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Exploring the validity and reliability of the student athlete training environment scale: a second-order CFA model analysis of items

Exploración de la validez y confiabilidad de la escala del ambiente de entrenamiento de estudiantes atletas: un análisis de ítems del modelo CFA de segundo orden

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Abstract. The aim of this research is to assess the validity of the concept and the determination of the reliability of the training environment scale, to test the contribution of each element and indicator in reflecting training environment variables, and to evaluate the extent to which the theoretical model of the training environment corresponds with empirical data. The sample for this research was 224 people with a sampling technique using probability sampling. The sample consisted of 132 male athletes and 92 female athletes, sample characteristics of 128 samples aged 12 - 15 years and 96 samples aged 16 - 18 years. The data collection method uses a training environment scale and data analysis uses Structure Equation Modeling (SEM) with Confirmatory Factor Analysis (CFA) through the Lisrel 8.71 program. Analysis of research results shows that student athletes in Indonesia are included in the "good" category regarding the training environment. Training environment variables show valid and reliable data, formed from various aspects and indicators. Aspects related to facilities have a large role in representing the training environment, while family aspects are less prominent in describing the training environment. The measurement model of training environment variables is in line with empirical data. This research can test the harmony between the theoretical model of training environment variables and the empirical data contained in the training environment.
Key words: training environment, student athlete, validity and reliability, confirmatory factor analysis

Resumen. El objetivo de esta investigación es evaluar la validez del concepto y la determinación de la confiabilidad de la escala del ambiente de entrenamiento, probar la contribución de cada elemento e indicador al reflejar las variables del ambiente de entrenamiento, y evaluar en qué medida el modelo teórico del entorno de formación se corresponde con datos empíricos. La muestra para esta investigación fue de 224 personas con una técnica de muestreo mediante muestreo probabilístico. La muestra estuvo compuesta por 132 deportistas masculinos y 92 deportistas femeninas, características de la muestra de 128 muestras de 12 a 15 años y 96 muestras de 16 a 18 años. El método de recolección de datos utiliza una escala de ambiente de entrenamiento y el análisis de datos utiliza el Modelado de Ecuaciones Estructurales (SEM) con Análisis Factorial Confirmatorio (CFA) a través del programa Lisrel 8.71. El análisis de los resultados de la investigación muestra que los estudiantes atletas en Indonesia están incluidos en la categoría "bueno" en cuanto al entorno de entrenamiento. Las variables del entorno de formación muestran datos válidos y fiables, formados a partir de diversos aspectos e indicadores. Los aspectos relacionados con las instalaciones tienen un papel importante en la representación del entorno de formación, mientras que los aspectos familiares son menos destacados a la hora de describir el entorno de formación. El modelo de medición de las variables del entorno de entrenamiento está en línea con datos empíricos. Esta investigación puede probar la armonía entre el modelo teórico de las variables del entorno de formación y los datos empíricos contenidos en el entorno de formación.
Palabras clave: ambiente de entrenamiento, estudiante atleta, validez y confiabilidad, análisis factorial confirmatorio

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Introduction

It is generally accepted that achievements in the field of sports are influenced by the interaction of various complex factors. Aspects such as physical fitness, mental preparedness, body development, body movement abilities, and tactical understanding all simultaneously contribute to the attainment of optimal performance (Glazier, 2017; Sallam et al., 2022). However, it cannot be ignored that environmental factors also play a crucial role in achieving optimal sports performance (Kean et al., 2017). Beyond achieving optimal performance, positive environmental factors also have a positive impact on the development of athletes' talents (Xiang et al., 2022). In fact, a study has elucidated that the training environment also affects mental health (Rice et al., 2022).

The importance of environmental factors in achieving performance and athlete development is emphasized by Ntomali et al (2017). According to this research, the demands of training within a supportive environment, as well as the relationships formed during the development process, contribute to improving the mental well-being and physical condition of athletes, while also helping to alleviate any potential psychological pressures that may arise (Ntomali et al., 2017). This ultimately leads to superior performance achievement and guides athletes towards perfection. In this context, the athlete's journey component and environmental conditions, such as the atmosphere at training centers, also play a very important role in maintaining the mental health of athletes (~~T.~~ Zhang & Shi, 2022).

When in a challenging environment, a team that is capable of achieving optimal performance must be equipped with adequate and responsive abilities, allowing them to quickly adapt to complex and dynamic situations (Puyenbroeck et al., 2017). This reaffirms that, in addition to individual aspects, adaptability in facing various environmental conditions also has a significant impact on overall sports performance.

