e-Bangi Faculty of Social Sciences and Humanities Universiti Kebangsaan Malaysia
Journal of Social Sciences and Humanities

ISSN: 1823-884x
Volume 23, Issue 2, DOI: https://doi.org/10.17576/ebangi.2026.2302.03

Original Research Article

Content Validity of the 24-Hour Activity Behavior Instrument and Influencing Factors among Preschool Students in Malaysia: Analysis of I-CVI and S-CVI by Experts Panel

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Received: 01 November 2025 / Accepted: 18 May 2026

Abstract. Integrated 24-hour movement behaviours encompassing physical activity, sedentary behaviour, and sleep are increasingly recognised as critical indicators of early childhood health. However, evidence on the content validity of instruments measuring these behaviours among preschool children in the Malaysian context remains limited. This study aimed to evaluate the content validity of an adapted questionnaire and a complementary semi-structured interview guide designed to assess 24-hour movement behaviours among preschool children aged 3 and 4 years. The questionnaire was adapted from the SUNRISE Global Study and contextualised to reflect local cultural practices and early childhood education settings. Content validation employed a Content Validity Index (CVI) approach with three purposively selected experts in early childhood education. Each item was rated using a four-point relevance scale, from which Item-level (I-CVI) and Scale-level (S-CVI) Content Validity Index values were computed. Most items achieved I-CVI values of ≥0.78, while S-CVI values were 0.95 for the questionnaire and 0.97 for the interview guide, indicating excellent overall content validity. Items failing to meet the recommended thresholds were revised based on expert feedback to enhance clarity and contextual appropriateness. These findings confirm that both instruments demonstrate strong content validity and are suitable for pilot testing and subsequent psychometric evaluation, providing a robust methodological foundation for large-scale research on 24-hour movement behaviours among Malaysian preschool children

Keywords: Content validity; CVI index; 24-hour behaviour; preschool children; SUNRISE questionnaire; interview.

Introduction

24-hour movement behaviours, including physical activity, sedentary behaviour, and sleep, among preschool-aged children have received increasing attention in early childhood education and public health research. Recent evidence indicates that instruments capturing behaviours across the full 24-hour period provide a more comprehensive representation of children's daily routines (Matthys, 2023). Nonetheless, the quality and contextual suitability of such instruments remain a methodological concern, particularly for children aged 3 to 4 years. Following this, empirical studies demonstrate both advancements and limitations in existing measurement approaches. For example, the Movement Measurement in the Early Years (MoveMEY) study developed and content-validated a proxy-report instrument for children aged 3 to 4 years, highlighting the importance of involving parents and researchers to improve item relevance and clarity for this age group (Phillips et al., 2022). Despite these efforts, a systematic review by Zamanzadeh et al. (2015) reported substantial variability in questionnaire content and identified that many instruments assessing 24-hour behaviours in young children lack adequate content validity and reliability. In essence, these findings highlight a persistent gap in the availability of robust, age-appropriate measurement instruments. In line with this concern, Altenburg et al. (2024) cautioned that insufficient content validity may compromise the accuracy of data used to assess adherence to 24-hour movement guidelines.

In Malaysia, early childhood routines are shaped by diverse caregiving arrangements, including extended family involvement and varying preschool schedules. Differences in access to outdoor play spaces, digital devices, and childcare resources may influence how parents and educators perceive and report children's movement behaviours, particularly among younger preschool children aged 3 to 4 years. Without careful adaptation, measurement instruments developed in other cultural contexts may fail to accurately capture these nuances, potentially leading to misclassification of behaviours or underestimation of children's adherence to movement guidelines. Notably, previous studies have highlighted that culturally insensitive instruments may compromise data quality and reduce the validity of cross-national comparisons (Tremblay, 2020).

