Confirmatory Factor Analysis of Emotional Management Instrument in Indonesian Futsal Players

Wawan Sundawan Suherman
Universitas Negeri Yogyakarta,
INDONESIA

Soni Nopembri
Universitas Negeri Yogyakarta,
INDONESIA

Sigit Dwi Andrianto
Universitas Negeri Yogyakarta,
INDONESIA

Fitri Agung Nanda
Universitas Sriwijaya,
INDONESIA

Dewi Nurhidayah*
Universitas Cenderawasih,
INDONESIA

Novriansyah
Universitas Samudra,
INDONESIA

José Vicente García-Jiménez
University of Murcia,
SPAIN

Article Info

Abstract

Background: Emotional management is a key psychological factor influencing futsal performance, but available measurement instruments are still general in nature, lack sport-specific validation, and have not been tested on Indonesian futsal athletes.

Aims: This study seeks to rigorously validate and confirm the factor structure of an emotional management instrument designed explicitly for Indonesian futsal athletes, thereby strengthening its scientific and contextual relevance calculations with CFA.

Methods: Confirmatory Factor Analysis (CFA) was performed on data from 438 athletes recruited through incidental sampling across multiple regions in Indonesia. The emotional management instrument comprised 23 items that had previously undergone rigorous content validation by experts, including psychologists, national-level futsal coaches, and sport science academics. Model fit indices, convergent validity, and internal consistency reliability were systematically evaluated to ensure the robustness of the measurement model.

Results: The five-factor model demonstrated excellent fit to the data (e.g., CFI > .95, TLI > .95, RMSEA < .06, SRMR < .08). All factors had AVEs above 0.50, indicating strong convergent validity. Reliability indices were high, with McDonald's ω and Cronbach's α exceeding .70 for all factors.

Conclusion: The results indicate that the emotional management instrument demonstrates satisfactory validity, reliability, and structural integrity for application among Indonesian futsal athletes, thereby providing a robust framework for psychological assessment and supporting future research, talent development, and mental training programs.

INTRODUCTION

Futsal is a high-intensity and fast-paced sport that demands rapid decision-making, precise coordination, and continuous regulation of emotional responses during competition (Amiq et al., 2024; Orangi & Ghorbanzadeh, 2025). Gomes et al. (2024) state that, in addition to technical and physical competencies, psychological skills play a decisive role in shaping athletes' performance outcomes. Lima et al. (2024) and Wu et al. (2021) mention that previous studies demonstrate that psychological components, particularly motivation, emotional regulation, and mental readiness, are trainable and contribute substantially to competitive success. Among these factors, emotional management has consistently been identified as a key determinant of performance, influencing athletes' ability to cope with pressure, maintain concentration, and function effectively within a

* Corresponding author:
Nurhidayah, D., Universitas Cenderawasih, INDONESIA. ✉dwhidayah@gmail.com

team context (Tranaeus et al., 2024). Kurova & Popovych (2024) claim that the psychological aspects that must be considered in developing an athlete's talent and that most influence success are competitive motivation and the ability to manage emotions. Furthermore, the application of effective emotion regulation strategies, including relaxation techniques and controllable performance goal setting, is essential for sustaining optimal performance throughout competitive tournaments (Carson et al. 2025).

Recent studies highlight that emotion management is a key determinant of futsal performance, influencing athletes' ability to handle competitive pressure and maintain effective team interaction. Emotional competence also reduces antisocial behavior and strengthens communication and collaboration within team sports (Amaro & Fernandes, 2025). Furthermore, strengthening athletes' psychological condition should be achieved through the use of valid, reliable, and systematically programmed instruments (Albuquerque et al., 2021). No standardized tool has yet been developed or validated for futsal athletes, particularly in Indonesia. This study addresses that gap by examining the validity and reliability of an emotion-management instrument tailored to Indonesian futsal players (Cid et al., 2022; Yeemin et al., 2025)

Instrument development must be based on a strong grand theory. The instrument developed in this study is based on Goelman and Gross's theory, which encompasses several dimensions of emotion management, including five factors and key components: Self-awareness, Self-management, Attentional deployment, Emotional empathy, and Cognitive change/reappraisal. Jafari et al. (2023) and Laibi & Fahd (2025) suggest that self-awareness refers to the ability to recognize one's emotional states, a skill essential for futsal athletes who must interpret bodily cues and regulate reactions under fast-paced match conditions. Welis et al. (2024) state that emotional management in self-management among futsal athletes enables them to control their emotions, thereby improving their game performance and ability to show off and share in the game. Attentional deployment supports emotion regulation by directing focus toward relevant cues— such as opponents' movements or tactical instructions —while filtering distractions (Jebur et al., 2024; Hideg-fehér & Elmadani, 2025; Marín-González et al., 2024). Finally, cognitive reappraisal allows athletes to reinterpret stressful situations constructively, helping them remain resilient and mentally flexible during competition (Joseph & Pennington, 2025). Together, these five dimensions provide a theoretically robust basis for constructing a sport-specific emotional management instrument suitable for futsal athletes.

