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PEER-REVIEW REPORT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112073

Title: Unlocking the Silent Signals: Motor Kinematics as a New Frontier in Early Detection of Mild Cognitive Impairment

Provenance and peer review: Invited manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 05632082
Position: Peer Reviewer
Academic degree and professional title: Lecturer
Reviewer's Country/Territory: Pakistan
Author's Country/Territory: Japan

Manuscript submission date: 2025-07-16

Reviewer chosen by: Jia-Lin Zhang

Reviewer accepted review: 2025-07-23 13:38

Reviewer performed review: 2025-07-24 11:31

Review time: 21 Hours

Content to be reviewed	Does the manuscript's content fall within the scope of the journal? **Yes** Is there any Key Word that is not included in the manuscript title? **No** Do authors' affiliations correspond to the content of the manuscript? **Yes** Does the Abstract contain the contents of each part of the manuscript (IMRaD)? **Yes** Are the Key Words complete? **Yes**

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	Is the content of the Introduction adequate? **Yes** Is the content of the Materials and Methods complete? **Not Applicable** Is the description of the experiments clear and complete? **Not Applicable** Are the experimental data presented in the manuscript's biostatistics content reliable? **Not Applicable** Are the experimental data of the Results true and reliable? **Not Applicable** Are the quality and resolution of the images up to standard? **Not Applicable** Do the selection and design of the figures and tables follow the principles of necessity and clarity? **Not Applicable** Is there any duplication between various parts of the manuscript and between the main text and the content presented in the figures and tables? **Not Applicable** Are the figures and tables numbered consecutively in the order in which they appear in the manuscript? **Not Applicable** Is the content of the Discussion reasonable? **Not Applicable** Is the Conclusion reasonable? **Not Applicable** Are all references necessary and reasonable? **Yes** Do authors omit important references? **No** Are all references related to the topic of the manuscript? **Yes** Do authors only cite their own earlier publications? **No** Is the manuscript's text correct, concise, and clear? **No**

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	Will the manuscript's content be of interest to readers? **No** Are additional experiments needed for the study? **No** Does the research scope comply with ethics? **Not Applicable**
Scientific quality	Grade B (Very good)
Novelty of this manuscript	Grade B (Very Good)
Creativity or innovation of this manuscript	Grade C (Good)
Scientific significance of the conclusion in this manuscript	Grade C (Good)
Language quality	Grade B (Very good)
Does this manuscript describe a study of the existing knowledge system?	Yes
Does this manuscript report a revolutionary innovation?	Yes
Does this manuscript report an unconventional innovation?	Yes
Conclusion	Major revision
Re-review	Yes
Peer-reviewer statements	Peer-Review: Onymous
	Conflicts-of-Interest: No
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

Author is congratulated on writing an editorial manuscript on such an advance technique integration in diagnostic tool.

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This commentary highlighted the increasing need for better early detection methods for mild cognitive impairment (MCI), given the limitations of traditional tools like MMSE and MoCA in terms of sensitivity and accessibility. It examined a recent study that applied machine learning to analyze gait and handwriting kinematics for MCI screening, reporting promising outcomes (74.44% accuracy, AUC 0.74). While the approach was recognized for its objectivity and practical application, certain limitations were noted, including its cross-sectional design and lack of diversity among participants. The article suggested that kinematic biomarkers could serve as valuable additions to current diagnostic methods and emphasized the importance of future research focused on longitudinal validation, inclusion of diverse populations, and development of portable, AI-based screening technologies to support early detection and timely intervention. Although commentary / editorial focused on advancement of ML integration into useful digital tool as described by Ren YX et al., (Manuscript No. 109478). The editorial manuscript quality and clarity can be improved as per following recommendations / suggestions.

To improve the quality and readability of the manuscript, the text is required to be rewritten using clear and direct sentences in the past tense. Complex phrases needed to be simplified, and passive constructions are recommended to reduced to make the writing more engaging and easier to follow. Scientific terms were retained where necessary, but unnecessary jargon may be avoided to enhance accessibility for a broader audience. Transitions between ideas were clarified to improve logical flow, and repetitive statements need to be removed to maintain conciseness. Overall, the manuscript may discuss the model used for machine learning. Manuscript may comment on the selection of model appropriateness in relation to current state of knowledge in ML. For instance, artificial neuronal networking model is an appropriate model to assess the relevant development of ML as described / claimed by the

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referenced manuscript by Ren YX et al.