Content validity represents an essential initial step in instrument development to ensure that items adequately reflect the intended constructs (D. F. Polit & Beck, 2006; Rutherford-Hemming, 2018). In particular, this study employed the Content Validity Index (CVI) approach, specifically the Item-level Content Validity Index (I-CVI) and Scale-level Content Validity Index (S-CVI), to evaluate expert agreement on item relevance and clarity. Consistent with established guidelines, I-CVI values ≥ 0.78 and S-CVI values ≥ 0.90 were used as decision thresholds (Zamanzadeh et al., 2015). Items meeting these criteria were retained, while those below the threshold were earmarked for revision based on expert feedback to improve clarity or contextual relevance. Furthermore, the use of CVI enables a systematic, transparent evaluation of expert agreement, providing empirical justification for retaining, revising, or removing items prior to further testing. This approach is particularly valuable in early-stage instrument development, where ensuring conceptual alignment and clarity is critical before proceeding to pilot testing or psychometric evaluation (Navarro-Pérez et al., 2023). Moreover, CVI-based validation has been widely applied in early childhood and health-related research to enhance the credibility and applicability of measurement instruments designed for young children and proxy respondents, such as parents and teachers (Putri et al., 2023).

In addition to the questionnaire, an interview guide was developed to complement quantitative findings through qualitative exploration of home environment, parental and teacher roles, nutrition, and technology use in children's daily routines. The interview items underwent the same CVI-based content validation procedure and decision criteria as the questionnaire, ensuring methodological consistency and relevance. Specifically, the content validation process involved three purposively selected experts with relevant professional backgrounds in early childhood education and extensive experience in preschool teaching and in developing child-related questionnaires. Concurrently, the use of three experts is appropriate for CVI-based assessment in early-stage instrument validation, provided that experts are selected based on domain expertise. Overall, the findings of this validation process indicate whether the adapted SUNRISE questionnaire and interview guide are suitable for use in a larger primary study or require further refinement prior to implementation. Hence, by integrating both questionnaire and interview data, the study adopts a mixed-methods perspective that enables a more holistic understanding of children's 24-hour movement behaviours within their everyday contexts. Ultimately, establishing strong content validity at this stage enhances the methodological rigour of future research and supports the development of evidence-based interventions and policies to promote healthy movement behaviours among preschool children in Malaysia.

Despite growing interest in 24-hour movement behaviour measurement, a persistent gap remains in the availability of robust, contextually appropriate instruments for preschool-aged children. A systematic review by Zamanzadeh et al. (2015) reported substantial variability in questionnaire content and noted that many instruments assessing these behaviours in young children lack adequate content validity and reliability. Although efforts such as the MoveMEY study (Phillips et al., 2023) have advanced proxy-report tool development for children aged 3 to 4 years, Altenburg et al. (2024) cautioned that insufficient content validity compromises the accuracy of adherence assessments, particularly for children under five years of age, and emphasised the critical role of end-user involvement to ensure items align with children's daily routines. Moreover, content validity is widely recognised as a foundational step prior to reliability and construct validity testing, with expert and target-group evaluations essential to ensure items accurately reflect intended constructs (Navarro-Pérez et al., 2023). Compounding this challenge, preschool children's movement behaviours are highly context-dependent, shaped by childcare settings, family routines, and sociocultural

norms that vary substantially across countries (Carson et al., 2017; Tremblay et al., 2020), such that instruments developed in Western or high-income contexts risk misclassifying behaviours without careful cultural adaptation (Carson & Kuzik, 2021). Within Malaysia, empirical evidence on content-validated 24-hour movement behaviour instruments remains limited, notwithstanding local and regional studies that have increasingly applied CVI-based approaches to enhance the relevance and cultural appropriateness of instruments used in early childhood settings (Arbine & Abd Hamid, 2024; Moktar et al., 2025; Putri et al., 2023). This gap underscores the need for systematic content validation of internationally adapted instruments for use with Malaysian preschool children, which the present study addresses.

Methodology

Figure 1 below presents a research framework and a summary of the construction process and content validity for the measurement items of the 24-hour activity behaviour instrument and influencing factors among preschool students in Malaysia.