Problems related to psychological skills and the results of previous research indicate a gap in the development of psychological measurement instruments, particularly those focused on emotional management in futsal athletes in Indonesia. To date, no study has developed or validated a futsal-specific instrument encompassing the five core components of emotion management—self-awareness, self-management, attentional deployment, emotional empathy, and cognitive reappraisal, nor applied CFA-based validation within the Indonesian athlete population. Addressing this gap, the present study aims to develop and validate a sport-specific emotion management instrument for Indonesian futsal athletes using CFA, ensuring robust reliability and convergent validity to support accurate psychological assessment and evidence-based training interventions.

METHOD

Research Design

This study is a quantitative study that aims to find and test the structure of an emotion management instrument specifically for futsal players using Confirmatory Factor Analysis (CFA). CFA is one of the analyses that must be conducted in developing an instrument, particularly for construct testing. CFA is generally used to test the structure of an instrument that has already been compiled. CFA includes testing the sample's feasibility as a prerequisite to factor testing, determining factor loadings, describing them through model plots, and estimating the instrument's validity and reliability coefficients.

Participant

The subjects in this study were Indonesian futsal players (county, provincial, national, college, and professional athletes), totaling 438. This study has undergone research ethics review with the number. T/35.21/UN34.9/PT.01.04/2025. The sampling technique used in this study was

purposive sampling. The sample criteria in this study were: 1) futsal players aged 19-23 years, 2) who had participated in at least one competition. The detailed sample criteria are shown in Table 1.

Table 1. Sample Characteristic

Characteristic	Total sample (n=438)
Age M (SD)	21.03 (1.59)
Gender n (%)	
Male	318 (73%)
Female	120 (27%)
Competition Level n (%)	
Regency	260 (59%)
Province	133 (30%)
National	34 (8%)
International	11 (3%)
Training frequency n (%)	
1-2 rep/week	186 (42%)
3-4 rep/week	215 (49%)
5-6 rep/week	29 (7%)
> 6 rep/week	8 (2%)
Training background n (%)	
< 1 year	105 (24%)
1-5 years	193 (44%)
5-10 years	94 (21%)
> 10 years	46 (11%)

Instrument

The instrument used in this study was a special emotional management instrument for futsal players developed by the researcher. The emotional management instrument was developed based on theory (Goelman & Gross). The instrument consisted of 23 statements grouped into five factors. These factors were self-awareness, self-management, attentional deployment, emotional empathy, and cognitive change/reappraisal. This instrument has undergone content validity testing by several experts, including psychologists, national futsal coaches, and futsal academics. The instrument's rating scale uses a Likert scale consisting of 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = agree, and 5 = strongly agree.

Data Analysis

The data analysis technique used in this study is Confirmatory Factor Analysis (CFA). The CFA analysis included 1) Kaiser-Meyer-Olkin Test (KMO) analysis, Measure of Sample Adequacy (MSA), chi-square ($\chi2$), degrees of freedom (df), p-value, Standardized Root Mean Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Bentler-Bonett Normed Fit Index (NFI), Tucker-Lewis index (TLI), Comparative Fit Index (CFI), and Goodness of fit index (GFI) as sample feasibility testing and prerequisite testing before CFA testing; 2) factor loading and model plot; 3) Validity coefficients as seen from the Average variance extracted (AVE) value, 4) Reliability coefficients as seen from McDonald's (ω) and Cronbach's (α) values. Decision making, KMO/MSA value ≥ 0.5; chi-square significant (p-value ≥ 0.05); CFI, NFI, GFI, TLI ≥ 0.9; SRMR and RMSEA ≤ 0.08; AVE > 0.5; and McDonald's coefficient (ω) and Cronbach's value (α) ≥ 0.7. Data normality is assessed using the Shapiro-Wilk test. The analysis was performed using JASP.

