Review of: "Parents' mHealth App for promoting dyslexia biomarker detection in children at home or at school: Feasibility, Acceptability, Economic impact, Pilot Study and Survey Results"

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The authors' work suggests that qEEG can be used as a biomarker to predict dyslexia status in young children. Overall, the authors present a pilot study, i.e., preliminary findings. While I see the practical relevance and importance of this work, I also see weaknesses, especially with regard to the article (not the study per se).

Here are some comments for the separate parts of the paper:

Abstract:
I find the first few sentences a little unclear - they could be more precise. For instance, I'm not sure what you mean by 'evolve in a better way'. Do you mean that they have better reading/ spelling performance, higher academic achievement, better mental health? Also, I guess intervention does only make sense if a disorder is present, but if there is no diagnosis, you'd probably rather talk of prevention.
Please add where the diagnosis is delayed (Turkey, here) - it's not so much the case in Germany.
I understand the drawbacks of MRI but I'm afraid I don't see how qEEG would be more suitable to categorize dyslexia types?! To my knowledge, there are no neural markers for different subtypes of dyslexia (the fact that there are subtypes is also still kind of under debate), so I do not see how EEG would do a better job than MRI.
also: dyslexia 'has' many subtypes (grammar)
The information 'In order to standardize the data, the Z-scores are calculated' is not necessary because you already wrote z-scored qEEG data before and any info on that should go into the methods section.
What is Auto Train Brain (and mHealth?)? Why is this name introduced in the last sentence after you present the accuracy? For the reader, it would be easier to follow if you presented the information in an easy-to-follow-way:
1) We need a biomarker app for dyslexia because ... (potentially help to prevent severe consequences by early diagnosis that helps provide early intervention)..
2) We developed an app (name!) that does this and that and combine it with qEEG because…
3) Using this approach, we found ....
I'm afraid the abstract needs some proofreading, preferably by a native speaker. The sentences are sometimes a little redundant, lacking linking words (many could easily be combined) and there are a few grammar mistakes and typos (e.g.,

space missing).

Introduction:

Dyslexia is officially known as 'learning disability/disorder', I would stick to this terminology instead of writing learning 'problem'.

I guess you mean that nonverbal (!) IQ is normal or even above (>85). I guess it would be good here to cite diagnostic manuals that actually suggest this.

You already wrote that dyslexia is characterized by problems with accurate and fluent word recognition, so the "dyslexic people find it difficult to read" is redundant here.

I struggle with the sentence saying that dyslexia is a result of weak connections ("Because of weak connections")- there is abundant (more recent) evidence that dyslexia is characterized by marked hypoactivation within the reading network, disrupted functional connectivity and differences in structural connectivity in certain fiber tracts. Writing about weak connections seems to be way too simplified.

There are no references for all the claims/facts in the second paragraph.

I'm not sure you can assume that your readership knows what fMRI/EEG/PET/MEG means and I guess it's better to introduce abbreviations first- maybe write the words and then use abbreviations?

"Visiting a psychiatrist could be a horrifying experience for a 7-year-old child, as dyslexia is not classified as a mental disease"- that seems like a way too strong statement in my view and is very subjective.

I'm afraid that telling your readers which methods have yielded a high accuracy does not explain in any way WHY and HOW they did so. Which brain regions are important? What is resting state compared to task-based fMRI? Why can both reveal who is dyslexic and who not? There is also a recent study that used a Machine Learning Approach including different structural brain measures, behavioural scores etc. to predict reading performance - might be interesting for you generally - https://www.frontiersin.org/articles/10.3389/fnins.2022.920150/full

I need some more information on what exactly you did - you used these z-scores qEEEG recordings from 14 channels (any random or is that normal in children?) and combined this with an app that was developed before? What does the title of the paper then mean?

I know that some of that was probably covered in your earlier works but this is an independent article, so I suggest to make it as transparent as possible and put the relevant information into that article as well. Nobody wants to go back to several older studies to figure out what this one is about.

Methods:

Something does not match up here: 96 children: 70 male, 20 female?

What do you mean when you write “The study is designed as a restrospective”?

"Did not use any medicines" is meant as "were not on medication", right?

SES is not introduced before - provide the info on how you assessed socio-economic status before you write about the families.

How do you achieve 70 features in your EEG recordings? The 14 channels and five types of waves? This should be made

clear because the 70 features sentence seems unrelated to the rest, e.g., "Altogether, this yielded 70 parameters..."
I'm not sure I would put too much emphasis on the disconnection between Broca and Wernicke. First, the only paper you cited is really old and saying that dyslexia is mainly a disconnection syndrome in that respect is oversimplified. Second, there is evidence for disrupted functional and structural connectivity, but not necessarily only between posterior temporal and inferior frontal regions. That only covers a small part of the story. So I would not put too much emphasis on this and go back to the most recent studies and argue that it is one of the common neural markers - but you should definitely back up these claims by providing recent references.
Please check grammar in Study Design (sentence structure, missing question makers)
Please check the tense in your methods section - sometimes past tense is used, sometimes present tense. Keep this consistent!

Results:
I'm not an expert in machine learning, but it seems that some sentences are not well-phrased. At least they don't make sense to me:
"In Table 1, model architecture talks about ANN architecture of every individual activation function in the system." What does the talk do in here?
Please check for grammar and typos again (e.g., "the model states that 27 dyslexic people as non-dyslexic". I'm a bit confused about the 27 out of 8301 - do you mean that all recordings/sessions from the 27 dyslexics were put in the wrong category, or just single sessions?

Discussion:
ANN is explained for the first time here. This needs to be done much earlier! And also the details on the ANN approach should be in the methods section or even in the intro where you state what you want to do and with which method.
Again, some sentences are just not very well-phrased, e.g., "An idea that can also achieve better results is to try different types of artificial neural network models such as generative-adversarial networks, convolutional neural networks, and recurrent neural networks." Why not say “Even better results could be achieved by using different types of ANNS, such as ...”? It would be smart, though, to emphasize that this is a future perspective because otherwise one could ask why you didn't just do that in the present study.
Figures should be in the results section. At least in my experience, figures/pictures are never introduced in the discussion. The discussion just wraps everything up.
Is there any way to make Figure 6 look nicer? For instance, by just showing what is in the graphic report on the phone and not including the phone?
"Child Neurologist" - why capital letters?
I'm a little confused by the title, abstract and what was done in the study - so, you only looked at whether the algorithm based on qEEG data can predict who is dyslexic, and who is not, right? I thought that there were results for the classification and the neurofeedback since there is a lot on neurofeedback and how it can improve this disconnection syndrome in the intro, the methods etc. If that is not part of the current article, why not only briefly mention and clarify that

this is not the focus of the current paper? Also the conclusions you draw seem like the classification can do anything in terms of rehabilitation.

I think it was a little hard for me to get the overall aim because the title, abstract and article do not really match. Is there a way to make it easier for the reader to understand, e.g., by changing the title and abstract accordingly?