Multimodel selection for developing a digital tool to enhance early detection / diagnosis is requires to adopt a suitable AI / ML tool for developing such methods. This model opted in reference manuscript as described by this editorial manuscript is required to discuss the appropriateness of the selected model by Authors (Ren YX et al.) to develop such a digital tool.

Repetitive sentences may be reduced to maintain the originality and conciseness.

Past tense statements are recommended to be used in whole manuscript to enhance its quality and understanding.

Some comments are mentioned in the manuscript file for rectification.

Authors is encouraged to write a comparative analysis of the adopted model by Ren YX et al., and focus on the advantage compared to existing tools like ANN use in developing logical reasoning for detection and analysis in the digital form.

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PEER-REVIEW REPORT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112073

Title: Unlocking the Silent Signals: Motor Kinematics as a New Frontier in Early Detection of Mild Cognitive Impairment

Provenance and peer review: Invited manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 08459618
Position: Peer Reviewer
Academic degree and professional title: PhD, Professor, Researcher
Reviewer's Country/Territory: China
Author's Country/Territory: Japan

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Review time: 6 Days and 17 Hours

Content to be reviewed	Does the manuscript's content fall within the scope of the journal? **Yes** Is there any Key Word that is not included in the manuscript title? **No** Do authors' affiliations correspond to the content of the manuscript? **Yes** Does the Abstract contain the contents of each part of the manuscript (IMRaD)? **Yes** Are the Key Words complete? **Yes**

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Scientific quality	Grade B (Very good)
Novelty of this manuscript	Grade B (Very Good)
Creativity or innovation of this manuscript	Grade C (Good)
Scientific significance of the conclusion in this manuscript	Grade D (Fair)
Language quality	Grade B (Very good)
Does this manuscript describe a study of the existing knowledge system?	Yes
Does this manuscript report a revolutionary innovation?	Yes
Does this manuscript report an unconventional innovation?	No
Conclusion	Major revision
Re-review	No
Peer-reviewer statements	Peer-Review: Anonymous
	Conflicts-of-Interest: No
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

This article "Unlocking the Silent Signals: Motor Kinematics as a New Frontier in Early Detection of Mild Cognitive Impairment", it discusses the application of motor kinematics in the early screening of mild cognitive impairment (MCI). It proposes that motor kinematic features such as gait and handwriting can serve as tools for the early identification of mild cognitive impairment. The authors demonstrate through a study that combining motor kinematic features with machine learning can achieve a certain level of discriminative effectiveness. This study offers a potential low-cost screening

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method for resource-limited areas and suggests combining this approach with traditional cognitive assessments, imaging, and biomarkers to form a more comprehensive screening strategy.

The view that "movement is an external manifestation of the nervous system" is well supported by scientific theory. Neuroscience holds that human behavior and movement are the direct result of nervous system activity. Related research indicates that movement is an expression of the brain's cognitive, perceptual, and control functions. Therefore, observing and analyzing human movement characteristics can reflect the brain's operational state, particularly holding significant importance in the diagnosis of early cognitive impairments.

The kinematic indicators mentioned in the article, such as gait and handwriting, have been proven in multiple studies to be strongly associated with cognitive function. Research shows that MCI patients exhibit significant differences in gait speed, stride length, and other aspects. In addition, changes in handwriting are often used as an early indicator of cognitive decline. These kinematic indicators provide a new way to assist in the diagnosis of mild cognitive impairment.

The article states that kinematics is a "new frontier " in the early screening of MCI, but from the perspective of disciplinary development, kinematics is not entirely a new field. Digital biomarkers and digital health technologies have already been applied in the early diagnosis of neurological diseases. The "new frontier" referred to in the paper refers more to technological innovation and application methods than to the creation of a new academic field. Therefore, it can be viewed as a new technological direction or methodology rather than an entirely new disciplinary field.

The multiple systematic reviews and clinical studies cited in the paper are all sourced from authoritative journals such as Age and Ageing and JAMA Network Open, providing robust academic support for the paper. However, some of the more novel

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studies cited in the paper, such as those on handwriting kinematics, are sourced from interdisciplinary journals, which have relatively lower levels of evidence.

The application of "motor kinematics" in the early screening of MCI has certain potential, but it is still in the preliminary exploratory stage. Although it provides a new complementary method to traditional cognitive assessment methods, its positioning as a "new field" may be too advanced. It should be viewed more as a new technological direction that requires further empirical research to validate its clinical feasibility.