Procedure

The research team distributed the instrument directly and indirectly. The research team directly distributed the instrument to futsal players participating in competitions in Yogyakarta and South Sumatra. The instrument was distributed indirectly via a Google Form link to coaches across Indonesia. All subjects were informed in the research ethics regulations before completing the questionnaire. Subjects who met the criteria and agreed to participate in the study were asked to complete the questionnaire within 10 minutes.

RESULTS AND DISCUSSION

Results

The results obtained from CFA include 1) sample feasibility and prerequisites, 2) factor loadings and residuals, 3) model plots, and 4) validity and reliability test results. All results obtained from this analysis are presented in detail in the following sub-chapters

Sample feasibility and prerequisites

Table 2. Model Fit Test Results

Parameter	Output	Criteria	Decision
Overall MSA/KMO	0.975	≥ 0,5	Appropriate Fit
Chi-square (p-value)	0.001	≤ 0.05	Not an appropriate Fit
SRMR	0.031	≤ 0.08	Appropriate Fit
RMSEA	0.064	≤ 0.08	Appropriate Fit
NFI	0.933	≥ 0.90	Appropriate Fit
TLI	0.949	≥ 0.90	Appropriate Fit
CFI	0.956	≥ 0.90	Appropriate Fit
GFI	0.973	≥ 0.90	Appropriate Fit

Note. KMO= Kaiser-Meyer-Olkin Test, χ^2= chi-square; df= degrees of freedom; SRMR= Standardized Root Mean Residual; RMSEA= Root Mean Square Error of Approximation; NFI= Bentler-Bonett Normed Fit Index; CFI= Comparative Fit Index; TLI= Tucker-Lewis index; GFI= Goodness of fit index

Sample feasibility test for CFA testing using the Kaiser-Meyer-Olkin Test (KMO) on 23 items in the futsal player emotion management instrument. The overall KMO result (Overall MSA) was 0.975 (Table 2). This value indicates an adequate sample adequacy because the overall MSA was > 0.5. The details of the MSA values for each item show a range in 0.955 to 0.990. The highest MSA value of 0.990 was found in item_13 and the lowest of 0.955 in item_5, all of which indicate an adequate contribution to the factor structure. Bartlett's Test was used to assess whether the correlations among instrument items were suitable for factor analysis. The Bartlett's Test results include the chi-square statistic, degrees of freedom, and p-value, as shown in Table 2. The chi-square value with 220 degrees of freedom is 614.964, which exceeds the chi-square table value, indicating that the data are suitable for factor analysis. The p-value in the analysis is 0.001, indicating it is ≤ 0.05. This indicates that the data are not suitable for further factor analysis, so researchers use other fit indices as a reference for model fit assessment (e.g., SRMR, RMSEA, NFI, TLI, CFI, GFI). Table 2 also shows the fit test output in the form of Standardized Root Mean Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Bentler-Bonett Normed Fit Index (NFI), Tucker-Lewis's index (TLI), Comparative Fit Index (CFI), and Goodness of fit index (GFI). The SRMR value is 0.031, and the RMSEA value is 0.072, indicating that both are ≤ 0.08. According to the decision, these results indicate that the data is suitable for factor analysis. The results are NFI = 0.933; TLI = 0.949; CFI = 0.956; GFI = 0.973. In accordance with the decision-making process, all values meet the minimum threshold for model fit. Therefore, all data are suitable for further factor analysis.

Table 3. Loading Factor and Residual Variance Result

Factor	Indicator	Statement	λ	θ	Std. Error	P	95% Confidence Interval Lower	Upper
Self-awareness (SA)	Item 1	I realized when I was overconfident while playing.	0.601	0.356	0.036	< .001	0.530	0.672
	Item 2	I know when I need to calm down during a game.	0.709	0.207	0.033	< .001	0.643	0.774
	Item 3	I can	0.725	0.303	0.037	< .001	0.652	0.798

