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PEER-REVIEW REPORT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112056

Title: Innovations and Approaches in Depression Detection Via Functional Near-Infrared Spectroscopy: A Mini Review

Provenance and peer review: Invited Manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 08726294
Position: Peer Reviewer
Academic degree and professional title: PhD, Researcher
Reviewer's Country/Territory: China
Author's Country/Territory: China

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Reviewer performed review: 2025-07-21 00:27
Review time: 3 Days and 20 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** Is the content of the Introduction adequate? **No**

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	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? **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? **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 C (Good)
Creativity or innovation of this manuscript	Grade C (Good)

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Scientific significance of the conclusion in this manuscript	Grade B (Very Good)
Language quality	Grade C (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?	No
Conclusion	Major revision
Re-review	Yes
Peer-reviewer statements	Peer-Review: Anonymous
	Conflicts-of-Interest: No
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

Thank you for inviting me to review the manuscript titled "Innovations and Approaches in Depression Detection Via fNIRS: A Mini Review", which reviews the application of fNIRS in depression, particularly the role of machine learning. The role of machine learning in this has some contributions to the field of mental health. However, I have some suggestions for the authors.

1. Introduction is too long, a brief description of what the title and keywords relate to and the shortcomings and differences in existing research would be sufficient, the current content seems to be longer than the content of fNIRS applications in depression that the article is mainly intended to summarize. 1.3 seems to be more appropriate to be incorporated into 2. Depression Detection via fNIRS.

Responses: We agree that the introduction was overly long. In the revised manuscript, we have

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condensed the introduction to focus on the definition and epidemiology of depression, etiological mechanisms, the reasons why fNIRS is a favorable detection tool， and the innovativeness and importance of machine learning. Additionally, we have moved section 1.3 to the "Depression Detection via fNIRS" section as suggested.

[page 5]

Depression Detection via fNIRS

Applications of fNIRS in Depression Research

Research on the use of fNIRS for depression detection involves multilevel explorations from basic research to clinical practice[36]. In addition to resting and task states, fNIRS applications in depression detection also include natural contexts and mixed states.

fNIRS has unique advantages compared to traditional technologies such as functional magnetic resonance imaging and electroencephalography (EEG), making it suitable for the long-term monitoring of natural environments[26,27]. As a chronic mental illness[28], depression can be monitored using fNIRS in natural settings, such as clinical consulting rooms, laboratories, and homes[29].

Studies have demonstrated that based on the detection of abnormal resting-state brain function, low oxygenation levels in the PFC of patients at rest are positively correlated with the severity of depression, which can serve as a potential marker for distinguishing patients with depression from healthy individuals[30]. Regarding abnormal emotional and cognitive responses in task states, the brain region activation patterns of patients with depression differed significantly from those of healthy individuals[31]. During executive function tasks, the amplitude of blood oxygen changes in the PFC of patients is significantly lower than that observed in healthy individuals. The degree of such abnormalities is correlated with the degree of cognitive impairment, which can be used as a supplementary indicator for diagnosis. For the dynamic monitoring of treatment effects and prediction of therapeutic efficacy, fNIRS can track changes in brain activity in patients with depression during drug therapy, psychotherapy, or physical therapy, providing an important basis

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for efficacy evaluation and the adjustment of individualized treatment plans[32].

In research on depression in special populations, by monitoring the prefrontal activity of adolescents during social interaction tasks using fNIRS, it was found that the activation of the ventrolateral PFC in patients was significantly reduced when facing peer evaluation, revealing the neural basis behind social anxiety and providing targets for early intervention[33]. fNIRS can monitor brain activity in elderly patients at the bedside. Studies have found that the reduction in blood oxygen levels in their PFC is closely related to cognitive decline, providing evidence for the comorbidity mechanism of geriatric depression with cognitive impairment[34]. For treatment-resistant depression, fNIRS can identify unique brain activity patterns in patients who are unresponsive to conventional treatments, thus providing a basis for personalized treatment.

fNIRS is also often used in combination with other technologies such as scale assessment, EEG, and behavioral tasks. The specific applications of fNIRS in depression research, from the exploration of objective diagnostic markers to the dynamic monitoring of treatment effects and the analysis of neural mechanisms of core symptoms to targeted research on special populations, all reflect its unique value[35].fNIRS is an ideal tool for depression detection due to its low cost and high portability, its ability to process high-dimensional data in combination with technologies like machine learning, its contribution to objective diagnosis, treatment effect monitoring, and mechanism research of depression, as well as its compatibility with various other technologies.