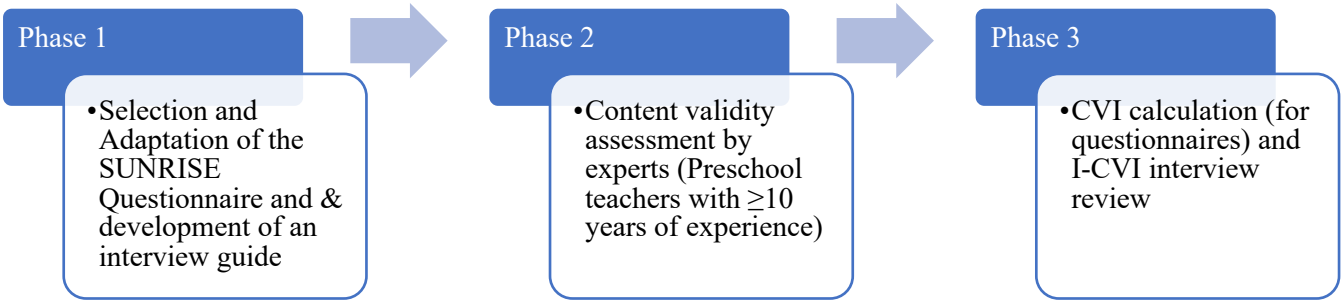

Figure 1. Framework for the SUNRISE Questionnaire Adaptation and Content Validity Study

This study employed a non-experimental instrument validation design to assess the content validity of two instruments: the adapted SUNRISE questionnaire and the semi-structured interview guide. Notably, this design was selected to ensure that the instruments used were appropriate in terms of content, language clarity, and local context before being used in a larger main study. Correspondingly, the assessment process involved three subject matter experts selected through purposive sampling, who rated each item and question using a four-point CVI-based relevance rating scale, as recommended by Lynn (1986) and D. Polit and Beck (2014). Subsequently, content validity analysis was conducted using the I-CVI and the S-CVI. This procedure is crucial in the instrument development and validation process, especially when instruments are adapted from international sources for use in different cultural contexts, such as Malaysia. Additionally, this design ensures that the results of expert assessments can be used to improve, drop, or retain items prior to the actual data collection phase. Essentially, this design emphasises the quality and validity of the instrument as the basis for measuring 24-hour activity behaviour among preschool children.

This study utilised two instruments: an adapted SUNRISE questionnaire and a semi-structured interview guide to obtain in-depth qualitative information. Specifically, the SUNRISE questionnaire was used to assess compliance with 24-hour activity behaviour among preschool children, while the interview guide aimed to obtain in-depth insights from teachers or caregivers.

Both instruments were subjected to content validity assessment using a four-point CVI-based relevance rating scale to evaluate item relevance, clarity, and contextual appropriateness. This process was essential to ensure that all items and questions used were relevant, clear, and appropriate to the context of early childhood education in Malaysia.

The expert panel comprised three experienced preschool teachers drawn from private and government educational institutions, selected through purposive sampling based on the following criteria: (1) holding a minimum of a Bachelor's Degree in Education; (2) having served in the field of early childhood education for 10 years or more; (3) being directly involved in the teaching and learning process of preschool students; and

(4) having prior involvement in reviewing or refining child-related educational instruments. These criteria ensured that the instrument's content was evaluated by professionals with the necessary domain knowledge to judge its relevance, clarity, and contextual appropriateness for the Malaysian preschool setting.

This study adhered to the ethical principles governing research involving human participants. Ethical approval was obtained from the Research Ethics Committee of Universiti Kebangsaan Malaysia (UKM) under research grant GUP-2024-038. Prior to data collection, written informed consent was obtained from all expert panel members, who were fully informed of the study's purpose, the voluntary nature of participation, and their right to withdraw at any time. Confidentiality and anonymity of participants were maintained throughout the study, and all data were stored securely and used solely for research purposes.

Each expert rated all items using a four-point relevance scale (1 = not relevant, 4 = highly relevant), consistent with CVI methodology rather than the Lawshe (1975) Content Validity Ratio (CVR) approach. The evaluation was conducted using an item-relevance assessment form provided by the researcher.

Table 1. Item Evaluation Interpretation

Score	Category	Interpretation
1	Not Necessary	This item is not relevant and should not be included in the instrument.
2	Necessary, but needs major modification	This item may be important, but it requires significant revision.
3	Needs minor modification	This item is relevant but needs some improvement in terms of structure/language.
4	Very Necessary and Clear	This item is very relevant and easy to understand without any modification.

