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Music performance self-efficacy scale development study

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ABSTRACT

In this study, it was aimed to develop a measurement tool to measure middle school students' music performance self-efficacy. There were 2 separate research groups in the study, 447 observation sets in the first research group and 351 observation sets in the second research group. Exploratory factor analysis (EFA) was conducted with the first research group and confirmatory factor analysis (CFA) with the second research group. In the study, a factor structure consisting of 5 factors, explaining 59.9% of the total variance and 27 items with factor loadings ranging from 0.365 to 0.770 was obtained. As a result of CFA, it was determined that the standardized values ranged between 0.59 and 0.84 and the fit indices were within the model fit criteria. The cronbach alpha value obtained for the entire factor structure was 0.922. When the sub-factors were analysed, it was found that the Cronbach alpha value of the first factor was 0.904, the second factor was 0.815, the third factor was 0.763, the fourth factor was 0.815, and the fifth factor was 0.760. As a result of all findings, it was revealed that the developed scale is a valid and reliable measurement tool.

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1. INTRODUCTION

At the centre of music education is the musical performance of individuals. Music performance means the ability of individuals to exhibit the cognitive, affective and psychomotor learnings they have acquired in music education processes with a musical performance. There may be many affective elements that can affect music performance. One of the important affective elements among these elements is the self-efficacy of individuals towards their performances. Self-efficacy is related to judgements about how well an individual can organise and implement the necessary action plans to cope with many uncertain, unpredictable, and often stressful situations [1]–[4]. In this context, the fact that individuals are likely to encounter stress, anxiety, during their musical performances and that these possibilities can negatively affect their performances suggests that self-efficacy is an important factor in music performance.

Individuals may experience affective problems such as anxiety, worry, during their performances. Musical performances are not only a physical activity but also a mental activity. Many factors such as mental comfort, belief in success, and self-confidence are important for individuals to perform successfully. The thoughts of anxiety and fear that individuals create in their minds during their performances can have a negative effect on their performances. Individuals who have positive thoughts about their performance and believe that they can perform successfully can also perform successfully. Individuals' performances can change according to their self-efficacy beliefs [5]. In this context, it is thought that it is important to determine the self-efficacy levels of individuals in order to realize a successful performance based on skill in music education [6]. When the literature was examined, it was stated that music performance self-efficacy is an important element in many

studies [7]–[19]; however, it was observed that a measurement tool that comprehensively explains individuals' music performance self-efficacy with its musical sub-dimensions has not been developed. In this context, this study is original research. The aim of the study is to develop a valid and reliable instrument that measures the music performance self-efficacy of middle school students.

2. METHOD

In this research, it was aimed to develop a measurement tool that determines the music performance self-efficacy levels of secondary school students. In this context, the research is basic research. In the scale development process, "scaling approach through graduated sums" was used. The ranked sums scaling approach, which is one of the scaling approach types, focuses on placing individuals in a different place on the scale in line with the responses of the respondents to the items [20].

2.1. Participants

Within the scope of the research, two different research groups were used; exploratory factor analysis (EFA) was performed with the first research group and confirmatory factor analysis (CFA) was performed with the second research group. The EFA research group consisted of 450 students. As a result of examining the assumptions, the number of observations was reduced to 447 and the analysis process was continued with 447 observations. The CFA research group (second research group) consisted of 364 students. As a result of the examination of the assumptions, the number of observations was reduced to 351 and the analysis process continued with 351 observations.

2.2. Procedure

The scale development process started with the item writing study. In this context, the 42-item item pool was prepared for expert validity and presented to the experts. In the analysis phase of the data obtained from the experts, Davis [21] technique was used to calculate the content validity indices of the items. The minimum value of 0.62 (α=0.05) in the item equivalent specified by Hooper and Veneziano [22] was accepted as a criterion; no item that did not meet the minimum value (CSV>0.62, α=0.05) was identified. However, the remaining items were examined in line with the suggestions given by the experts; it was decided by the researchers that 9 items measuring the same purpose, repeating each other and thought to be combined in a single item should be removed; and the trial form consisting of 33 items was made ready.

