Original Article

Structured Role-Play in Physiology Practicals: Feasibility, Acceptability, and Undergraduates Perception in a Resource Limited Setting

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Abstract

Objective: To explore the student perceptions of structured role play as an active learning method during second-year MBBS physiology practical sessions and to obtain preliminary comparative data against traditional demonstration teaching.

Methodology: An exploratory repeated measure study was accomplished from September 2024 to February 2025 at Gujranwala Medical College with 94 second-year MBBS students. The Sensory Nervous System module used regular demonstrations, while the Special Senses module employed organized role play. Lastly, the efficacy of role play was assessed using a student perception survey. OSCE checklists were developed in accordance with the curricular goals of the University of Health Sciences. The teaching strategy was hidden from the faculty examiners. SPSS v28 was used to analyze the data.

Results: Role play was associated with a significant pre-to-post knowledge gain (+2.84 points, $p < 0.001$) whereas the traditional module showed a decline (−3.12 points, $p < 0.001$). OSCE scores were higher after the role-play module (6.57 ± 1.18 vs. 5.43 ± 1.07; $p < 0.001$). However, differences in content complexity and timing prevent causal attribution of outcomes to teaching method alone. Ninety percent of respondents recommended continuation of role play.

Conclusion: Structured role play is feasible and highly acceptable to students in a resource-limited Pakistani medical college and is associated with positive learning experiences and encouraging preliminary outcomes. Ultimate superiority over traditional techniques cannot be claimed from this exploratory study.

Keywords: Active Learning, Education, Medical, Undergraduate, Physiology, Role Playing, Students, Medical.

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Introduction

Nowadays, a key component of medical education is simulation-based education (SBE), which aims to increase students' clinical comfort, practical proficiency, and independence.[1]

The World Health Organization has emphasized the importance of improving healthcare education, especially in low- and middle-income countries (LMICs), where straightforward, scenario-based role play can serve as a useful and reasonably priced replacement for high-fidelity simulation.[2]

The use of simulation in medical education is still relatively new in Pakistan. Even though some institutions have begun to establish simulation centers, traditional methods like lectures and bedside instruction are still widely used.[3] A recent analysis identified several impediments, including limited academic competence, a concentration of resources in metropolitan regions, and insufficient follow-up evaluation.[4]

A useful and reasonably priced substitute that can enhance student engagement and facilitate experiential learning is peer role play. Peer role play is a practical and cost-effective solution that can enhance experiential learning and student engagement. Simulation is not always dependent on advanced equipment or technology. Simple, low-cost strategies like role play can also help pupils Improve abilities and confidence.[5]

According to research from Rwanda, even basic simulation exercises can improve competency in low-resource situations.[6] In contrast, structured simulation enables learners to perform procedures efficiently and develop confidence in comparison to traditional teaching.[7] Teachers' attitudes determine how current teaching approaches are used. Educator's mindset also influences method adoption: those favoring collaboration are more likely to implement role play.[8]

Although active learning strategies are globally accepted, their implementation in Pakistan remains limited and undocumented. The inherent differences in conceptual complexity between physiology topics make direct head-to-head comparisons of teaching methods challenging. The present work was therefore designed as an exploratory feasibility study to assess whether structured peer role play can be successfully introduced into routine physiology practicals, how students perceive it, and to gather preliminary comparative data against traditional demonstration teaching, while openly acknowledging the limitations of module and timing differences.

Methodology

Study Design and Setting

This was an exploratory feasibility pilot study with a within-subjects (repeated-measures) design rather than a comparative effectiveness trial. Two consecutive physiology modules of differing conceptual complexity were taught using different methods during the same academic year to the same cohort.

Framework Development

Clarifying the learning objectives for the chosen module and developing a pre-test to report baseline knowledge were the first steps. Realistic doctor-patient interactions that were in line with the expected physiological competences were simulated using therapeutically relevant situations based on the gaps that were found.

To ensure that every student was involved, role-playing sessions were designed to encourage active engagement. To create a courteous and concentrated learning environment, ground rules were established early on. Every lesson gave students enough time to fully inhabit their roles and put their theoretical knowledge to use in real-world situations.