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RE-REVIEW REPORT OF REVISED MANUSCRIPT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112073

Title: Unlocking the Silent Signals: Motor Kinematics as a New Frontier in Early Detection of Mild Cognitive Impairment

Provenance and peer review: Invited manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 05632082
Position: Peer Reviewer
Academic degree and professional title: Lecturer
Reviewer's Country/Territory: Pakistan
Author's Country/Territory: Japan

Manuscript submission date: 2025-07-16

Reviewer chosen by: Xin-Yue Hu

Reviewer accepted review: 2025-09-08 10:14

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Review time: 4 Hours

Content to be reviewed	Does the manuscript's content fall within the scope of the journal? **Yes** Is there any Key Word that is not included in the manuscript title? **No** Do authors' affiliations correspond to the content of the manuscript? **Yes** Does the Abstract contain the contents of each part of the manuscript (IMRaD)? **Yes** Are the Key Words complete? **Yes**

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	Is the content of the Introduction adequate? **Yes** Is the content of the Materials and Methods complete? **Not Applicable** Is the description of the experiments clear and complete? **Not Applicable** Are the experimental data presented in the manuscript's biostatistics content reliable? **Not Applicable** Are the experimental data of the Results true and reliable? **Not Applicable** Are the quality and resolution of the images up to standard? **Not Applicable** Do the selection and design of the figures and tables follow the principles of necessity and clarity? **Not Applicable** Is there any duplication between various parts of the manuscript and between the main text and the content presented in the figures and tables? **No** Are the figures and tables numbered consecutively in the order in which they appear in the manuscript? **Not Applicable** Is the content of the Discussion reasonable? **Yes** Is the Conclusion reasonable? **Yes** Are all references necessary and reasonable? **Yes** Do authors omit important references? **No** Are all references related to the topic of the manuscript? **Yes** Do authors only cite their own earlier publications? **No** Is the manuscript's text correct, concise, and clear? **Yes** Will the manuscript's content be of interest to readers?

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	Yes Are additional experiments needed for the study? **No** Does the research scope comply with ethics? **Not Applicable**
Scientific quality	Grade B (Very good)
Novelty of this manuscript	Grade B (Very Good)
Creativity or innovation of this manuscript	Grade B (Very Good)
Scientific significance of the conclusion in this manuscript	Grade A (Excellent)
Language quality	Grade B (Very good)
Does this manuscript describe a study of the existing knowledge system?	Yes
Does this manuscript report a revolutionary innovation?	No
Does this manuscript report an unconventional innovation?	Yes
Conclusion	Accept
Peer-reviewer statements	Peer-Review: Onymous
	Conflicts-of-Interest: Yes
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

Takahiko Nagamine had successfully written the editorial manuscript titled "Unlocking the Silent Signals: Motor Kinematics as a New Frontier in Early Detection of Mild Cognitive Impairment". This manuscript holds various merits for publication. Some of the described by Prof. Takahiko N. are as following:

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Mild cognitive impairment (MCI), affecting over 15% of adults above 50 years, represents an intermediary stage between normal aging and dementia. Despite its prevalence, MCI remains underdiagnosed due to limited awareness and shortcomings of existing tools. Standard assessments such as the Mini-Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) are valuable but resource-intensive, while neuroimaging and fluid biomarkers, though informative, are costly, invasive, and impractical for large-scale screening.

Motor kinematics offer a promising alternative. Cognitive decline is closely linked with motor deficits, and individuals with MCI often exhibit slower gait, shorter stride length, prolonged double support, and handwriting impairments such as slower speed, reduced pressure, and increased errors. These subtle changes frequently precede overt cognitive symptoms, making them potential early biomarkers.

The highlighted study, Integrating Gait and Handwriting Kinematic Parameters for Mild Cognitive Impairment Screening: A Machine Learning Approach, pioneers a multimodal framework. While handwriting or gait assessments alone demonstrated moderate diagnostic accuracy, their integration significantly improved performance (accuracy 74.44%, AUC = 0.74). Machine learning algorithms enhanced detection by extracting discriminative features, recognizing complex multidimensional patterns, and building robust predictive models validated with cross-validation.

This approach offers several advantages: it is objective, quantifiable, non-invasive, and practical for use in primary care and community settings. Importantly, gait and handwriting tasks reflect ecologically valid aspects of daily functioning, linking motor and cognitive decline more directly than conventional measures.

However, challenges remain. The study's cross-sectional design and modest, region-specific sample limit predictive power and generalizability. Future research should prioritize longitudinal validation, larger and more diverse cohorts, dual-task

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paradigms, and integration with wearable technology for real-world monitoring.

In conclusion, combining gait and handwriting kinematics with machine learning represents a paradigm shift toward accessible, scalable, and early detection of MCI, with potential to transform prevention and intervention strategies worldwide.