2.3. Data analysis

EFA was performed in order to reveal the latent structure of the scale and the relationship between the items. In order to perform EFA, firstly, the necessary assumptions (missing data, normality examination, single, and multiple outliers, multiple connection problem) were tested. As a result of the analyses, it was determined that there was no missing data and the distribution was normal. When single and multiple outliers were analysed, it was found that there were univariate outliers in 3 observations whose Z values were not between -4 and +4; and there were no multivariate outliers as a result of the examination according to the Mahalanobis distances (χ 33.128, 0.001>63.87). In line with these results, the observations were removed from the analysis process and the study was continued with 447 observations. Collinarity statistics were used to determine the multicollinearity problem among the items. In this context, the multicollinearity problem was examined by looking at the tolerance and variance inflation factor (VIF) values (tolerance 0.20; VIF 5); Durbin-Watson statistic was used for the independence of errors. The Durbin-Watson value between 2 and 2.5 indicates that there is no autocorrelation problem [23]. As a result of the analyses, since the Tolerance values are between 0.317 and 0.726 and the VIF values are between 1.378 and 3.158, no multicollinearity problem was found and the Durbin-Watson value (2.117) was found to be at an acceptable level. The research continued with 447 observations and 33 items in the observation set.

Following the hypothesis examinations carried out within the scope of the research, Kaiser-Meyer-Olkin (KMO) and Bartlett tests were conducted to test whether the data were suitable for EFA. In line with the results obtained, it was observed that there was no relationship between the factors based on the covariance matrix; since there was no relationship between the factors, varimax rotation technique, which maximises the variance, was preferred. After the examinations, it was taken into consideration that the common variance of the items in the data analysis was 0.50, the factor loading was 0.45, and the difference between the factor loadings of the factors obtained was 0.10 [24].

While deciding the number of factors, the slope graph, the number of factors with eigenvalues higher than 1 (Kaiser method) and the total variance explained were taken into consideration. After the examinations made within the scope of EFA, appropriate factor structures were reached.

CFA was performed to strengthen the construct validity of the scale obtained as a result of EFA. As a result of the analyses, no single outlier was found because the Z values were between -4 and +4; as a result of the examination made according to the Mahalanobis distances (χ 15, 0.001>55.48), it was determined that there were no missing data, the data were normally distributed and there were multivariate outliers in 13 observations. Within the scope of the results, 13 observations were removed from the analysis process and the study was continued with 351 observations. Tolerance and VIF values (tolerance 0.20; VIF 5) were examined for the multicollinearity problem among the items, and Durbin-Watson statistic was used for the independence of errors. Since the Tolerance values were between 0.292 and 0.658 and the VIF values were between 1.520 and 3.424, no multicollinearity problem was found and the Durbin-Watson value (2.078) was found to be at an acceptable level. In line with these results, CFA was continued with 351 observations.

As a result of the CFA with 351 observations, factor loadings, standardised values, t values, and fit indices (non-normed fit index (NNFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR)) were obtained and model-data fit was determined. For convergent and divergent validity, composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average of the square of the MSV were analysed. As a result of the analyses, it was determined that the model-data set fit was achieved.

Cronbach alpha method, convergent and divergent validity analyses, convergent and divergent validity analyses were performed for the reliability analysis of the study. The reliability coefficient of the whole scale obtained as a result of EFA with Cronbach alpha method and the reliability coefficients of each sub-factor were calculated. Within the scope of the research, combinatorial reliability was used in the CFA study group. With the obtained CR value, alternative reliability to cronbach alpha value was calculated. At the same time, convergent validity studies were carried out by examining the AVE based on CFA, and divergent validity studies were carried out by examining the MSV squared and the ASV. Based on the estimated standardised loadings and error variances of the measurement models and the correlations between factors in multifactor structures, CR, AVE, and MSV values for the proposed multifactor model were obtained. CR>0.70; AVE<CR and each AVE value of 0.5 and above for convergent validity; and MSV<AVE for divergent validity [25], [26] were used in the appropriateness assessments of the obtained evidence.