To standardize the assessment of skills, structured rubrics were developed. An OSCE station on "Assessment of near Vision," which is in line with UHS competency HNSS-009, was used to measure practical abilities for the Special Senses module. Using standardized instruments like Jaeger charts, students conducted near vision assessment in an outpatient simulation. Using a four-level performance scale, the rubric evaluated tasks such as informed consent, subject positioning, chart selection, instructions, binocular testing, and outcome documenting.

For the Sensory Nervous System module, a comparable rubric was created with an emphasis on superficial reflex assessment. Both rubrics were created in accordance with international simulation-based medical education standards, had a total score of 8, with a passing score of 6, and were peer-reviewed by senior faculty (complete rubrics are in Supplementary Appendices A and B). The teaching style was kept a secret from faculty assessors. Students were encouraged to consider their knowledge, communication, and practical abilities after each session and were given structured feedback.

The evaluation cycle was completed with a post-test that assessed knowledge retention.

Participants and Sampling

Convenience sampling was used to select 120 second-year MBBS students who were enrolled in Gujranwala Medical College's physiology course. Those student were eliminated who did not finish the pre- or post-tests, was absent during either module, or refused to give feedback. Informed consent was acquired, and participation was entirely voluntary. Of these, 62 students provided comments via the post-intervention questionnaire (51.7% response rate), while 94 students finished both the pre- and post-tests (76.7% response

rate). The confidentiality of the students was upheld at all times. The Gujranwala Medical College Institutional Review Board granted ethical approval.

Study Duration

It covered two consecutive physiology modules and took place between September 26, 2024, and February 10, 2025. Ethical approval was granted by the Institutional Review Board of Gujranwala Medical College on 3rd December 2024.Teaching sessions had commenced in September 2024 as part of the routine UHS curriculum. No additional research-specific intervention occurred before approval. Pre-tests were part of normal academic practice. All post-intervention data collection (post-tests, OSCE scores, perception questionnaires) and informed consent procedures began only after ethical clearance. Participation in the questionnaire was voluntary and anonymous.

No data analysis was done prior to ethical approval, despite the fact that teaching sessions started earlier as part of the regular curriculum.

Intervention and Control

Two modules were taken into consideration:

- Module 5: Special Senses –Students took part in organized role-playing exercises that mimicked exchanges between a doctor and a patient.
- Module 6: Sensory Nervous System –

Traditional demonstration-based practical instruction was used to teach the students without any active role-playing.

In order to ensure comparability in baseline characteristics and learning conditions, the same cohort took part in both modules.

Data Collection Procedures

Standardized multiple-choice question (MCQ) assessments were used to measure knowledge both before and after the interventions. Trained faculty members who were blind to the educational approach completed standardized observation rubrics to assess practical abilities.

Perception tool

Student perception was assessed using a purpose-designed 7-item questionnaire on a 5-point Likert scale. The items were adapted from previously published article.9 No formal validation or cross-cultural adaptation process was performed. Internal consistency of the final tool was acceptable (Cronbach's α = 0.765).

Data Analysis

SPSS version 28 and graph pad prism 11 was used to analyze the data. While independent t-tests examined post-test scores between the role-play and demonstration groups, paired t-tests assessed within-group changes from pre- to post-test. Statistical significance was defined as a p-value of less than 0.05.

Results

Out of 120, Ninety four second year MBBS students completed this study including pre and post test of module 5(Special Senses) and module 6 (Sensory Nervous System) plus OSCE examination while 62 students gave feedback in the students perception questionnaire. The Shapiro-Wilk test confirmed normality for most variables ($p > 0.05$), supporting the use of parametric tests.

Knowledge Retention (Pre-Test vs. Post-Test)

Paired t-tests were used to weigh changes in knowledge before and after each intervention (Table 1, Fig. 1). Interpretation of inter-module differences is limited by unequal baseline pre-test scores, differing topic complexity, and temporal effects (end-of-semester fatigue and upcoming professional examination.

Role Play Group (Module 5):

Scores improved significantly from pre-test (M = 68.2, SD = 7.5) to post-test (M = 71.1, SD = 7.2), with a mean increase of +2.84 points ($t = 3.79$, $p < 0.001$), indicating a positive effect of role play on knowledge retention.

