Suppl):S330-334.)

We also added this into the Introduction section (page 4, the second paragraph).

The title of the manuscript suggests that the short form Orebro was used. However, on reading, it appears that 2 questions were replaced with questions from other scales albeit measuring
potentially the same construct. An explanation for replacing these 2 items should be provided with some indication of the internal reliability of the 'adapted' version. Were each of the additional items scored the same way as their comparator in the Orebro or as per the parent scale?

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Response:

As responded to Reviewer 1’s comment above, this adapted version of the SF-OMSPQ was also used in earlier published studies conducted by our Research centre. The two replaced items (the sleep and tension/anxiety questions) were rescaled so that they ranged from 0 to 10, being the same as the equivalent items in the SF-OMPSQ. This were also added into the “Method/ Risk stratification at baseline” section (page 6, the last paragraph).

Discussion: A section on implications for end-users would be beneficial. What recommendations would the authors make for the way the tools should be used? When should it be administered (the Conclusion states 'early' but this is not defined in the manuscript) and by whom? Should the clinician use the original Orebro or the modified version? What should the clinician do with this information once low risk for recovery is identified? Or perhaps, the insurer case manager should administer this scale as they are responsible for approving additional services as required.

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Response:
A paragraph on implications was added to the Discussion section (page 13, the second paragraph) providing suggestions regarding the users of the tool, timeframe that the tool should be administered and referral for those identified as high risk of poor-recovery.

Limitations: one limitation not mentioned is the 30% loss to follow up.

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Response:

A limitation relating to loss to follow-up was added to the Discussion section (page 13, the first paragraph).

All tables and figures are interesting and useful to support the results.

A few grammatical errors that need correcting:

Page 4, line 17-18
Page 4, line 25
Page 5, line 5
Page 5, line 18
Page 7, line 8
Page 8, line 23
Page 11, line 27,
Page 11, line 58
Grammatical errors were checked and corrected.