2. are there only 2 resting-state studies?

Responses: We appreciate your attention to the number of resting-state studies. While only two studies were mentioned in the first draft, we recognize the need for a more robust literature foundation. After rechecking the literature, we added citations to these studies and updated the reference lists.

[page 7]

Wong et al. used fNIRS to measure the dorsolateral prefrontal cortex (DLPFC) in 70 subjects, and found that patients with depression receiving combined acupuncture and antidepressant

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therapy exhibited improved depressive symptoms and stronger resting-state functional connectivity in the DLPFC compared with those treated with antidepressants alone[53]. Lin et al. recruited 37 patients and 49 healthy controls to investigate the association between the resting-state prefrontal network and cognitive function in patients with depression and insomnia using fNIRS. They found that these patients exhibited impaired prefrontal cortical functional connectivity, which is closely linked to cognitive function[54].

[page 17]

Reference:

53 Wong YK, Wu JM, Zhou G, Zhu F, Zhang Q, Yang XJ, Qin Z, Zhao N, Chen H, Zhang ZJ. Antidepressant Monotherapy and Combination Therapy with Acupuncture in Depressed Patients: A Resting-State Functional Near-Infrared Spectroscopy (fNIRS) Study. *Neurotherapeutics* 2021; 18: 2651-2663 [PMID: 34431029 DOI: 10.1007/s13311-021-01098-3]

54 Lin X, Ji S, Shan Z, Wang L, He X, Xue R, Jia X, Liu X, Yu H. The association between resting-state prefrontal network and cognitive function in depressed patients with insomnia. *Neuroscience* 2025; 581: 208-214 [PMID: 40645325 DOI: 10.1016/j.neuroscience.2025.07.012]

3. the current structure of the article is not appropriate. the most critical and salient aspect is the application of machine learning to fNIRS in depression, which should be focused and detailed. Suggested presentation is as follows:

Introduction: definition and epidemiology of depression - etiological mechanisms - lead to why fNIRS is a favorable detection tool (long used clinically to differentiate between depression and schizophrenia) - lead to the innovativeness and importance of machine learning；

And then the second part describes the previous fNIRS studies in depression；

And the third part focuses on highlighting the use of machine learning in the fNIRS in depression. characteristics and importance in fNIRS research；

Conclude with a discussion, or integrate the discussion into the second and third parts, and

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conclude with a summary.

Responses: We appreciate your suggestion on the structure. This structure allows us to focus more on the application of machine learning in fNIRS for depression detection and present the content in a more logical and coherent manner.

4. the references do not account for a large proportion of the literature in the last three years, in addition to the formatting is not uniform, with 11 references being otherstyle.

Responses: We appreciate your suggestions on the references. We have carefully checked the references and added more literature from the last three years to ensure that the manuscript reflects the latest research progress. We have also standardized the formatting of all references, correcting the 11 references with non-uniform styles.

[page 17]

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56 Mou L, Shen Y, Wu B, Zhang C, Zhu J, Tan Q, Zhang X, Wang Z, Shen Z. Different prefrontal cortex activity patterns in bipolar and unipolar depression during verbal fluency tasks based on functional near infrared spectroscopy study. *Sci Rep* 2025; 15: 21257 [PMID: 40593067 DOI: 10.1038/s41598-025-05896-z]

5. Authors should also pay attention to language presentation, which should preferably be scrutinized by a professional native English speaker.

Responses: We have arranged for a professional native English speaker to carefully revise the language of the manuscript to ensure that the expression is accurate, fluent, and in line with academic writing standards.