3. RESULTS AND DISCUSSION

3.1. Exploratory factor analysis

Personal perceptions of self-efficacy are particularly relevant in the field of music performance, which is oriented toward the outward expressions of one's own ability through public performances [9]. Moreover, it is recommended to study the self-efficacy as a coping mechanism for music performance anxiety [10]. After the necessary assumptions for performing EFA (missing data, normality examination, single and multiple outliers, multiple connection problem) were fulfilled, EFA applications were started with 447 observations and 33 items. For the suitability of the data for factor analysis, KMO and Bartlett's tests were performed and the explained common factor variances (communalities) were examined. It was determined that an excellent fit was achieved with KMO value (0.916>0.50); and as a result of the Barttlet test, the chi-square test was significant ($\chi 2=5847.426$, $p<0.05$). These results showed that the data were suitable for factor analysis. When the explained common factor variances were analysed, it was observed that the values varied between 0.365 and 0.770. As a result of the analyses conducted for the factor structure, it was observed that a five-factor structure with an eigenvalue greater than 1.00 was formed. The total variance explained by the five factors was 59.9% and the first factor alone explained 34.5% of the total variance, the second factor alone explained 9.2%, the third factor alone explained 6.7%, the fourth factor alone explained 5.6% and the fifth factor alone explained 3.9%. The scree slope graph for the eigenvalues of the factors is presented in Figure 1.

It is observed that the eigenvalues in the slope graph in Figure 1 decline between factors 1-5 and then exhibit a horizontal movement. In this context, it is seen that a 5-factor structure is formed. In this context, when the factor eigenvalues in Figure 1 are analysed together with the slope graph and the total variance explained (59.9%), it is concluded that the factor structure obtained has 5 factors. In Table 1, the factor loadings of the items in the factor structure and the common variances explained are given.

When Table 1 is analysed, it is seen that there are 8 items in factor 1 and the factor loads vary between 0.589 and 0.772; 6 items in factor 2 and the factor loads vary between 0.532 and 0.760; 5 items in factor 3 and the factor loads vary between 0.611 and 0.736; 4 items in factor 4 and the factor loads vary between 0.574 and 0.812; 4 items in factor 5 and the factor loads vary between 0.535 and 0.701. When the explained common variance is analysed, it is observed that the values vary between 0.365 and 0.770. When all the findings obtained were analysed, it was determined that the results were highly valid. In this context, the construct measured by the items in the 1st factor was named as "self-efficacy for playing the instrument" and accounted for 34.5% of the total variance; the construct measured by the items in the 2nd factor was named as "self-efficacy for vocalising notes" and accounted for 9.2% of the total variance; the construct measured by the items in the 3rd

factor was named as “self-efficacy for singing” and accounted for 6.7% of the total variance; the construct measured by the items in the 4th factor was named “self-efficacy for vocalising music genres” and accounted for 5.6% of the total variance; the construct measured by the items in the 5th factor was named “self-efficacy for rhythm” and accounted for 3.9% of the total variance. The structure measured by 5 factors together was named as “music performance self-efficacy scale” by the researchers. As a result of the analyses, it was determined that the total variance explained by the structure obtained was 59.9%.