Based on the preceding explanations, the purpose of this study is to investigate the validity and accuracy of the

Training Environment construct. Furthermore, this research will test whether the jointly evaluated aspects, namely the Family (FA) aspect and the Training Facilities (TF) aspect of the Training Environment concept, demonstrate consistency. The aims of this research are as follows: The objectives of this research are as follows: 1) to assess the level of validity using confirmatory factor analysis on the Training Environment scale as a measuring tool, 2) to determine the contributions of the aspects and indicators of the Training Environment in comprehensively reflecting the Training Environment, and 3) to evaluate the suitability of the theoretical model of the Training Environment variable with empirical data.

Material and methods

Study Participants

In this study, the total sample was 224 student-athletes. The sampling technique used in this research is probability sampling. This technique is used to ensure that the population has an equal chance of being selected as a sample. The identifiable samples were 132 male athletes and 92 female athletes, with 128 athletes aged 12-15 years attending Junior High School and 96 athletes aged 16-18 years attending Senior High School. Athletes who have been sampled for this research have received direct approval from their coaches.

Study Organization

This study employs a correlational research approach (Dash & Paul, 2021). This research uses an analytical survey, where the entire data collection process is conducted online through Google Forms in the form of a questionnaire. The questionnaire consists of 40 items of questions regarding the Training Environment for student athletes, which must be answered by respondents using a Likert Scale as the assessment tool. Data collection procedures were carried out on Sundays when athletes were off from training. Questionnaires were distributed directly to athletes from the authors of this study, then coaches were only asked to monitor each athlete to ensure that the athlete completely filled in the questionnaire items correctly. This data collection process was carried out for four weeks.

Instrument

The framework of the instrument was developed based on several previous studies. Researchers categorized each variable, with family variables divided into five categories (education, family-athlete relationship, home environment, economic situation, and training facilities), and training environment variables divided into six categories (training methods, training curriculum, coach-athlete relationship, athlete-athlete relationship, team discipline, and training equipment). Each variable was grouped so that the values of each independent and dependent relationship were more detailed. All items were measured using a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree).

The family items (education, family-athlete relationship, home environment, economic situation, and training facilities) were developed based on previous studies (Kovacs et al., 2020, 2024). Then, some information from previous research results related to family support or parental support is also used as supporting data, for example informative support, instrumental support, emotional support (Mandan et al., 2024**;** Imtihansyah et al., 2024). Based on the results of previous research, the indicators for the family aspect adapted in the questionnaire in this research are Parenting Style, Family members' Relationship with the athlete, Home atmosphere, Family economic situation, Training facilities.

Meanwhile, the training environment items (training methods, training curriculum, coach-athlete relationship, athlete-athlete relationship, team discipline, and training equipment) were modified based on statement items from previous research (Do Nascimento Junior et al., 2020; Kean et al., 2017; Woods et al., 2021; Sridana et al., 2024; Wijayanti et al., 2024; Latief et al., 2024). Based on the results of previous research, the indicators for the Training Facilities aspect adapted in the questionnaire in this research are Training methods, Training curriculum, Coach-athlete relationship, Athlete-athlete relationship, Team discipline, Training equipment.

This study employed a questionnaire that had been validated by experts in the academic field through Focus Group Discussions (FGD) and recommended minor revisions, resulting in 40 items. Subsequently, the questionnaire was distributed via Google Forms. The following are blueprint items and scale statements regarding thhe training environment presented in tables 1 and 2.

Table 1.
Blueprint of the Training Environment Scale

No	Aspect	Indicators	Item Number		Weight
			F	UF	
1.	FAMILY	Parenting Style	2, 3	1, 4	50%
		Family members' Relationship with the athlete	5, 6, 7, 9, 10	8	
		Home atmosphere	11, 12	13	
		Family economic situation	14	15	
		Training facilities	17, 18, 19, 20		

				16	
2.	TRAINING FACILITIES	Training methods	21, 22, 23	24	50%
		Training curriculum	26	25	
		Coach-athlete relationship	27, 28, 29, 31	30	
		Athlete-athlete relationship	32, 34	33, 34	
		Team discipline	35, 37, 38	36	
		Training equipment	39, 40	-	
TOTAL			28	12	100%