Traditional Group (Module 6):

On the contrary, students in the traditional group experienced a decline from a pre-test mean of 72.3 (SD = 6.9) to a post-test mean of 69.2 (SD = 6.8), a statistically significant decrease of -3.12 points ($t = -4.56$, $p < 0.001$).

Comparison of Post-Test Scores

A paired t-test comparing Post-test 1 and Post-test 2 showed no significant difference (M = -0.495, SD = 8.923), $t(94) = -0.540$, $p = 0.590$, suggesting stable performance between the two post-tests.

OSCE Performance

The same cohort accomplished OSCE assessments for the two modules. The mean score for the Special Senses station (role play) was 6.574 (SD = 1.17), while the Sensory Nervous System station (traditional demonstration) scored 5.43 (SD = 1.07). A paired t-test noted a significant difference between the modules ($t = 8.435$, $df = 93$, $p < 0.0001$), with a mean difference of -1.138 (95% CI: -1.406 to -0.8703) and a standard deviation of 1.308. The effect size (partial eta squared = 0.4334) indicates a large practical impact, suggestive of better clinical skills performance with role play (Table 3). The Near Vision station (role-play module) is procedurally different than the Superficial Reflexes station (traditional module). The observed 1.14-point difference must therefore be interpreted with extreme caution and cannot be attributed solely to the teaching method. Also, the inter-rater reliability was not formally calculated.

Student Perceptions of Role Play

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Table 1. Paired Samples Test Comparing Pre-test and Post-test Scores

Pair	Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	p-value
Pre-test 1 – Post-test 1	2.840	7.258	0.749	1.354	4.327	3.794	93	0.000
Pre-test 2 – Post-test 2	-3.117	6.623	0.683	-4.474	-1.760	-4.563	93	0.000

Table 2. Paired Samples Test Comparing Post-test 1 and Post-test 2 Scores

Pair	Mean Difference	Std. Deviation	Std. Error Mean	95% CI of the Difference		t	df
Post-test 1 – Post-test 2	-0.495	8.923	0.915	-2.312	1.323	-0.540	94

Table 3. Paired Samples Test Comparing OSCE Scores

Module	Teaching Method	Mean OSCE Score (±SD)	Min–Max (Range)	Maximum Score*	Sample Size (n)**	Paired t-test (df = 93), p-value
Special Senses (Module 5)	Role Play	6.574 ± 1.178	1–8 (7)	8	94	
Sensory Nervous System (Module 6)	Traditional Demonstration	5.436 ± 1.073	4–8 (4)	8	94	t = 8.435, p < 0.0001

Table 4. Contingency Table (n=62)

Likert Scale (1-5)	Informative & Useful	Better Medical Knowledge	Practice Medical Advice	Satisfied with Role Play	Knowledge Translates to Clinics	Social& Recreational Activity	Challenging Role Play	Recommend Role Play
Strongly Disagree (1)	5	6	3	0	0	1	1	2
Disagree (2)	1	1	9	1	4	3	14	1
Neutral (3)	4	6	20	11	7	9	171	10
Agree (4)	37	38	20	39	39	36	26	33
Strongly Agree (5)	15	11	10	11	12	13	4	16

Table 5. Summary of Chi-square Test for Student Perceptions of Role Play

Aspect Assessed	Chi-square (χ^2)	Degrees of Freedom (df)	p-value
Overall association with perception	92.04	28	< 0.001

Sixty-two students put the last touch on post-intervention perception questionnaire (5-point Likert scale). Responses indicated a high level of satisfaction (Fig. 2). Participants agreed that role play was informative and useful tool(87%), the understanding of the subject had been improved (85%), better application of skills, increase in confidence(83%), enhanced communication and good teamwork(78%) was noticed. It has been rec-