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PEER-REVIEW REPORT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112056

Title: Innovations and Approaches in Depression Detection Via Functional Near-Infrared Spectroscopy: A Mini Review

Provenance and peer review: Invited Manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 08345064
Position: Editorial Board
Academic degree and professional title: Assistant Professor, PhD
Reviewer's Country/Territory: China
Author's Country/Territory: China

Manuscript submission date: 2025-07-16

Reviewer chosen by: AI Editor

Reviewer accepted review: 2025-07-17 02:58

Reviewer performed review: 2025-07-23 08:49

Review time: 6 Days and 5 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? **Yes** 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** Is the content of the Introduction adequate? **Yes**

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	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? **No** 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? **Yes** Are additional experiments needed for the study? **Yes** 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)

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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: Anonymous
	Conflicts-of-Interest: No
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

Depression now affects over 280 million people worldwide and is projected to become the leading cause of disability by 2030, yet its diagnosis remains challenging, spurring demand for innovative approaches. This gap has intensified the search for objective, low-cost biomarkers that can be deployed quickly in primary-care or community settings. Against this backdrop, the authors' proposal that functional near-infrared spectroscopy (fNIRS), which is a portable, non-invasive optical imaging technique, could serve as a scalable depression-screening tool is both timely and compelling. This topic is both important and useful. The success application of this approach could quickly translate into better patient care and improved mental-health outcomes. The mini-review would benefit from three specific refinements.

First, regarding scope and sample size, the article provides a concise synthesis of resting-state and task-based fNIRS studies, but the cumulative participant total remains below 1,000.

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This limitation markedly reduces statistical power and weakens the persuasiveness of the findings. The authors should explicitly discuss it and future studies should recruit a broader, more diverse participant pool.

Response:We acknowledge the limitation that the cumulative number of participants in the reviewed studies is less than 1,000, which may affect the statistical power and persuasiveness of the findings. In the revised manuscript, we have added the relevant content in the discussion to explicitly discuss this issue.

Second, although the review spotlights facial, emotion recognition and verbal-fluency tasks, it leaves out essential details, such as the exact stimuli, timing, and baseline duration, which strongly shape the observed haemodynamic signals. Similarly, the manuscript lists several analytical pipelines and machine-learning classifiers, but offers no side-by-side comparison of their merits, drawbacks, or best-use scenarios. The authors should therefore include these missing details.

Response: We agree that the exact stimuli, timing, and baseline duration of the tasks, as well as the comparison of analytical pipelines and machine learning classifiers, are crucial for a comprehensive understanding of the research. In the revised version, we have supplemented these missing details. For the analytical methods, we have added a table to present a side-by-side comparison of the merits, drawbacks, and best-use scenarios of different analytical pipelines and machine learning classifiers.

[page 9]

Interpretability techniques, such as SHAP values or feature importance analysis, were employed to identify brain regions and functional connectivity patterns that were most predictive of depression, thereby enhancing the clinical applicability of the approach. All articles are summarized in Table 1.

[page 19]

Table 1 Summary of machine learning-based detection methods

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Author	Method	Year	Task	Sample Size	Number of Channels	Evaluation Criterion
Enneking et.al[27]	SVR	2022	Resting	64(34P+30HC)	53	—
Yu et.al[47]	GNN	2022	VFT	96	53	ACC(0.8775)
Shao et.al[48]	2D-CNN	2024	Vision	96(17HC+79P)	53	ACC(0.905)
Huang et.al[49]	SVM	2024	VFT	140	52	ACC(0.928)
Kim et.al[50]	SVM	2023	Stroop	34	15	ACC(0.703)
Wang et.al[51]	AlexNet	2021	Vison	96(17HC+79P)	53	ACC(0.90)
Lin et.al[55]	RF	2025	VFT	143(73HC+70P)	44	ACC(0.77)
Mou et.al[56]	1D-CNN	2025	VFT	172(132P+40HC)	22	ACC(0.7957)

P:Patients; HC: Healthy control; ACC: Accuracy; SVR: Support Vector Regression; GNN: Graph Neural Network; 2D-CNN: 2D Convolutional Neural Network; SVM: Support Vector Machine; RF: Random Forest; 1D-CNN: 1D Convolutional Neural Network.

Third, In the discussion part, the author did not show the limitation and future direction of the applications of fNIRS. The authors should add some sentence including the forward-looking discussion underplays current fNIRS constraints such as depth sensitivity, susceptibility to

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systemic physiological noise, and absence of standardized acquisition protocols for psychiatric screening and etc. A clearer roadmap should therefore outline multi-site harmonised data collection with more participants, integration with complementary biomarkers and prospective cost-effectiveness trials in primary-care settings.

