Reviewer's report

Title: Cumulative occupational lumbar load and lumbar disc disease - results of a German multi-center case-control study (EPILIFT)

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Reviewer: Michele Battié

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The authors have attempted to determine whether a dose-response relationship exists between occupational loading history and health care seeking for painful back conditions with a diagnosis of herniated disc or severe disc narrowing. This is an important issue on the controversial subject of effects of physical loading, specifically repeated or cumulative loads, on disc pathology. To date, there have been mixed findings and the presence of a dose-response relationship of cumulative physical loading and disc pathology remains unclear. The authors have conducted an ambitious project and have done a formidable amount of work aiming to quantify lifetime occupational loading to examine this issue for the group of care seekers mentioned above, as compared to the general population. They were also interested in determining whether “physical work plays an etiological role in the development of lumbar disc disease”. The questions posed are well defined and the paper adds to the limited body of knowledge in this area.

The paper is clearly written. The title and abstract convey the core of the study, although I am less convinced of a dose-response relation in the results for women than for men. Also, the term degenerative disc disease is ambiguous, without a uniform definition, but I can appreciate that it might have been selected for the title for brevity. The authors do explain what is meant by the term in this study when they define more precisely their case definitions.

The study findings suggest a dose-response relationship between occupational loading history and care seeking with the diagnosis of disc-related pathology in men. The findings are less persuasive in women, particularly related to severe disc narrowing.

Minor Essential Revisions

A few issues that I would like the authors to briefly address or clarify in the methods or discussion sections:

1. A primary concern relates to the interpretation of the results relative to “degenerative disc disease”. As the cases all sought health care due to a painful condition, pain and care seeking are key elements of case definition. If painful back conditions are exacerbated or symptoms prolonged by greater occupational physical loads or if those affected are less able to tolerate heavy loading, affected individuals with heavy occupational physical requirements may be more likely to seek medical care (becoming cases). Thus, cases may be
over-represented in higher occupational loading categories. This could have implications to the interpretation of study findings related to etiology of “lumbar disc disease” (effect size and dose-response relation). In other words, is the occupational physical loading history related to causation of disc pathology or the exacerbation of symptoms in the presence of such pathology or a combination of both?

2. Study issues that collectively may have biased study results to inflate an effect of occupational loading on cases include:

- Non-respondents were more likely to be blue-collar workers (heavier occupational loading) in both case and control groups, and a greater portion of the controls did not respond (46.6%) as compared to cases (33.6%).

- Neither the interviewers or ergonomic experts who collected and analyzed data for the biomechanical analysis were noted as being blinded to subject case or control status.

- Also, subjects with a history of substantial painful back problems, particularly associated with diagnosed “disc disease”, may be more likely to recall or overestimate occupational loading activities (lifting and bending), as these are accepted as being causal of such conditions in Germany. The effect of this could be to inflate an association between more occupational loading in cases as compared to controls.

- It was good that subjects were not told the purpose of the study, however, if they were told that the study was about “occupation and health” and they were asked specifically about musculoskeletal and back symptoms, the link between occupational loading and back and other musculoskeletal problems may have been apparent.

On the other hand, random error in measurement of occupational loading, which surely occurred to some degree in the lifetime lumbar loading estimates, would tend to dilute group differences.

A few queries/clarifications:

3. Summarizing a lifetime of recalled occupational loading activities and associated lumbar loads is a daunting task. Although it might not be possible to determine validity of such lifetime history-based lumbar loading calculations, can the authors comment on the method’s reliability when based on such histories when repeated by different interviewers?

4. Also, a very brief summary of the dose models considered and selected may be useful, as the references cited are in German and inaccessible to many readers.

5. I was unclear why “region was considered a possible confounder because occupational exposures were suspected to differ between regions”, since detailed data of occupational exposures of interest were gathered for each subject. Can the authors clarify this?
6. The authors state that “As past physical workload and actual physical workload are highly correlated…” By “actual” do you mean current? Please clarify.

7. The authors state that a similar dose-response relation between physical workload and osteochondrosis and herniations were found by Seidler et al. [15 & 16]. Is this the same study sample? If so, this should be made clear in the text.

8. As the body does not differentiate lumbar loads at work and leisure, did the authors consider collecting data on loading outside the workplace? If there is any relation between occupational physically demanding jobs and level of physical activity outside of work, might physical loading activities outside of work be a potentially confounding factor, either diluting or exaggerating the apparent effects of occupational loading?

9. The authors seem to use the term lumbar chondrosis, such as in the tables, interchangeably with symptoms with severe disc narrowing. The latter term is clearer from the case selection description given in the methods and it may improve clarity to use it consistently throughout the manuscript.

Discretionary

I can appreciate that “degenerative disc disease” may have been used in the title for brevity, but it is a controversial term without a uniform definition that is used inconsistently in the scientific literature. It might be clearer to state that cases sought care and received disc-related diagnoses (the diagnosis of herniated disc or severe disc narrowing associated with back-related symptoms).

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.