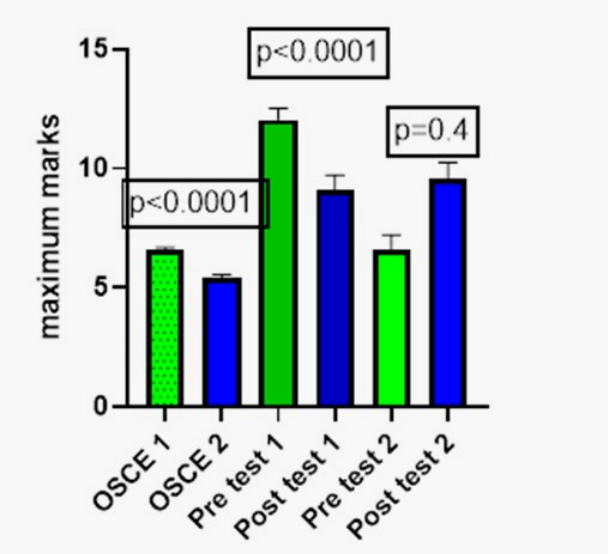

Figure 1: Comparison of Scores Obtained by 2nd year Student in modules intervened by role play and tranditional teaching method

meaningful differences in perception (Table 4).

Discussion

This feasibility pilot study demonstrates that structured peer role-play can be successfully introduced into routine second-year MBBS physiology practicals in a public-sector Pakistani medical college using existing resources and without additional contact hours. Students rated the approach very highly, with 90% recommending its continuation and more than 80% reporting improved understanding, confidence, communication, and practical skills. Knowledge scores and OSCE performance were higher after the role-play module than after the traditional demonstration module; however, because the two modules differed substantially in conceptual complexity and were delivered sequentially at different points in the academic year, these differences cannot be attributed solely—or even primarily—to the teaching method itself.

The high level of contentment is consistent with past investigations. According to research from India, role

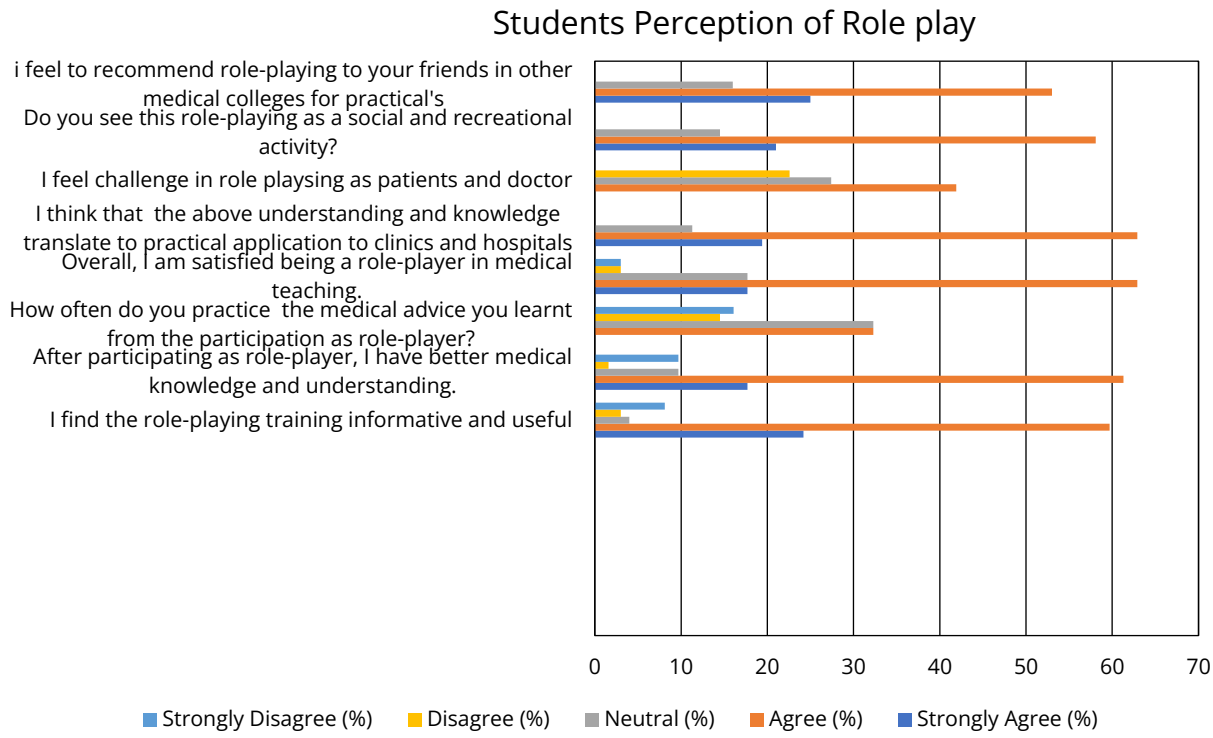

Figure 2: Students' Perceptions of Role Play in Physiology Practicals Based on a 5-Point Likert Scale

ommended that role play tools should be added in curriculum (90%).