Response: We recognize that the previous discussion lacked a comprehensive analysis of the limitations of fNIRS and a clear roadmap for future research. In the revised discussion, we have added content about the current constraints of fNIRS.

[page 10]

Limitations

Despite the promising advances, several limitations must be acknowledged. First, the spatial resolution of fNIRS remains inferior to that of fMRI, restricting its capacity to probe subcortical structures critically involved in depression, such as the amygdala or hippocampus. Second, variability in experimental protocols (e.g., task design, duration, and channel configurations) undermines the comparability and reproducibility of cross-study findings. Third, most existing models are trained on relatively small, homogeneous samples, limiting their generalizability across diverse populations, ethnicities, and clinical subtypes. Additionally, fNIRS signals are susceptible to motion artifacts, physiological noise, and systemic variations, which can confound the interpretation of hemodynamic responses. The interpretability of machine learning models also remains a challenge; while they achieve high accuracy, the clinical translation of these "black-box" systems requires clearer neurobiological correlates. Finally, longitudinal studies are scarce, and the utility of fNIRS in tracking long-term treatment outcomes or predicting relapse has yet to be fully established. Addressing these limitations through standardized protocols, multimodal validation, and larger multi-center cohorts will be essential for translating fNIRS into a reliable clinical tool.

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RE-REVIEW REPORT OF REVISED MANUSCRIPT

Name of journal: *World Journal of Psychiatry*

Manuscript NO: 112056

Title: Innovations and Approaches in Depression Detection Via Functional Near-Infrared Spectroscopy: A Mini Review

Provenance and peer review: Invited Manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 08345064
Position: Editorial Board
Academic degree and professional title: Assistant Professor, PhD
Reviewer's Country/Territory: China
Author's Country/Territory: China

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Reviewer chosen by: Shi-Rui Bai

Reviewer accepted review: 2025-09-26 05:57

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Review time: 2 Days

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? **Yes** 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** Is the content of the Introduction adequate? **Yes**

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	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? **Yes** 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? **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 C (Good)

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Scientific significance of the conclusion in this manuscript	Grade B (Very 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	Accept
Peer-reviewer statements	Peer-Review: Anonymous
	Conflicts-of-Interest: No
Are your review comments generated by AI tools?	No

SPECIFIC COMMENTS TO AUTHORS

The revision manuscript has reorganized the structure and language in response to the previous feedback. The inculsion of table has significantly improved the clarity of the conclusions. However, noting the limitations of the reviewed studies only in the conclusion is insufficient. I recommend adding a dedicated section on limitations at the end of the Discussion. With this minor revision, I recommend acceptance.

Response: We thank the reviewer for their positive feedback and valuable suggestion. We have added a dedicated "Limitations" subsection at the end of the Discussion to provide a more critical and balanced analysis of the research field. This subsection systematically summarizes the current challenges in fNIRS-based depression detection, including:

1.The limited spatial resolution of fNIRS technology.

2.Heterogeneity in experimental protocols (e.g., task paradigms) across studies.

3.Limited generalizability of machine learning models due to small, homogeneous datasets.

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4.Signal noise and the "black-box" nature of models hindering clinical interpretation.

5.A scarcity of longitudinal studies.

[page 10]

Limitations

Despite the promising advances, several limitations must be acknowledged. First, the spatial resolution of fNIRS remains inferior to that of fMRI, restricting its capacity to probe subcortical structures critically involved in depression, such as the amygdala or hippocampus. Second, variability in experimental protocols (e.g., task design, duration, and channel configurations) undermines the comparability and reproducibility of cross-study findings. Third, most existing models are trained on relatively small, homogeneous samples, limiting their generalizability across diverse populations, ethnicities, and clinical subtypes. Additionally, fNIRS signals are susceptible to motion artifacts, physiological noise, and systemic variations, which can confound the interpretation of hemodynamic responses. The interpretability of machine learning models also remains a challenge; while they achieve high accuracy, the clinical translation of these “black-box” systems requires clearer neurobiological correlates. Finally, longitudinal studies are scarce, and the utility of fNIRS in tracking long-term treatment outcomes or predicting relapse has yet to be fully established. Addressing these limitations through standardized protocols, multimodal validation, and larger multi-center cohorts will be essential for translating fNIRS into a reliable clinical tool.