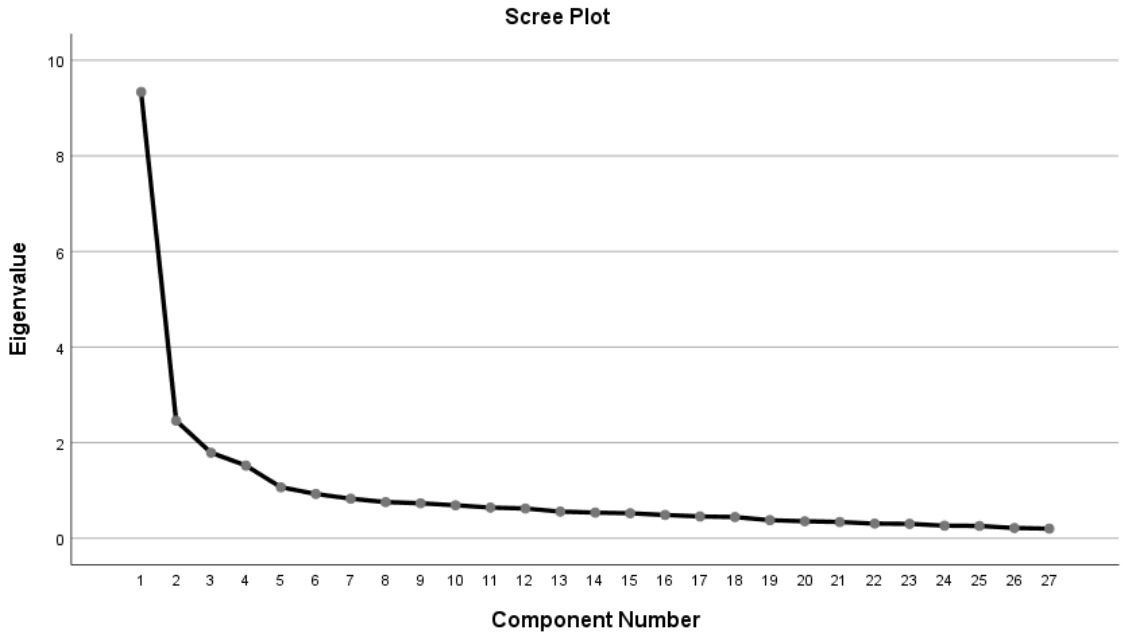

Figure 1. Slope graph of factor eigenvalues

Table 1. Factor analysis results

Factors		Articles	Factor loadings	Common variance
Self-efficacy towards playing the instrument	Article 1	I can play a piece correctly with my instrument according to the note sounds	0.772	0.714
	Article 2	I can accompany a person singing with my instrument	0.743	0.637
	Article 3	I can accompany a person playing an instrument with my instrument	0.743	0.650
	Article 4	I can play a piece correctly with my instrument according to note durations	0.733	0.699
	Article 5	I can participate in group instrument playing activities	0.724	0.585
	Article 6	I can play an instrument by looking at notes	0.677	0.607
	Article 7	I can play an instrument individually	0.647	0.564
	Article 8	I can create my own melodies with my instrument	0.589	0.591
Self-efficacy towards note vocalisation	Article 9	I can read notes individually	0.760	0.634
	Article 10	I can vocalise note durations correctly	0.744	0.645
	Article 11	I can vocalise the notes correctly	0.725	0.632
	Article 12	I can vocalise a song correctly according to note durations	0.647	0.544
	Article 13	I can sing a song correctly according to its note	0.644	0.563
	Article 14	I can sing by looking at the notes	0.532	0.365
Self-efficacy for singing	Article 15	I can sing the lyrics correctly when I read a song	0.736	0.636
	Article 16	I can continue singing even if I make a mistake while singing	0.688	0.488
	Article 17	I can sing alone without instrumental accompaniment	0.656	0.490
	Article 18	I can vocalise songs without mistakes	0.645	0.570
	Article 19	I can accompany a person singing with my voice	0.611	0.487
Self-efficacy towards vocalising music genres	Article 20	I can perform examples of Turkish art music pieces	0.812	0.770
	Article 21	I can perform examples of Turkish folk music pieces	0.809	0.762
	Article 22	I can distinguish between national music genres (Turkish folk music, Turkish art music, religious music, mehter music) when I listen to them	0.731	0.594
	Article 23	I can perform examples of popular music (pop) pieces	0.574	0.524
Self-efficacy towards rhythm	Article 24	I can accompany a person playing an instrument with rhythm	0.701	0.668
	Article 25	I can create my own rhythms	0.685	0.595
	Article 26	I can accompany a person singing with rhythm	0.673	0.651
	Article 27	I can accompany myself with rhythm while singing	0.535	0.510

3.2. Confirmatory factor analysis

CFA was performed in order to provide additional evidence for the construct validity of the factor structure revealed by the EFA. The t values and standardised values obtained as a result of the CFA are shown in Figure 2, and the r values showing the relationship between the factors are shown in Table 2. When Figure 2(a) is analysed, it is observed that the factor loadings of the items vary between 0.59 and 0.84. When Figure 2(b) was analysed, it was found that t values were significant ($p<0.001$). The results obtained from Figures 2(a) and 2(b) show that there is a relationship between item and factor structures.