Factor	Indicator	Statement	λ	θ	Std. Error	P	95% Confidence Interval Lower	Upper
		differentiate between emotions from the game and personal issues.						
	Item 4	I can recognize the changes in my emotions as the game progresses.	0.721	0.189	0.033	< .001	0.656	0.786
Self-management (SM)	Item 5	I can control myself when my opponent plays rough.	0.703	0.413	0.040	< .001	0.624	0.781
	Item 6	My opponent does not easily provoke me.	0.696	0.410	0.040	< .001	0.617	0.774
	Item 7	I can control my emotions so as not to harm the team.	0.705	0.247	0.035	< .001	0.638	0.773
	Item 8	I can hold back negative emotions until the game is over.	0.698	0.230	0.034	< .001	0.632	0.764
	Item 9	I can remain calm even under pressure from coaches or spectators.	0.698	0.269	0.035	< .001	0.629	0.767
Attentional deployment (AD)	Item 10	I can express my disappointment without blaming others.	0.680	0.273	0.034	< .001	0.613	0.748
	Item 11	I have the courage to show passion and enthusiasm for the team.	0.723	0.170	0.032	< .001	0.661	0.786
	Item 12	I can deliver criticism constructively when the game isn't going well.	0.697	0.303	0.036	< .001	0.627	0.767
	Item 13	I can share my feelings after the match, whether we win	0.730	0.240	0.034	< .001	0.663	0.798

Factor	Indicator	Statement	λ	θ	Std. Error	P	95% Confidence Interval Lower	Upper
		or lose.						
Emotional empathy (EE)	Item 14	I can feel the team's mood during the match.	0.690	0.244	0.034	< .001	0.625	0.756
	Item 15	I show compassion when teammates are hurt or upset.	0.713	0.169	0.031	< .001	0.652	0.775
	Item 16	I understand the importance of keeping the team motivated when they're behind.	0.751	0.151	0.032	< .001	0.689	0.814
	Item 17	I help maintain team cohesion with a positive attitude.	0.711	0.123	0.030	< .001	0.653	0.769
	Item 18	I can motivate teammates who are feeling low on enthusiasm.	0.719	0.215	0.033	< .001	0.654	0.784
Cognitive change/reappraisal (CC)	Item 19	I don't dwell on my emotions after a loss.	0.724	0.285	0.036	< .001	0.653	0.795
	Item 20	I can evaluate the match objectively despite my disappointment.	0.745	0.278	0.036	< .001	0.674	0.817
	Item 21	I don't hold grudges against opposing players.	0.767	0.318	0.038	< .001	0.692	0.841
	Item 22	I can speak calmly in the post-match team evaluation.	0.743	0.191	0.033	< .001	0.678	0.808
	Item 23	I was able to control the negative emotions that arose after the match was over.	0.720	0.307	0.037	< .001	0.648	0.792

Note: Loading factors (λ), Residual Variances (θ)

The first result of the CFA analysis is factor loading. Table 3 presents the factor loadings, indicating the distribution of statement items across five factors. The first factor consists of four

statement items, with item_3 having the lowest factor loading (0.601) and item_1 the highest (0.725). The second factor consists of five statement items, with item_7 having the highest factor loading of 0.703 and item_6 the lowest of 0.696. The third factor consists of four statement items, with item_13 having the highest factor loading of 0.730 and item_10 the lowest of 0.680. The fourth factor consists of 5 statement items, with item_16 having the highest factor loading (0.751) and item_14 the lowest (0.690). The fifth factor consists of 5 statement items, with item_21 having the highest factor loading (0.767) and item_23 the lowest (0.720). All statement items grouped in factors 1, 2, 3, 4, and 5 have factor loadings ≥ 0.5, meaning that all items in each factor have good validity and can represent latent variables well. In this test, no items were eliminated. The factor loadings can be seen in the model plot (Figure 1)
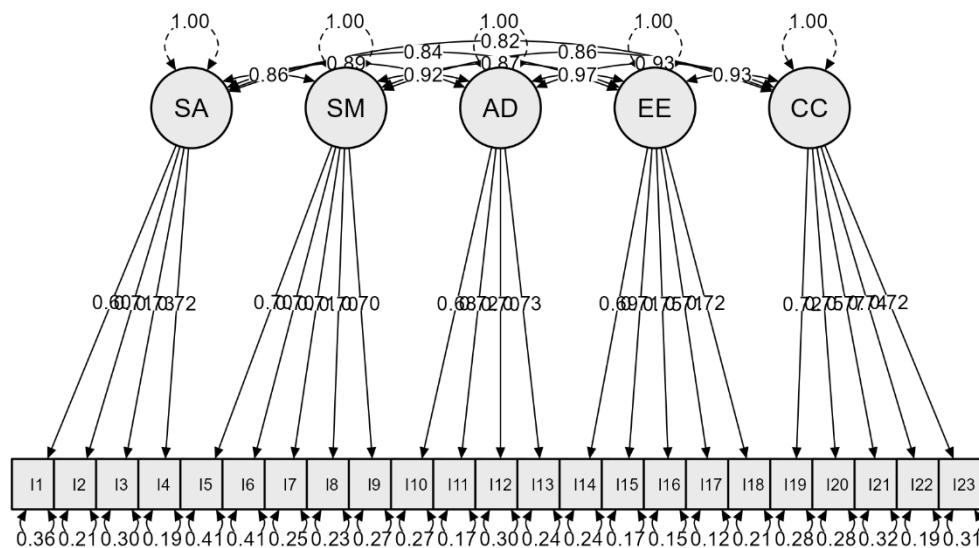