Note: F – Favorable; UF – Unfavorable

Table 2.
Items of the Training Environment Scale Statements

NO	STATEMENTS
1.	My parents prohibit me from developing my athletic career potential.
2.	My parents ask me to train independently for at least 1 hour per day.
3.	My parents advise me if I don't train.
4.	My parents prohibit me from befriending athletes who are less successful.
5.	My parents help me when I encounter difficulties in self-training.
6.	My home environment is comfortable when I am training.
7.	My family turns off the TV when I am training independently.
8.	I never tell my parents when there are problems at the training location.
9.	My parents accompany me during training.
10.	Every time I return from training, my parents ask about the difficulties I face.
11.	A clean and healthy home can support my athletic success.
12.	My tidy home motivates me to train independently.
13.	My home conditions are uncomfortable, so I am lazy to train independently.
14.	My family's food needs are met, which helps me achieve success.
15.	I buy personal equipment with my own pocket money.
16.	My parents are reluctant to support personal equipment.
17.	My parents provide private coaches to improve performance.
18.	The lighting in my home is good so I can train comfortably.
19.	My home is spacious and can be used for self-training.
20.	My parents provide training facilities to support my performance.
21.	The material presented by the coach is easy to understand.
22.	The coach explains the training material in an interesting way.
23.	The coach explains the training material with humor.
24.	The coach asks athletes to review after each training session.
25.	The coach explains the training material too quickly for me to understand.
26.	I can solve problems quickly and accurately because I diligently follow the training.
27.	My relationship with the coach at the training location is good.
28.	My coach is friendly, so I dare to ask when encountering difficulties.
29.	I am familiar with the coach, so I like and feel comfortable at the training location.
30.	I am reluctant to ask the coach if there are difficulties in training.
31.	The coach provides additional training hours if the athlete's performance is considered poor.
32.	Additional training sessions will be conducted together if the team's performance is poor.
33.	I refuse to help friends who are having difficulties in training.
34.	I help friends who are having difficulties at the training location.
35.	The coach reprimands me for being late to training.
36.	The coach sanctions me when I don't do self-training tasks.
37.	The coach reprimands me when I am absent from training.
38.	There are no training holidays for one week.
39.	The training club provides complete training equipment.
40.	The available training equipment meets international standards.

Construct Validity and Reliability

The internal structure of the two-factor model was evaluated using confirmatory factor analysis (CFA) in LISREL version 8.8 (Dash & Paul, 2021). CFA was chosen to assess construct validity by comparing observed data with the proposed model structure, with several goodness-of-fit criteria serving as indicators (Palevych et al., 2021). Additionally, construct reliability Rahayu et al., (2022) was examined through CFA to validate the construct. The analysis results indicate that the model is acceptable based on the data and meets the recommended criteria (Y. Zhang et al., 2021). Various indicators were considered to evaluate the overall model fit in this study.

The research findings show that the model meets the following criteria: a low Chi-square value and $p > 0.05$, RMSES < 0.05 indicating a good fit, and $0.05 <$ RMSEA < 0.08 suggesting a good fit. Furthermore, the Standardized Root Mean Square Residual (RMR) is < 0.05, GFI > 0.90

indicates a good fit, NFI > 0.90 signifies an acceptable fit, NFI > 0.90 represents a satisfactory fit, CFI > 0.90 implies a satisfactory fit, IFI > 0.90 also suggests a satisfactory fit, and RFI > 0.90 indicates a moderate fit. A comprehensive analysis of the model concludes that it meets the recommended criteria.

Statistical Analysis

Data analysis in this study was carried out using the Structural Equation Modeling (SEM) technique. The SEM approach utilized the Linear Structural Model (LISREL) version 8.71, developed by Joreskog and Sorbom in 2008. The second stage of Confirmatory Factor Analysis (CFA) method was employed through SEM (Jeong et al., 2020). In this study, SEM was used to integrate latent variables into the analysis (Dash & Paul, 2021).

Results

The results of the descriptive statistical analysis indicate that the research respondents can be categorized into two distinct groups based on gender and age. The first group consists of middle school students aged 12-15 years, while the second group comprises teenagers aged 16-18 years. For further information, please refer to Table 3 below.

Table 3.
Descriptive Statistical Results of Gender and Age Grouping

Variables		Means	Std. Deviation	Frequency	Percent (%)
Gender	Male	1.41	0.493	132	58.9
	Female			92	41.1
Age	Junior High School (12-15 years)	14.98	1.817	128	57.2
	Senior High School (16-18 years)			96	42.8

Table 1 presents the results of descriptive statistical analysis that categorizes data based on gender and age. This table includes mean values, standard deviations, frequencies, and percentages. In Indonesia, the average value for gender is 1.41, with a standard deviation of 0.493. Regarding the categorized age group, the overall average value in Indonesia is 14.98, with a standard deviation of 1.817. Respondents in the middle school group are 128 (57.2%), and the high school group consists of 96 respondents (42.8%).