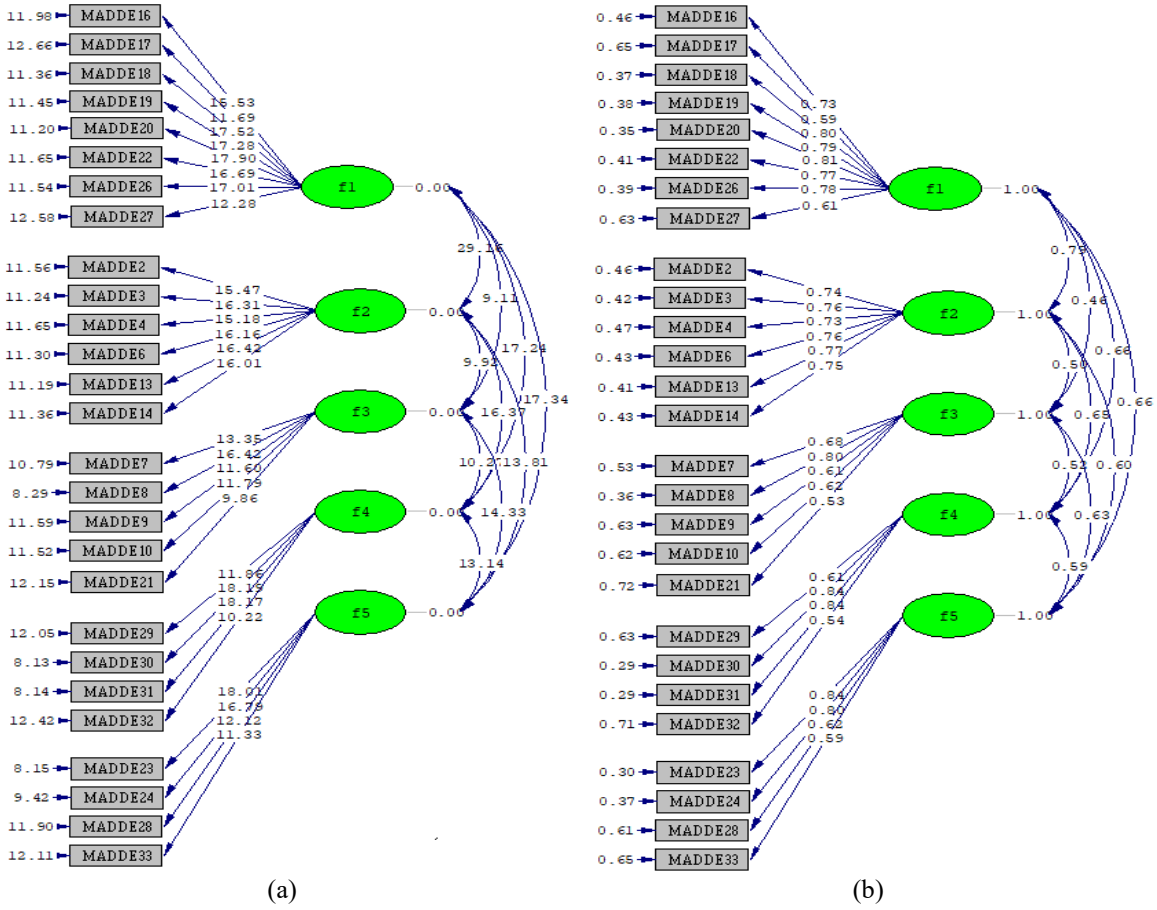

Figure 2. T values and path diagrams with standardized factor loadings: (a) T values and (b) standardised load values

Table 2. r values showing the relationship between factors

Factors	R
f1-f2	0.79
f1-f3	0.46
f1-f4	0.66
f1-f5	0.66
f2-f3	0.5
f2-f4	0.65
f2-f5	0.6
f3-f4	0.52
f3-f5	0.63
f4-f5	0.59

When Table 2 is analysed, it is concluded that the relationship between the factors is significant ($p<0.05$). When the results obtained from Figures 2(a), 2(b), and Table 2 were analysed together, it was found that the factor loadings of the items varied between 0.59 and 0.84 and the t values were significant ($p<0.001$). All the results obtained show that the relationship between the factors is significant ($p<0.05$). When the fit

indices of the model were examined as a result of CFA, NNFI=0.96, CFI=0.97, RMSEA=0.076, and SRMR=0.072. When all the findings obtained are evaluated together; the fact that the standardised load values are high, t values are reached and the model fit indices are among the good model criteria reveals that model-data fit is provided. As a result, a reliable and a valid scale was developed. As cited in [11], studies on school academic subjects their investigation demonstrated the importance of self-efficacy in predicting young musicians' performance examination results.

