**Manuscript Review for "Kinarm Approach Avoidance Task: A robot-based reaching task to assess automatic attitudes towards visual stimuli"**

## Summary

This manuscript presents a novel adaptation of the Approach-Avoidance Task (AAT) using the Kinarm Endpoint Laboratory. The Kinarm Approach Avoidance Task (KAAT) offers a unique and quantitative way to study automatic approach-avoidance tendencies through upper limb movements. The manuscript describes the development of the task, its potential for providing richer kinematic data compared to traditional interfaces, and its applications in cognitive and motor research.

## Strengths

1. **Innovative Use of Robotics**: The integration of the Kinarm system with the AAT provides a significant advancement in assessing approach-avoidance tendencies. The ability to capture kinematic variables such as hand speed and movement direction adds a valuable dimension to the study of human behavior.
2. **Task Customizability**: The KAAT's flexibility in presenting various stimuli and applying resistive loads demonstrates its potential for broad applications in research, including rehabilitation.
3. **Clear Task Description**: The manuscript provides detailed explanations of task parameters, operations, and conditions, making the study replicable for other researchers.
4. **Interdisciplinary Relevance**: By linking cognitive functions to motor responses, the study bridges psychology, neuroscience, and rehabilitation science, expanding its impact across disciplines.
5. **Supporting Literature**: The authors thoroughly reference previous work, contextualizing the KAAT within the broader research landscape.

## Weaknesses

1. **Lack of Experimental Results**: While the manuscript describes the task design, it lacks empirical data to demonstrate its utility. Including pilot data or example results would strengthen the manuscript.
2. **Technical Jargon**: Certain sections, particularly those describing task operations and parameters, are dense with technical terms, which may be challenging for non-expert

readers. Simplifying or supplementing these sections with diagrams or tables could improve accessibility.

3. **Application in Diverse Populations**: Although the manuscript mentions applications in rehabilitation and cognitive impairments, it does not detail how the KAAT could be adapted for specific populations, such as children, individuals with severe motor impairments, or non-dominant hand use.

4. **Validation Metrics**: The manuscript does not address how the reliability or validity of the KAAT will be assessed. Including a discussion of psychometric properties would enhance the scientific rigor.

5. **Potential Bias in Visual Stimuli**: The choice of stimuli (e.g., images of physical or sedentary activities) could influence participant responses. More discussion on controlling for such biases would strengthen the methodology.

**Suggestions for Improvement**

1. **Include Pilot Data**: Adding preliminary data with a brief analysis would provide concrete evidence of the task's effectiveness and reliability.

2. **Expand Discussion on Rehabilitation Applications**: Provide more examples of how the KAAT could be tailored for different clinical populations and specific rehabilitation goals.

3. **Simplify Task Details**: Use visuals, such as flowcharts or schematic diagrams, to clarify task operations and conditions for readers unfamiliar with the Kinarm system.

4. **Address Validity and Reliability**: Discuss plans for validating the KAAT, including test-retest reliability, sensitivity to behavioral changes, and comparability with traditional AAT measures.

5. **Stimuli Selection**: Include a discussion on how potential biases in visual stimuli will be managed and whether diverse stimuli could broaden the KAAT's applicability.

6. **Figures and figure competition**: The figures could benefit from better-explained captions and some flow charts or tables. The specific comments about the figures are mentioned at the end of the document.

**Overall Assessment**

The manuscript introduces an innovative tool with significant potential for advancing research on approach-avoidance tendencies. While the design and application are well-detailed, the manuscript would benefit from empirical validation, expanded discussion on clinical applications, and simplification of technical descriptions. Addressing these aspects will enhance its impact and appeal to a broader audience.

In addition, we encourage you to **answer the following questions** to help recommenders make well-informed and efficient decisions**.**

If you answer "No" to a question, please **explain why and list your suggestions for improvement** by the authors **in your free-text review or below each question.**

- **Comments on Title and abstract**
  - **Does the title clearly reflect the content of the article?**

[ ] Yes

[X] No (please explain)

The title, *"Kinarm Approach Avoidance Task: A robot-based reaching task to assess automatic attitudes towards visual stimuli,"* emphasizes the use of the Kinarm system and its relevance to assessing approach-avoidance tendencies. However, it does not convey the unique features or advantages of the KAAT compared to traditional AATs, such as the ability to capture detailed kinematic data or its potential applications in rehabilitation and cognitive research. A more descriptive title could highlight these aspects, for example:

*"Kinarm Approach Avoidance Task: Advancing the Assessment of Automatic Attitudes through Robotic Reaching and Kinematic Analysis."*

  - **Does the abstract present the main findings of the study?**

[X] Yes

The abstract effectively outlines the key aspects of the study, including the limitations of traditional AATs, the unique features of the KAAT, and its potential for studying approach-avoidance tendencies. However, it does not include any empirical findings or pilot data. While this is understandable for a methodological paper, mentioning hypothetical applications or expected outcomes could strengthen its appeal.