Furthermore, to conduct Confirmatory Factor Analysis (CFA) as a secondary analysis, it is recommended to consider factor loadings greater than 0.5 and t-values exceeding 1.96. Previous research has suggested that factor loadings of 0.50 are considered significant as they fully explain the underlying constructs (Zappullo et al., 2023). The LISREL software was used to analyze the data, taking into account factor loadings above 0.5 and t-values exceeding 1.96. The results are presented in Figure 1 and 2 below.

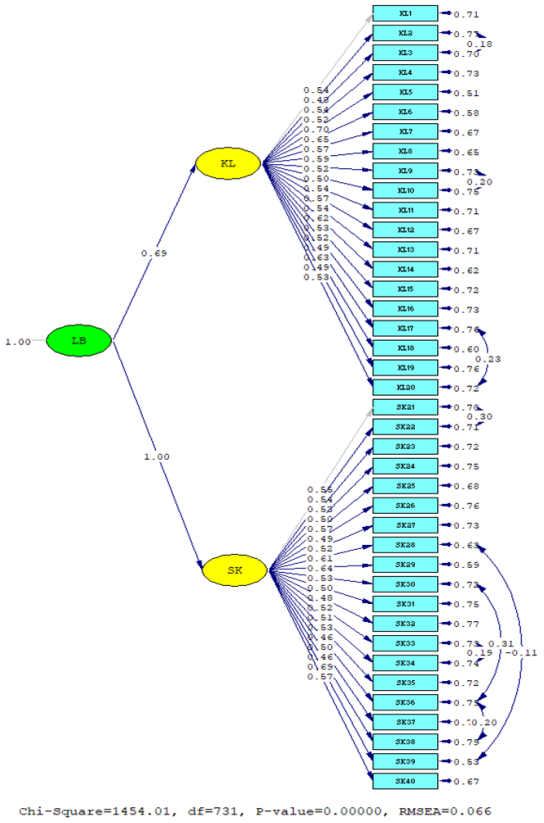

Figure 1. The factor loading values in the 2nd Order CFA (Confirmatory Factor Analysis) for the Training Environment

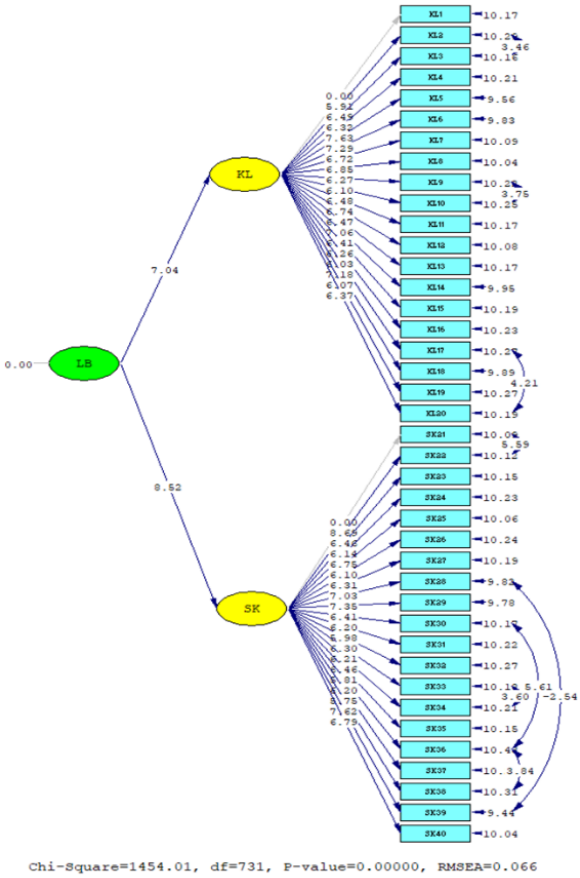

Figure 2. The t-value in the 2nd Order CFA for the Training Environment

The initial analysis involved a process of decomposition from latent constructs to their underlying aspects and indicators. All factor loadings exceeded 0.05, and all t-values were significant, with factor loadings greater than 1.96 based on the analysis conducted. This indicates that all 40 items used to measure the training environment have validity and significance. A summary of these findings can be seen in Table 4, which is explained below.

Table 4.
The results of the 2nd Order CFA (Confirmatory Factor Analysis) for Construct Validity of the Training Environment (Aspects-Indicators).