3.3. Convergent and divergent

Convergent and divergent validity studies were conducted as a result of CFA. For convergent validity, CR, and maximum explained common AVE values for the factors were analysed. Table 3 shows the CR and AVE values.

When Table 3 is analysed, CR values are 0.90 for factor 1, 0.88 for factor 2, 0.78 for factor 3, 0.80 for factor 4, and 0.80 for factor 5; AVE values are 0.54 for factor 1, 0.56 for factor 2, 0.56 for factor 2, 0.42 for factor 3, 0.52 for factor 4, and 0.51 for factor 5. The fact that AVE values are above 0.50 and at the same time lower than CR values (AVE>0.50; AVE<CR) shows that convergent validity is provided. The result obtained shows that the items under the relevant factor have a high relationship with each other.

For divergent validity, maximum explained variance and maximum mean explained variance values were calculated. MSV value was found as 0.62 and ASV value was found as 0.37. The obtained results show that ASV value is smaller than AVE values, but MSV value is larger than AVE values. When the analyses were examined, it was observed that the reason why the MSV value was greater than the AVE value was due to the high relationship (r:0.79) between factors 1 and 2. This result shows that the related factors are independent and separated from each other, and that single procedures with other factors other than factors 1 and 2 will produce a reliable and valid result.

Table 3. CR and maximum explained mean variance values

Factors	CR	AVE
Factor 1	0.90	0.54
Factor 2	0.88	0.56
Factor 3	0.78	0.42
Factor 4	0.80	0.52
Factor 5	0.80	0.51

3.4. Reliability

As a result of the analyses performed, Cronbach's alpha reliability coefficients and CR values were examined in the reliability study of the music performance self-efficacy scale consisting of 27 items. As a result of EFA procedures, the Cronbach alpha value determined for the entire factor structure is 0.922. As a result of the examination of the sub-factors, it was determined that the Cronbach alpha value of the first factor was 0.904, the second factor was 0.815, the third factor was 0.763, the fourth factor was 0.815, and the fifth factor was 0.760. When the unifying reliability coefficient determined as a result of CFA was analysed, it was found that the first factor was 0.90, the second factor was 0.88, the third factor was 0.78, the fourth factor was 0.80, and the fifth factor was 0.80. All the detected results reveal that the measurements to be made with the developed scale will be reliable.

4. CONCLUSION

As a result of the construct validity studies conducted within the scope of the research, a reliable and valid measurement tool measuring the music performance self-efficacy of secondary school students was developed. The developed measurement tool has a 5-factor structure and consists of 27 items. There are 8 items in the 1st factor, 6 items in the 2nd factor, 5 items in the 3rd factor, 4 items in the 4th factor, and 4 items in the 5th factor. Factor 1 was named as "self-efficacy towards playing an instrument", factor 2 as "self-efficacy towards vocalising notes", factor 3 as "self-efficacy towards singing", factor 4 as "self-efficacy towards vocalising musical genres", and factor 5 as "self-efficacy towards rhythm". The scale developed as a result of the research was named as "music performance self-efficacy scale". The 5-factor measurement tool developed as a result of the research can comprehensively measure the music performance self-efficacy of secondary school students both on the basis of sub-factors and in general. At the same time, it was observed that the sub-factors reached within the scope of the structure obtained are variables that are important in music performance self-efficacy. However, since the developed scale is only for secondary school students, a scale adaptation study or a new scale development study can be conducted for primary and high school students.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Alican Gülle	✓	✓	✓	✓	✓	✓		✓	✓	✓				
Cenk Akay	✓					✓	✓			✓				

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all individuals included in this study.

ETHICAL APPROVAL

The research followed all national rules and institutional policies in accordance with the Helsinki Declaration principles.

DATA AVAILABILITY

The research data supporting this study's findings can be obtained from the corresponding author, [AG], through reasonable request.

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