Reviewer’s report

Title: Examining the influence of gender, education, social class and birth cohort on cognitive tracking over time: a population-based prospective cohort study

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Reviewer: Kaarin Anstey

Reviewer’s report:

The statistical analyses are thorough and sophisticated, and the major strength of the manuscript. The figures are excellent. The evaluation of cohort effects is extremely important and the authors raise methodological issues relating to this topic. The authors have also considered causes of dropout and included these in the statistical models. The paper makes a important contribution by demonstrating more broadly to the other groups how to approach these types of analyses which will become increasingly important in the future. The limitations all relate to substantive rather than methodological or statistical issues.

Major Compulsory revisions

1. The authors have only one measure of cognition and this is a dementia screening instrument that was not designed to measure cognition in the normal population. As the MMSE has ceiling effects in healthy older adults, it is particularly limited as a measure of cognitive change because it is unable to detect reliable change in those who are high functioning. This is the major limitation of the paper. Hence I think the title should be changed to refer to the MMSE rather than cognition, and likewise the abstract and results etc need to refer to change in the MMSE rather than cognition. The overall findings of the study need to be tempered due to this consideration.

2. The introduction is relatively brief and makes strong generalizations about the findings on education and cognitive decline without surveying the literature in any depth or demonstrating knowledge of some of the key contextual factors that influence this relationship. The discussion is also very brief and does not raise many of the issues important for drawing conclusions in this field. The authors only cite one paper on education and cognitive decline in late life in the introduction, whilst there have been many papers published on this topic, (or that report the relationship of education to cognitive decline whilst focussing on other covariates). An evaluation of the literature on the association between education and cognitive decline must consider the measures of cognitive function that have been examined longitudinally, and the measure of education. Measures of verbal ability are strongly associated with educational level, whereas measures of processing speed are less strongly associated with education. Hence education may influence cognitive change in these measures differently. It is well established that adults with higher levels of education perform better on the MMSE. These issues need to be elucidated to enable a balanced and informed
interpretation of results.

3. In the introduction the authors state that variation in study design may explain different findings for educational effects on cognitive decline. Another issue not mentioned by the authors is the measure of education used in these studies which may not be comparable between studies within and between countries. Most measures of education are quantitative and few rate the quality of education received. This may be as important or more important than study design.

4. The use of a binary measure of education limits the sensitivity of the analyses of the effects of education. Given this is a focus of the current paper, this needs to be acknowledged as a major limitation in the discussion, or preferably, replaced with a continuous ordinal measure in the analyses.

5. I do not think that many would agree that ‘cognitive norms’ (page 4) can be derived from this instrument. I suggest that “MMSE Norms” would be more appropriate and less open to criticism.

6. A limitations section needs to be added to the discussion. This needs to include discussion of the limitations of the MMSE for measuring cognitive change in healthy adults, the lack of measures of the major cognitive abilities, the known association of demographic factors with MMSE performance and the limitations of the education measure.

Minor essential revisions

Discretionary revisions

**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 have no competing interests