No.	Item	Factor Loading	*T-Value*	Description
1	KL1	0,54		
2	KL2	0,48	5,91	Significant
3	KL3	0,54	6,49	Significant
4	KL4	0,52	6,32	Significant
5	KL5	0,70	7,63	Significant
6	KL6	0,65	7,29	Significant
7	KL7	0,57	6,72	
8	KL8	0,59	6,85	Significant
9	KL9	0,52	6,27	Significant
10	KL10	0,50	6,10	Significant
11	KL11	0,54	6,48	
12	KL12	0,57	6,74	Significant
13	KL13	0,54	6,47	Significant
14	KL14	0,62	7,06	Significant
15	KL15	0,53	6,41	
16	KL16	0,52	6,26	Significant
17	KL17	0,49	6,03	Significant
18	KL18	0,63	7,18	Significant
19	KL19	0,49	6,07	Significant
20	KL20	0,53	6,37	Significant
21	SK21	0,55		Significant
22	SK22	0,54	8,65	Significant
23	SK23	0,53	6,46	
24	SK24	0,50	6,14	Significant
25	SK25	0,57	6.75	Significant
26	SK26	0,49	6,10	Significant
27	SK27	0,52	6,31	Significant
28	SK28	0,61	7,03	
29	SK29	0,64	7,35	Significant
30	SK30	0,53	6,41	Significant
31	SK31	0,50	6,20	Significant
32	SK32	0,48	5,98	Significant
33	SK33	0,52	6,30	Significant
34	SK34	0,51	6,21	Significant
35	SK35	0,53	6,46	
36	SK36	0,46	5,81	Significant
37	SK37	0,50	6,20	Significant
38	SK38	0,46	5,75	Significant
39	SK39	0,69	7,62	Significant
40	SK40	0,57	6,79	Significant

Notes: KL – Keluarga (Family); SK – Sarana Kepelatihan (Training Facilities)

In the second-stage analysis, an evaluation was conducted on the latent structure based on its structural components. The abbreviation "KL" stands for "Keluarga" in the Indonesian language, which translates to "Family" in English. "SK" is an abbreviation for "Sarana Kepelatihan" in the Indonesian language, which means "Training Facilities" in English. All factor loadings exceeded 0.5, and all t-values were statistically significant, with factor loadings greater than 1.96 based on the research findings. The "Family" aspect obtained a factor loading of 0.69 with a t-value of 7.04, and the "Training Facilities" aspect had a factor loading of 1.00, with a t-value of 8.52. The overall analysis results are summarized in Table 5 below.

Table 5.
Results of 2nd Order CFA Construct Validity for the Training Environment (Latent-Aspects)

No.	Aspect	Factor Loading	*T-Value*	Description
1	Family, (Point)	0,69	7,04	Significant
2	Training Facilities, (Point)	1,00	8,52	Significant

These findings indicate that both aspects of the training environment, namely "Family" and "Training Facilities," have validity and significance in measuring the latent variable of the training environment. This validity is further supported by the Chi-square value (X^2) of 1454.01 with a p-value of 0.00 ($p > 0.05$). Furthermore, based on calculations using the formula for construct reliability, the construct reliability yields a value of 0.95, and the extracted variance is 0.50, demonstrating that the training environment variable has very good reliability.

Table 6.
Results of 2nd Order CFA Construct Reliability for the Training Environment

No.	Item	Factor Loading	Error	CR	VE
1	KL1	0,54	0,71		
2	KL2	0,48	0,77		
3	KL3	0,54	0,70		
4	KL4	0,52	0,73		
5	KL5	0,70	0,51		
6	KL6	0,65	0,58		
7	KL7	0,57	0,67		
8	KL8	0,59	0,65		
9	KL9	0,52	0,73		
10	KL10	0,50	0,75		
11	KL11	0,54	0,71		
12	KL12	0,57	0,67		
13	KL13	0,54	0,71		
14	KL14	0,62	0,62		
15	KL15	0,53	0,72		
16	KL16	0,52	0,73		
17	KL17	0,49	0,76		
18	KL18	0,63	0,60		
19	KL19	0,49	0,76		
20	KL20	0,53	0,72	0,95	0,50
21	SK21	0,55	0,70		
22	SK22	0,54	0,71		
23	SK23	0,53	0,72		
24	SK24	0,50	0,75		
25	SK25	0,57	0,68		
26	SK26	0,49	0,76		
27	SK27	0,52	0,73		
28	SK28	0,61	0,63		
29	SK29	0,64	0,59		
30	SK30	0,53	0,72		
31	SK31	0,50	0,75		
32	SK32	0,48	0,77		
33	SK33	0,52	0,73		
34	SK34	0,51	0,74		
35	SK35	0,53	0,72		
36	SK36	0,46	0,73		
37	SK37	0,50	0,70		
38	SK38	0,46	0,79		
39	SK39	0,69	0,53		
40	SK40	0,57	0,67		

Notes: KL – Keluarga (Family); SK – Sarana Kepelatihan (Training Facilities)

Furthermore, for the model fit, it is universally acceptable. The model fit criteria can be seen in Table 7 below.