The questionnaire response rate was 51.7% (62/120). Because baseline characteristics of responders versus non-responders were not compared, non-response bias remains a possibility and represents an important limitation.

The feedback demonstrated acceptable internal consistency (Cronbach's α = 0.765). Chi-square analysis revealed a significant association between responses and different aspects of role play ($\chi^2 = 92.04$, df = 28, $p < 0.001$), indicating that student feedback exhibited

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Appendix A: OSCE Rubric – Special Senses (Near Vision)

Level of Student: Second Year MBBS

Discipline / Specialty: Physiology

System / Sub-specialty: Special Senses

Blueprint Coordinates (Objective): HNSS-009

Setting: Outpatient

Station Title: Determination of Near Vision

Equipment: Supplies Required: Stool, well lighted room

Material Required: Subject, jaegers chart

Task: Assess the visual acuity for near vision using appropriate technique and communication skills.

Skill Component	Excellent (1)	Good (0.75)	Fair (0.5)	Needs Improvement (0)
Consent	Takes consent with all components (greeting, introduction, explanation, permission)	Performs 3 of the 4 parts correctly	Performs 1–2 parts of consent	Fails to take consent
Positioning	Positions subject at correct distance (14–16 inches)	Not confident	Corrects errors after mistake	Incorrect positioning
Choosing Chart	Chooses age/language appropriate Jaeger chart	Not confident	Corrects after error	Incorrect chart selected
Instructions	Gives clear instructions to cover one eye and read smallest line	Not confident	Corrects errors after mistake	Fails to cover one eye
Binocular Vision	Performs test on both eyes	Not confident	Corrects errors after mistake	Misses second eye
Recording	Records acuity for both eyes accurately	Not confident	Corrects error	Fails to record correctly

Total Marks: 8

Pass Marks: 6

Time Allowed: 5 minutes

play enhanced prescription writing and conceptual clarity, with more than 89% of students supporting it.[10] Kashan University studies have shown that role play improves professionalism, communication, and teamwork.[11] Phase I medical students reported enhanced professionalism and communication skills through role play, with Kalamazoo Checklist scores increasing from 27.0 to 41.2.[12] During the COVID-19 epidemic, role playing was also used to improve teamwork and flexibility.[13] At King Abdulaziz University, combining role play with case-based learning improved students' critical thinking and collaboration ($p < 0.001$).[14] In medical terminology teaching, 92-99% of participants reported that role play was interesting and successful.[15] Role play outperformed bedside teaching for paediatric trainees in Mini-CEX categories like professionalism, communication, and clinical competence ($p < 0.05$).[16]

Likewise, biomedical students who participated in stress and anger management role plays gave the sessions excellent marks for both enjoyment and utility.[17] Improvements in communication abilities using Kalamazoo measures and peer feedback during pharmacological role plays ($p = 0.001$) were also reported.[18] A survey from South India discovered that scenario-based role play resulted in higher empathy scores on the Jefferson Empathy Scale.[19] These findings support the use of role play to counteract the well-known drop in empathy, known as "empathic erosion," during medical school.[20]

Appendix B: OSCE Rubric – Nervous System (Superficial Reflexes)

Level of Student: Second Year MBBS

Discipline / Specialty: Physiology

System / Sub-specialty: Nervous System

Blueprint Coordinates (Objective): NS-P-029

Setting: Outpatient / Bedside

Station Title: Examination of Superficial Reflexes (Abdominal & Plantar)

Equipment: Supplies required: couch, well lighted room

Material Required: Subject, clinical hammer

Task: Perform assessment of superficial reflexes using proper technique and interpretation.