The content validity assessment was conducted by three experienced preschool teachers who met the expert panel criteria, namely having at least a Bachelor's Degree in Education and more than 10 years of teaching experience in early childhood education. Each expert was asked to place a check mark (✓) on the level of relevance of each item based on the following scale:

In calculating the I-CVI, each item evaluated by the expert panel was assigned a relevance level. Items that received a score of 3 (Needs minor modification) or 4 (Very necessary and clear) were given a value of 1, indicating agreement that the item is relevant. On the other hand, items that received a score of 1 (Not necessary) or 2 (Necessary, but needs major modification) were assigned a value of 0, denoting that the item was deemed irrelevant by the expert assessment. Following this, the I-CVI value for each item was calculated by dividing the total value of '1' (i.e., the number of experts who agree that the item is relevant) by the total number of experts who evaluated the item. Subsequently, the S-CVI was calculated as the average of all I-CVI values across all items in the instrument. Note that this S-CVI value was used to determine the overall content validity level of an instrument, whether it is a questionnaire or an interview guide.

The content validity of the instruments was assessed using two main indicators: the I-CVI and the S-CVI. The I-CVI was calculated by dividing the number of experts who rated an item as either 3 (Relevant with minor modification) or 4 (Very relevant and clear) by the total number of experts. For instance, in this study involving three experts, the minimum acceptable I-CVI value is ≥ 0.78, as recommended by Lynn (1986). The formula used is depicted below, and items rated 3 or 4 were coded as 1 (relevant), and items rated 1 or 2 were coded as 0 (not relevant) for I-CVI computation.

$$\text{I-CVI} = \frac{\text{Number of experts rating the item as 3 or 4}}{3}$$

The S-CVI was calculated as the average of all I-CVI values across the instrument's items. The formula is demonstrated below, and an S-CVI value ≥ 0.90 is set as a benchmark for excellent overall content validity (D. F. Polit & Beck, 2006; Zamanzadeh et al., 2015).

$$\text{S-CVI} = \frac{\sum \text{I-CVI values of all items}}{\text{Total number of items}}$$

The Findings

This section presents the results of the content validity assessment for a total of 59 questionnaire items and 12 interview guide items, each evaluated by a panel of three experts. As such, the I-CVI was computed for each item to determine its relevance, clarity, and appropriateness in measuring the intended constructs. Based on the I-CVI results, decisions were made regarding whether each item should be retained, revised, or removed.

Questionnaire Evaluation Findings

Table 2 summarises the I-CVI values for selected questionnaire items. Of the 59 items assessed, the majority demonstrated strong content validity. Items with an I-CVI score below the accepted threshold of 0.78 were revised to enhance clarity and contextual appropriateness.

Table 2. Summary of I-CVI Values for Questionnaire Items

Questionnaire Item	I-CVI	Results
Item 1 – Child's age	1.00	Retained
Item 2 – Frequency of child playing outside	0.67	Revised
Item 5 – Total hours of tablet use	0.67	Revised
Item 44 – Parents allow more than 2 hours of screen time	0.67	Revised
Item 59 – Child's bedtime on weekends	0.67	Revised
Item 30 – Child running around on the playground	1.00	Retained

Findings of Interview Validity Assessment

A semi-structured interview guide containing 12 open-ended questions was developed to cover the following main themes: family and caregiver background; sedentary behaviour, screen time, and sleep; food sources; food diversity; eating habits at home; and food insecurity (Table 3). Specifically, all of these questions were assessed by three experts in early childhood education on content suitability, language clarity, and context suitability. Accordingly, the assessment revealed that 10 of 12 questions (83.3%) received an I-CVI score of 1.00, implying full agreement among the three experts that the questions were relevant, clear, and appropriate for this research. Hence, all these questions were retained without amendment.

Table 3. Summary of I-CVI Values for Interview Items

Question	Interview Item	I-CVI	Result
1	Family and caregiver background	1.00	Maintained
2	Communication between teachers and guardians	1.00	Maintained
3	Observed sedentary behaviour	1.00	Maintained
4	Sleep and screen time information from caregivers	1.00	Maintained
5	Observations related to sleep time	0.67	Revised
6	Observation of the food supply is insufficient	1.00	Maintained
7	Caretakers pay attention to food preparation	1.00	Maintained
8	Home environment and play space	1.00	Maintained
9	Variety of food in supply	1.00	Maintained
10	Challenges in ensuring food diversity	1.00	Maintained
11	Sharing experiences of eating routines at home	1.00	Maintained
12	The role of nutrition in children's behaviour	0.67	Revised

However, two questions (16.7%), namely Item 5, which is related to observing children's sleep time, and Item 12, which is related to the role of nutrition on children's behaviour, recorded an I-CVI score of 0.67. This score indicates that at least one expert assessed the questions as unclear or in need of improvement. Based on the feedback, these two items were revised to improve sentence structure, local context adaptation, and conceptual and language clarity, making them easier to understand and more relevant to the target population. After the improvement process, the overall S-CVI for this interview guide was 0.97, reflecting excellent content validity. Therefore, this refined interview guide is considered methodologically sound and suitable for use in the subsequent phase to obtain in-depth qualitative data on preschool children's 24-hour activity behaviour and the factors influencing it. The overall S-CVI for the interview was 0.97, implying that the instrument has excellent content validity for qualitative data collection.

