Reviewer’s report

Title: The impact of attack frequency and duration on neurocognitive processing in migraine sufferers: evidence from event-related potentials using a modified oddball paradigm

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Reviewer: Marla JS Mickleborough

Reviewer's report:

Comments for the Author

1. Title.

Appropriate.

2. Abstract.

Page 2, line 22. The authors say, "In this study, we aimed to reevaluate cognitive processing via event-related potential (ERP) examinations and explore further correlations between ERP data and migraine characteristics." This underlined portion could be more specific as to what you are actually looking for here (ie, visual spatial attention).

Page 2, line 8. The authors say, "We found that migraine patients were more anxious and depressed than healthy controls." I was surprised the results started with this as it was not the focus of the study. I was expecting ERP results. Perhaps this can be an "Of note..." statement later in results, as it is not the central focus of the study. The connection between migraine and mental illness is further explored on page 3, lines 3-4, but this topic still seems out of place with the rest of the study, especially because the authors seem to contrast mental disorders with cognitive impairment on page 3, line 4 ("In addition...")

Page 2, line 9. Why does P3 exist twice in the following statement? "As for P3/difference P3 components".

It would be appropriate to tell us off the start what the P3, N1, and N2 components represent in your study, as not everyone reading BMC Neurology knows all the ERP components.

Page 2, line 15. "cognitive processing deficits should be highlighted during clinical practice". While this data and other ERP studies are building to suggest that these visual-spatial attentional "abnormalities" in migraineurs seem to be reproducible, it is important to note that we still do not have a full picture of how they play out in day-to-day life as a symptom for migraineurs, so this
is perhaps not quite ready to be translated into something we can "highlight" during clinical practice.

3. Background

Page 2, line 21: "mainly impacting individuals in their prime, between the third and fourth decades." I can appreciate the authors' attempt at emphasizing the impact of migraines on migraineurs, but I'm not sure if it is their place to be qualifying an individual's "prime".

Page 3, line 6. Why does it say "Several studies…" and then only reference one study?

Page 4, line 4. I think this should state specifically that you are looking at attentional ERP components.

4. Methods

Page 5, lines 6-7: Could the authors please provide a citation or rationale as to why 49 and 52 were chosen as the cut-offs? Is this an accepted level for the SAS and SDS or did the authors choose these values themselves—and if so, why?

Page 4, Line 11. "Besides" - Authors are not using "Besides," correctly (page 4, line 11; page 7, line 1; page 9, line 11; page 12, line 17; page 15, line 21)

5. Results

Page 8, line 10: "As for emotional characteristics, migraine patients tended to be more anxious and depressed compared with healthy controls." This is a bold statement and I'm not convinced it is adequately justified, especially because the authors only used two self-report scales (one for anxiety and one for depression; page 5, lines 5-6). The emotional characteristics of migraine doesn't seem to fit with the ERP/cognitive processing focus of the paper. It would be helpful to include a rationale for this dimension, and whether or not it has any implications for the results (does it possibly undermine the results? Why or why not.) (Also see page 13, lines 13-14.)

6. Discussion

I'm not sure why you are leading with the information that migraine patients are more anxious and depressed than controls, as that doesn't seem to be the focus of the ERP study (visual spatial attention). While you report cognitive ERP "abnormalities" that are correlated with frequency
and duration of migraine attacks, the first paragraph does not tell me why that might have any meaning to a migraineur or clinician.

- I think if you combine the following two statements and put them at the end of the first paragraph of the discussion (as well as in the conclusion), you will have a clear take-home message for the reader, then you can go on to explain the components as you do.

- Page 14, line 11. This statement, "our findings indicated that migraineurs might have interictal impairment in attentive neurocognitive processing, such as target processing and orienting responses"

- Page 14, line 20. This statement, "...that migraineurs might suffer from deficits in the speed of visual information processing, especially when triggered by infrequent or unfamiliar stimulus."

7. Conclusion

Page 16, line 11. I think "P3/difference P3 amplitudes" needs to be reworded.

Page 16, line 12. "suggesting the existence of impairment in cognitive processing, which was usually neglected in clinical practice." Again, I think the statement about "impairment in cognitive processing" is TOO general. This will be quoted in other studies and therefore should specifically reflect the impairment you are suggesting, such as abnormalities in attentive neurocognitive processing such as target processing, orienting responses, and speed of visual information processing, especially in response to infrequent stimuli. Further, I don't think we can make specific statements about this being neglected in clinical practice when it is not yet clear what it means to have this abnormal attentional processing.

8. Overall

Overall, I think this is a great paper. I think this furthers previous work using ERP to look at very specific attentional processing in migraineurs, showing that variations of this effect of abnormal visual spatial attention in migraineurs is consistent and reproducible. I think the findings are valuable and definitely worth publishing. The fine-tuning that I would like to see is specific to the message that it gives.

For example, are we certain this abnormality is an impairment? Can you specify more clearly what the abnormal brain wave amplitude means? I think the authors could explore this a bit further for the audience. For example, could a decreased attentional response to target and novel stimuli sometimes be an advantage or is it always a disadvantage?
The other key changes (described in my review) were to consider how the anxiety and depression scales were included, as they do not seem very relevant to the ERP research in the study. If they are relevant, then it needs to be more clearly explained (how do depression and anxiety affect these ERP components?). Finally, the statements claiming how this can be translated into clinical practice need to be either tamed down or better justified on how exactly this information could be used clinically.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

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If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

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