- **Comments on Introduction**
  - **Are the research questions/hypotheses/predictions clearly presented?**

**[ ] Yes**

**[X] No (please explain)**

While the introduction provides a thorough overview of the context and importance of approach-avoidance tendencies, it does not explicitly outline specific research questions, hypotheses, or predictions. A clear statement of the study's objectives and expected outcomes (e.g., how the KAAT improves upon traditional AATs or its anticipated findings in movement analysis) would strengthen the introduction.

- **Does the introduction build on relevant research in the field?**

**[X] Yes**

The introduction references a wide range of relevant literature, including studies on approach-avoidance tendencies, traditional AAT methods, and the application of robotic systems like the Kinarm in cognitive and motor research. This contextualizes the work effectively and highlights the novelty of the KAAT. However, more explicit connections between prior studies and the specific goals of the KAAT could enhance the narrative.

- **Comments on Materials and Methods**
  - **Are the methods and analyses sufficiently detailed to allow replication by other researchers?**

[X] Yes

The manuscript provides detailed descriptions of the task layout, operational procedures, and specifications for the Kinarm system. Key aspects, such as the stimulus conditions, trial protocols, and block structure, are explained thoroughly. However, while the technical details are comprehensive, some sections (e.g., the task parameters and force application) could benefit from additional clarification or visual aids (e.g., a summary table or flowchart) to make replication easier for researchers unfamiliar with the Kinarm system.

- **Are the methods and statistical analyses appropriate and well described?**

[ ] Yes

[X] No (please explain)

The methods for task implementation are well described, but there is no mention of statistical analyses or how the data will be validated or interpreted. While this may be acceptable for a methodological paper, a brief section on planned statistical approaches (e.g., how kinematic data will be analyzed or compared across conditions) would enhance the rigor and completeness of the methods. Including a discussion of how reliability and validity will be assessed would also strengthen this section.

- **Comments on Results**

- **In the case of negative results, is there a statistical power analysis (or an adequate Bayesian analysis or equivalence testing)?**

[ ] Yes

[X] No (please explain)

The manuscript does not include a section presenting statistical power analysis, Bayesian analysis, or equivalence testing for any negative results.

- **Are the results described and interpreted correctly?**

[ ] Yes

[X] No (please explain)

While the task's operational results are described, there is no clear presentation or interpretation of empirical data, as the manuscript focuses primarily on task development. Without actual results or data interpretation, it is challenging to determine whether the KAAT's performance aligns with the stated objectives. If this is a methodological manuscript, it would benefit from including pilot data or example analyses to validate the task's utility and interpretation framework.

- **Comments on Discussion**
  - **Have the authors appropriately emphasized the strengths and limitations of their study/theory/methods/argument?**

[ ] Yes

[X] No (please explain)

The discussion highlights the innovative aspects of the Kinarm Approach Avoidance Task (KAAT), such as its ability to capture detailed kinematic data and its potential applications in rehabilitation. However, it does not sufficiently address the limitations of the study, including the lack of empirical validation, potential challenges in adapting the KAAT for diverse populations, or possible biases introduced by the visual stimuli. Explicitly discussing these limitations would provide a more balanced perspective and enhance the manuscript's credibility.

- **Are the conclusions adequately supported by the results (without overstating the implications of the findings)?**

[ ] Yes

[X] No (please explain)

The conclusions are based on the theoretical advantages of the KAAT but lack empirical data to support the claims. While the task's design is promising, the absence of results means the conclusions rely heavily on the potential of the method rather than demonstrated outcomes. Including pilot data or a clear validation framework would ensure the conclusions are adequately supported and prevent overstating the implications of the findings.

**Comments on Figures:**

The figures are well-structured and appropriately illustrate the task layout, stimulus conditions, and operation details. However:

1. Some figures, particularly those showing trial operations (e.g., Figures 1, 6, and 13), could benefit from clearer annotations or labels to enhance understanding for readers unfamiliar with the Kinarm system. This includes mentioning the x and y axis of the kinarm instead of direction as (east and or west).

2. The figures showing stimuli (Figures 2-5) are visually clear but could include captions that explicitly explain how these stimuli contribute to assessing approach-avoidance tendencies.

3. It would be helpful to include a figure summarizing the overall workflow of the KAAT (e.g., a flowchart or schematic of task progression) to complement the detailed textual description.