Figure 1. Model Plot

Results of validity and reliability

Table 4 presents the results of validity and reliability testing for the Indonesian futsal players' emotional management instrument. The results of the instrument validity testing are evident in the AVE values, which are an> 0.5; thus, it can be concluded that all factors have good validity. The reliability test results for the instrument can be seen from the McDonald's (ω) and Cronbach's (α) coefficients. The ω and α coefficients are> 0.7, indicating high reliability.

Table 4. Validity and Reliability Result

Factor	AVE	ω	α
Self-awareness (SA)	0.644	0.876	0.879
Self-management (SM)	0.610	0.889	0.880
Attentional deployment (AD)	0.670	0.890	0.891
Emotional empathy (EE)	0.740	0.933	0.939
Cognitive change/reappraisal (CC)	0.665	0.908	0.910

Note. Average variance extracted (AVE), McDonald's (ω), Cronbach's (α)

Discussion

Implication

CFA is one of the analysis and reliability methods for assessing the feasibility of instruments for determining calculation data or for distributing and testing on research samples. In line with the research statement, Geng et al. (2024) state that, in general, an NFI greater than 0.90 indicates that the model fits well and that there is satisfactory agreement between the model and the observed data (Zhang, 2024). Based on the results of CFA, Zhang (2024) conducted confirmatory factor analysis on additional sample data. In line with previous research, several fit indices were used to assess overall fit: NFI, GFI, AFGI, CFI, and RMSEA. CFI, NFI, GFI, and AFGI values > 0.90 were analyzed using the CFA approach in assess the suitability of the instruments for continued use and

application in research. In this study, Stanghellini et al. (2024) used a Comparative Fit Index (CFI) of 0.927, a value ≥ 0.9 indicates a good fit, and a Root Mean Square Error of Approximation (RMSEA) of 0.052, a value ≤ 0.06 indicates a good fit (Pey et al., 2021).

The Factor loading results show the distribution of items. All items grouped into factors 1, 2, 3, 4, and 5 have factor loadings ≥ 0.5, indicating that all items in each factor have good validity and can represent their respective latent variables well. Several factor items are discarded in accordance with the decision-making process. This is similar to the research conducted by Chen et al. (2024), which found that, based on item-elimination criteria, items with a loading value of 0.7 or higher are generally considered a good threshold. Based on these criteria, the first item with a factor loading below 0.7 was excluded. Tomczak et al. (2022) showed that the factor loadings obtained from the somatic anxiety and worry scales were in the good range, while the concentration disturbance scale was slightly below the recommended limit calculated using CFA. Akbar et al. (2024) conducted a CFA analysis and successfully identified five main factors, which were confirmed through convergent validity, composite reliability, and Cronbach's alpha. Research showed that the CFA results supported a three-factor structure: Parenting Role, Traditional Feminine Role, and Traditional Masculine Role (Dabbagh et al., 2023).

Sürücü et al. (2024) state that the factor loading value of a variable reflects the extent to which the variable contributes to the factor in question. Thus, the higher the factor loading, the stronger the variable's ability to explain the related factor. Based on this view, a smaller sample size can be considered reasonable if the data have high factor loadings. The factor loading for CFA and ESEM shows that all subscales load significantly on their respective factors (Hill et al., 2024). Liao et al. (2022) State that factor loadings must be >0.5. Therefore, to make the structural dimensions of physical function a well-defined factor structure, researchers must retain indicators with factor loadings >0.50 and no double loadings between any two indicators. Factor loadings are considered to form the scale structure. Therefore, principal component analysis with fixed numbers based on the retained factors is performed. These factor loadings represent the total number of original variables shared with all other variables, so similarity becomes very important (Handrianto et al., 2023). In addition, factor loadings indicate the relationship between items and constructs; items with higher loadings are more strongly associated with the construct. (Shrestha, 2021).