Skill Component	Excellent (1)	Good (0.75)	Fair (0.5)	Needs Improvement (0)
Consent and Rapport	Greets, introduces, explains procedure, obtains permission	Performs 3 of 4 steps	Performs 1–2 steps	Fails to take consent or explain task
Positioning	Positions subject properly and respectfully	Minor adjustment needed	Major adjustment needed	Incorrect or uncomfortable position
Reflex Hammer Use	Correct grip and strike technique	Minor errors in grip or strike	Awkward but usable	Incorrect use
Plantar Reflex	Correctly elicits Babinski sign with explanation	Minor delay or stroke error	Incorrect stimulation but tries to correct	Fails or incorrect test
Abdominal Reflex	Correct quadrant testing with symmetrical response	Tests 2–3 quadrants correctly	Incorrect technique or order	Fails to test or interpret reflexes
Interpretation	Accurately interprets findings and correlates with UMN/LMN signs	Minor terminology errors	Partial or hesitant interpretation	Incorrect or no interpretation
Communication	Clear language, reassures subject, avoids jargon	Mostly clear	Basic communication only	Vague or overly technical
Recording Findings	Records all findings clearly and systematically	Incomplete format	Partial or unclear record	Fails to record or records inaccurately

Total Marks: 8

Pass Marks: 6

Time Allowed: 5 minutes

Taxonomy level: Interpretation of findings / Problem-solving (analysis, synthesis, judgment leading to action)

Importance: Essential

Estimate of Difficulty: Moderate

Submitted by Dr .Sana Akhlaq in Portfolio of International certificate of medical teaching to mentor Dr. Huma Saeed , Head of department of Physiology and cell biology, University of Health Sciences, Lahore by Shifa Tameer e millat university as a part of Assignment # 7: A set of objective test items and assessment rubrics

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A meta-analysis of 12 research involving 907 students found a large impact size (0.818; 95% CI: 0.600-1.035), bolstering the efficacy of role play.[21]

Traditional lectures remain useful, especially in integrated, student-centered curriculum.[22] Role play enhances engagement, comprehension, and modification of behavior. Several studies have also found that role play improves ethical reasoning. Role play was more successful than lectures in improving nursing students' ethical sensitivity and decision-making skills.[23] Similarly, students at Bilawal Medical College reported that role play had a positive impact on their growth in thinking, doing, and attitude.[24]

At Aga Khan University, a hybrid strategy of video-based instruction and simulation resulted in higher OSCE scores, especially in neurological and abdominal tests ($p < 0.05$).[25] Overall, the study identifies role play as an excellent method for developing knowledge, psychomotor abilities, and interpersonal communication while also increasing student involvement and confidence. Combining role play with standard teaching methods may provide a more balanced approach, particularly in resource-limited contexts.

The primary limitation is that the two modules differ substantially in cognitive load and clinical reasoning demands. Special Senses practicals involve relatively straightforward psychomotor tasks, whereas Sensory Nervous System requires understanding of complex pathways — but students traditionally find both of them challenging. In addition, Module 6 was taught closer to the first professional examination, when exam pressure and intensive revision are common. These factors provide plausible alternative explanations for the observed knowledge decline and lower OSCE scores in the traditional module. Consequently, the study cannot establish causality or definitive superiority of role play.

Role-play sessions replaced part of traditional demonstration time (no extra contact hours) but required approximately 6 additional faculty hours for scenario development and briefing. Given the documented 28–40% faculty vacancy rates and limited formal teacher training in most Pakistani medical colleges, widespread adoption would require targeted faculty development programmes and institutional support (protected time, teaching assistants, or workload adjustment).

Despite these constraints, the intervention proved feasible within existing resources and was met with overwhelming student approval (90% recommended continuation).

Conclusion

Structured peer role play is feasible, requires no expensive equipment, and is highly acceptable to second-year MBBS students in a public-sector Pakistani medical college. It is associated with positive student perceptions, improved confidence, and encouraging preliminary learning outcomes. However, because of unavoidable confounding by content difficulty and timing, this exploratory study cannot conclude that role play is superior to traditional demonstration teaching. Properly powered parallel-group randomized trials using modules of matched complexity are needed before firm recommendations can be made. Until such evidence is available, role play can be considered a valuable optional active-learning supplement in resource-limited settings.

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Authors' Contribution Statement

UY contributed to the acquisition, analysis, interpretation of data, drafting of the manuscript, and critical review of the manuscript. All authors are accountable for their work and ensure the accuracy and integrity of the study.

Conflict of Interest

Authors declared no conflict on interest

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None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.