Overall Summary of Findings

In general, all instruments demonstrated strong content validity, as follows. The S-CVI values exceed the threshold recommended by Polit and Beck (2006), demonstrating that the overall construct and item structure are appropriate and valid in the cultural and early childhood education context in Malaysia.

Table 4. Overall Summary Findings

Type of Instrument	Number of Items	Item I-CVI ≥ 0.78	Item I-CVI < 0.78	S-CVI
Questionnaire	59	52	7	0.95
Interview	12	10	2	0.97

Discussion

The findings indicate that the instrument comprising the SUNRISE questionnaire and interview guide implies a high level of content validity, as evaluated using the CVI approach, specifically the I-CVI and S-CVI. Content validation was conducted by three purposively selected experts, a panel size considered adequate for initial CVI-based instrument evaluation. Meanwhile, the S-CVI values obtained (0.95 for the questionnaire and 0.97 for the interview guide) exceeded the benchmark of ≥ 0.90 recommended by Polit and Beck (2006), indicating strong agreement among experts regarding the relevance of the items for measuring 24-hour activity behaviour among preschool children.

Content Validity of the Questionnaire Instrument

Most questionnaire items achieved high I-CVI values (1.00), reflecting unanimous expert agreement on item relevance and clarity. Thus, this finding is consistent with previous research demonstrating the effectiveness of the CVI method in identifying and refining items during early instrument development (Abdul Kadir & Mohd, 2021; Zamanzadeh et al., 2015). However, seven items recorded I-CVI values below the recommended threshold of 0.78. These items were identified for revision and rewording to improve clarity and contextual suitability rather than removal. Conversely, lower ratings were primarily associated with items perceived as overly general or insufficiently aligned with local routines. For instance, the item on weekend screen time (Item 59) needed modification because patterns of digital device use among Malaysian preschool children vary substantially by family socioeconomic background. In essence, this finding underscores the significance of cultural and contextual adaptation when applying international instruments within the Malaysian setting.

Content Validity of the Interview Guide

The interview guide reported a similarly high level of content validity, with most items meeting the I-CVI threshold. Two interview questions were identified for revision to enhance specificity and contextual relevance. For example, the question “How does nutrition affect children’s behaviour?” was restructured to focus on concrete daily practices, such as sugar intake before bedtime or eating habits during screen use. Notably, these revisions were intended to facilitate richer and more focused responses during interviews.

Consistent with previous findings, interview instruments require careful attention to cultural context and lived experiences to ensure meaningful data collection in child development research. Additionally, refining interview questions to emphasise observable routines and context-specific behaviours is particularly crucial when exploring 24-hour movement behaviours among preschool children, as young children may not be able to articulate their experiences directly. Thus, by prompting parents and caregivers to reflect on specific practices, such as meal timing, snack choices, and technology use, the revised interview guide is better positioned to capture nuanced information that complements questionnaire data. On a similar note, this approach enhances the depth and interpretability of qualitative findings and supports a more holistic understanding of children's daily movement patterns within the home and preschool environment.

Research Implications

The application of the CVI (I-CVI and S-CVI) in this study is consistent with recent Malaysian instrument development research, which emphasises expert-based content validation as a critical foundation prior to psychometric testing. Furthermore, studies conducted in local educational contexts have revealed that CVI-supported validation strengthens item relevance, clarity, and contextual suitability, thereby enhancing instrument credibility and applicability (Arbine & Abd Hamid, 2024; Moktar et al., 2025). From a research perspective, the findings underscore the significance of conducting systematic content validation when adapting international instruments for use in local contexts. Establishing content validity at an early stage provides a strong methodological foundation for subsequent phases of instrument development, including pilot testing, reliability assessment, and construct validation. Moreover, the use of CVI enables transparent reporting of expert agreement, allowing future researchers to replicate or extend the validation process in different populations or settings. This CVI-based approach contributes to the growing body of Malaysian research on rigorous instrument development in early childhood and public health studies.