CFA is needed to verify the relationships in the measurement model and ensure the proposed theoretical model is valid, reliable, and appropriate for data collection. (Baharum et al., 2023). CFA tests whether observed variables represent a hypothetical latent construct with a predetermined number and characteristics of factors, thereby playing a role in instrument validation and construct validity assessment through model fit indices (Sathyanarayana & Mohanasundaram, 2024). CFA modeling is unidirectional, from exogenous variables to constructs and from constructs to indicators (Sureshchandar, 2023). However, factor loadings have limitations, including sensitivity to structural misspecification and to non-idealities under certain conditions. To address these issues, researchers need to include factor-scale indicators in the estimation and eliminate similar variables from the equation (Bollen, 2020). In addition, factor loadings limit the generalizability and applicability of factor structures to other samples in subsequent studies (Tavakol & Wetzel, 2020; Kueh et al., 2024). Furthermore, excessive factor loadings can limit the generalizability of the factor structure and distort structural relationships due to excessively high correlations between factors.

The results of Confirmatory Factor Analysis testing of the Indonesian futsal players' emotion management instrument in this study have formed an instrument construct consisting of five factors. The construct developed in this study served as the basis for testing construct validity, namely, Confirmatory Factor Analysis (CFA). Therefore, in future research, the instrument needs to be retested to obtain an suitable instrument for use in determining the emotional management of futsal players in Indonesia. Mubarak et al. (2025) state that research using questionnaires that cover various contexts is beneficial because it allows athletes from different contexts to be compared. This approach provides more stable parameter estimates through posterior distributions, provides uncertainty measurements, and allows for direct interpretation (Koh et al., 2020). Research using questionnaires has high reliability and convergent validity and is acceptable for measuring fitness levels in adolescents, but is low in criterion validity. Aryanto et al., (2021). Ling et al. (2024) state that research using questionnaires can demonstrate the significant

relevance of the construct of commitment in sports. Based on the above expert opinions, it can be concluded that questionnaire-based research is highly reliable.

The results of this study have theoretical and practical implications for futsal sports psychology in Indonesia. Theoretically, these findings strengthen the conceptual framework of athlete emotional management by providing empirical evidence for two main factors that are valid and reliable, and they contribute to the development of psychological measurement instruments in team sports. Practically, this validated instrument can be used by coaches, sports psychologists, and academics as an objective measurement tool to identify athletes' emotional management profiles, support the development of mental training programs and psychological interventions, and is suitable for widespread application in national futsal coaching and further research related to athlete performance.

Research Contribution

The study "Confirmatory Factor Analysis of Emotional Management Instruments in Indonesian Futsal Players" contributes by validating an emotion-management instrument tailored to Indonesian futsal athletes' characteristics, resulting in a more accurate and reliable measurement tool. The findings strengthen theoretical understanding of emotional regulation in athletic performance and offer practical value for coaches and sport psychologists in designing more effective mental training interventions.

Limitations

The study's limitations include a sample that may not represent all Indonesian futsal players, reliance on self-report data, which may introduce bias, and the use of only confirmatory factor analysis, without additional validation methods to strengthen the instrument's overall accuracy.

Suggestion

Future studies should involve a more diverse group of futsal players, employ additional validation methods, and include complementary data sources, such as coach evaluations, to strengthen and refine the emotional management instrument. Further research is expected to expand the variables discussed and ensure that each young athlete selected is at the same level or has been participating for a long time.

CONCLUSION

The emotional management instrument for futsal players in Indonesia has been tested using Confirmatory Factor Analysis, in which all instrument factors have demonstrated good validity. The test results also showed good reliability, as indicated by the McDonald's and Cronbach's coefficients. This tested instrument can help coaches measure their athletes' emotional management. This way, the coaching team can monitor their athletes' psychological condition. This study produced an emotional management instrument developed based on relevant academic principles and meeting the criteria of high accuracy, reliability, and construct validity. This instrument is expected to serve as an effective measurement tool for identifying and developing psychological and emotional management skills in elite futsal athletes, thereby contributing to improved performance and mental readiness in competition.

ACKNOWLEDGMENT

AUTHOR CONTRIBUTION STATEMENT

WSS and FAN were responsible for the study's design and conceptualization. SN and were responsible for writing the manuscript. DN and JVGJ was responsible for data analysis and for

discussing the findings. Data processing and collection, as well as full responsibility in the field during the study, were carried out by SDA and NN.

CONFLICTS OF INTEREST

There is no conflict in this article.

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