This is a review of the manuscript “Identifying individuals who currently report feelings of anxiety using walking gait and quiet balance: An exploratory study using machine learning”, submitted to the “Intelligent Sensors” section, special issue “Analysis of Biomedical Signals and Physical Behavior Sensing in the Development of Systems for Monitoring, Training, Controlling, and Improving Quality of Life”.

This manuscript describes a pilot study using machine learning (ML) to simultaneously monitor individuals’ gait and quiet balance to potentially identify individuals under the influence of anxiety. Although the concept may be interesting to the readers of Sensors and this special issue, especially among those clinicians who are looking for an objective and reliable surveillance and/or screening tool for psychological assessment on anxiety. However, the current manuscript was not written with clear logic and hard to follow with the presence of spelling errors, grammar issues, and redundant wordings. It could use some extensive editing work to make the main text fluent and easier to understand. More importantly, after reading the manuscript, the reviewer developed some concerns over the quality of this manuscript in its current format, particularly the study design, the way data were analyzed, and the interpretation of results. Some additional explanation would be good.

In general, based on the overall impression of the current exploratory study, the reviewer would say that the authors aimed to establish an objective approach to identify/predict feelings of anxiety using machine learning with a pool of candidate variables of the gait and balance features, as stated in the Introduction section, “to identify whether balance control, gait, or a combination of the two would be most accurate to predict if a healthy individual is feeling anxious in the moment”. To the reviewer’s knowledge, gait parameters, balance control, etc. are closely related to neuromuscular functions, which can be affected by the psychological status and/or disturbance, not necessarily limited to or caused by anxiety alone. Therefore, it appeared to be a long leap trying to establish a direct connection using gait and balance as the outcome measure of anxiety. The current Introduction section is not focused on providing the foundation work, such as the existing evidence of the associations between gait parameters and postural control capability (i.e., balance test) and the psychological features (i.e., anxiety), especially some concrete evidence explaining the biological plausibility, in what particular way anxiety would actually influence how an individual walk or stand. If the logic is not offered or clearly presented, the whole study might become a pursue of pure statistics, just throwing a whole bunch of variables out there and let the algorithm run and see what kind of relationship will show up. In the Discussion section, the authors do provide some insight when discussing Objective 1 and 3. The reviewer would suggest adding similar material in the Introduction. Most importantly, the authors would need to explain the causal relationship that may warrant a predictive relationship between how people feel and how they walk or balance. It is one thing that they are statistically associated and another thing if you can rely on one to predict another. In practice, if indeed an individual is exhibiting large deviation from the “normal” walking gait, we do not immediately seek explanations or diagnosis from a psychology perspective. Instead, clinicians will more likely look for neuromuscular and/or skeletal issues first. Therefore, what is the relevance of these findings to clinical practices?

Secondly, as the authors mentioned in the Limitations section that this is a cross-sectional design with self-reported anxiety status collected from a relatively small sample of young subjects, who were separated into two groups, one with anxiety (≥3) and the other without anxiety (=0), the current methodology may not just have limitations but flaws in logic. The current comparisons were made

between datasets collected from different subjects rather than from the same subject at various status (i.e., use his/herself as reference for what is normal and what is abnormal). Unfortunately, with the vast variations in human neuromuscular-skeletal system, it is not an easy job to establish a standard that is true and applicable to all individuals, not to mention the influence of other variables, including gender, age, body composition, general health, and medical conditions. The current sample while being young and healthy, is also a substantial limiting factor on the possible application of the current findings among other samples, where subjects do have this or that condition, such as obesity, sleep problems, degenerative changes to the neuro-musculoskeletal system. With everything blended in together, how can we single out the influence of anxiety? As mentioned by the authors, since anxiety-inducing conditions can be simulated (16,19), the current study may consider establishing baseline and anxiety-induced observations and evaluate the influence. For example, will subjects w/o anxiety behave differently (when the differences can be detected) or if it will have greater influence among subjects w/ anxiety. In addition, it seems that data used for analyses were collected during just one collection session. Could the author explain why the subjects were not asked to perform multiple sessions and use the averaged data instead? What if a subject walked a bit differently because he/she was nervous, under the influence of adrenalin with faster heart rate, or just some random effect?

Thirdly, after reading the Results section, the reviewer noticed that most of these statistically significant differences were not material, within 2 or 3 degrees of angle, which raised the concerns over the biological plausibility. First of all, the audience should understand the pros and cons of an IMU-based motion capture system. With general design features, a typical IMU system can detect angular change greater than 1 or 2 degrees of angle. According to the company, the Opal sensor has dynamic accuracy of 2.8 degrees. Therefore, unlike the evaluations of other large joint movements, with differences so close to the margin of error, it may not be so straightforward to interpret the results.

Aforementioned are some of the major concerns over the quality and readiness of this manuscript.

Some specific questions/suggestions,

Abstract, “5 top features at identifying anxious individuals …” only included 4 in the parenthesis

Page1, line6, missing “than” between “more” and “three”

Page1, line8-9, redundant usage of “annual”

Page2, line13, should be “individual’s”

Page2, line14, should be “use” instead of “using”

Page2, line22-23, this statement seems detached from the prior literature review, where it states “these findings suggest the need to …. using objective measures”. To serve the purpose of this study, gait and balance may be objective measures; but they are also indirect ones if they are chosen to evaluate someone’s anxiety level. Maybe the authors should provide greater details on how self-reported measures are complemented by indirect and object measures.

Page2, line25-26, the wording needs revision

Page2, line31-32, missing “they” between “because” and “suggest”

Page2. Line34, should be “Zhao”

Page3, line85, delete “I” between “has to be” and “between”

Page3, line86-91, the wording needs revision. “Individuals were excluded … were included in this study”

Page3, line91, 133 “were” qualified

Page4, line112, should be “range”

Page5, line166-170, please consider presenting the formulas in dedicated open space

Page5,6,7, there may be too much redundancy in wording when referring to the two group of subjects, please consider an easier and more concise way to communicate and save room on wording counts for additional information or discussion.

At this moment, the reviewer decided to bring up major concerns with a few examples of spelling errors and grammar issues. The reviewer believes that the comments provided in this report should be addressed or explained by the authors first before moving forward with additional review. Please take your time to prepare your response to clarify all the issues, concerns, and misunderstandings, the process would only help strengthen your work.

Thank you very much!