Practice Implications

In practical terms, the validated questionnaire and interview guide provide a culturally adapted instrument suitable for assessing 24-hour activity behaviour among Malaysian preschool children. The findings highlight that adapting international instruments such as SUNRISE requires more than direct translation. It necessitates careful consideration of linguistic, cultural, and socioeconomic factors that shape children's daily routines. This approach enhances the instrument's relevance and acceptability for educators, researchers, and policymakers in early childhood settings. At the same time, practitioners may use the validated instruments to identify patterns of physical activity, sedentary behaviour, and sleep that warrant targeted intervention at the preschool or community level. On the other hand, for policymakers, the availability of contextually appropriate measurement instruments supports evidence-based decision-making related to early childhood health promotion and guideline implementation. Additionally, the combined use of questionnaire and interview data enables practitioners to triangulate quantitative findings with qualitative insights, thereby informing more tailored, culturally responsive strategies to promote healthy movement behaviours among young children.

Strengths and Limitations of the Study

This study is strengthened by the use of systematic, theory-driven procedures to assess content validity and by the involvement of experts with relevant disciplinary backgrounds in early childhood education and related fields. Nevertheless, several limitations should be acknowledged. The content validation process involved only three experts, which, although adequate for an initial CVI assessment, may limit the breadth of perspectives obtained (Ayre & Scally, 2014). In line with this, the validation was based solely on expert judgement and has not yet been tested with the target population. These limitations will be addressed in subsequent phases through pilot testing, the inclusion of larger samples, and further psychometric evaluation, including reliability testing and construct validity analyses. Another limitation concerns reliance on proxy reporting by parents and educators, which may be subject to recall bias or social desirability effects. However, this approach is commonly used in early childhood research due to the developmental limitations of self-report

among young children. Hence, future studies may consider integrating objective measures, such as accelerometers or sleep monitoring devices, to complement subjective reports. Nonetheless, despite these limitations, the current study provides a significant methodological contribution by establishing a strong content-valid foundation for subsequent empirical investigations of 24-hour movement behaviours among Malaysian preschool children.

Conclusion

This study has successfully assessed the content validity of two instruments: the adapted questionnaire from the SUNRISE Study and the interview guide developed specifically for the Malaysian context. Using the I-CVI and S-CVI, based on a 4-point CVI relevance rating scale, it was revealed that both instruments have excellent content validity, with S-CVI values exceeding 0.90 for both components.

Moreover, the findings indicated that 88.1% of the questionnaire items and 83.3% of the interview items achieved I-CVI ≥ 0.78, while the remaining items were reviewed and suggested for improvement. This result provides confidence that the items used are relevant, content-valid, and appropriate for measuring 24-hour activity behaviour among 3- and 4-year-old preschool children in Malaysia.

Collectively, this assessment contributes to refining existing instruments and supports the need to contextualise international instruments within local culture and the education system. It also provides a solid foundation for large-scale field studies, particularly for research monitoring adherence to the World Health Organization (WHO) Global Guidelines for Physical Activity, Sedentary Time, and Sleep for children under five years of age. Recommendations for further research include:

Recommendations for future research include: (1) conducting construct validity assessments (Exploratory and Confirmatory Factor Analysis) to identify stable factor structures; (2) assessing the reliability of the instrument through pilot testing with the actual target population; (3) examining the relationship between 24-hour activity behaviour and other variables such as anthropometric status, executive function, and motor skills of children; and (4) expanding the use of this instrument to other populations, such as rural kindergartens and B40 communities, to increase the generalisability of the findings

In conclusion, this study demonstrates that assessing content validity using the CVI approach is an essential and effective step in developing a robust research instrument. This validated instrument has the potential to be widely employed in public health studies, early childhood education, and policy monitoring related to child development in Malaysia.

Acknowledgement: The financial support from the Ministry of Education [KPM.BT.700-30/23] is gratefully acknowledged. Furthermore, this study could represent a continuation of research conducted the previous year. Therefore, the researcher extends sincere appreciation to the institutions and affiliated parties whose support facilitated the successful execution of this study.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: We would like to declare that there are no conflicts of interest associated with this publication. All authors have been fully informed and actively participated in the study.

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