Table 7.

Model Fit Criteria

No	Fit Index	Value	Description
1	Chi Square p	1454,01	Not Fit
2	RMSEA	0,066	Fit
3	ECVI	6,76	Fit
4	CAIC	1632,01	Not Fit
5	NFI	0,88	Not Fit
6	NNFI	0,93	Fit
7	PNFI	0,83	Not Fit
8	CFI	0,94	Fit
9	IFI	0,94	Fit
10	RMSR	0,034	Fit
11	RFI	0,87	Not Fit
12	NPC	723,01	Fit
13	GFI	0,76	Not Fit
14	AGFI	0,73	Not Fit

Notes: RMSEA - Root Mean Square Error of Approximation; GFI - Goodness of Fit Index; CFI - Comparative Fit Index; RMSR - Standardized Root Mean S¬quare Residual; NFIs - Normed Fit Indexes; IFI - Incremental Fit Index; NNFI – Non-Normed Fit Index; ECVI – Expected Cross-Validation Index; CAIC – Consistent Akaike Information Criterion; PNFI – Parsimonious Normed Fit Index; RFI Relative Fit Index; NPCs – Noncentrality Parameters; AGFI – Adjusted Goodness-of-Fit Index

The analysis reveals that 7 out of 14 fit indices indicate a strong model fit. These results indicate that the theoretical model of the training environment aligns well with empirical data. Overall, the research findings suggest that the training environment, encompassing the "Family" and "Training Facilities" aspects, exerts a high level of influence in supporting the performance and training sessions of student athletes in Indonesia. This is because the aspects and items comprising the training environment exhibit validity and reliability. The entirety of these aspects and indicators effectively reflects and contributes to the development of training for student athletes.

Discussion

The findings of the analysis indicate that the measurement instrument of the training environment has demonstrated validity and reliability. The dimensions reflecting "Family" and "Training Facilities" have proven to be valid and reliable. The "Training Facilities" aspect, as the dominant factor reflecting the training environment, is supported by a t-value of 8.52, showing that the training facilities significantly contribute to a comfortable training environment. Meanwhile, the "Family" aspect, with a t-value of 7.04, particularly relates to providing a support system to student athletes and serves as a key indicator.

The research findings in this study show differences and similarities with previous studies on training environment factor analysis. Some previous studies used confirmatory factor analysis with AMOS and reported different Cronbach's Alpha results, such as Cronbach Alpha values of 0.87, 0.90, 0.92, and 0.87 (Costa et al., 2020; Lima et al., 2022; Malkoç et al., 2018; Tang et al., 2022) using AMOS data analysis. In contrast, our study used LISREL data analysis, similar to the findings of Shahabi et al., (2020) using LISREL with a Cronbach's Alpha of 0.70. However, in this study, a construct reliability value of 0.95 was obtained.

It is generally accepted that various complex interacting factors influence performance in the field of sports. In the explanation of the Family aspect, a parenting style that is supportive and understands the needs of athletes has a positive and significant effect on the performance of student athletes. Good parenting increases athletes' motivation and enthusiasm in training and competing. This statement further explains that a harmonious relationship between family members and athletes can provide significant emotional support, increase self-confidence and overall athlete performance (Yaffe et al., 2021). A conducive and supportive home atmosphere, away from conflict, provides space for athletes to focus on training and reduce stress, thereby improving their performance. Good family economic conditions enable the provision of adequate training facilities and infrastructure, so that they have a positive and significant effect on the performance of student athletes (Imtihansyah et al., 2024). Then, complete and quality training facilities increase the effectiveness of training, help athletes achieve the best performance, and have a positive influence on their performance (Vargas et al., 2022).

Furthermore, optimal performance achievement is influenced by several aspects, including physical development, tactical understanding, physical fitness, mental preparedness, and body movement capabilities (Glazier, 2017; Sallam et al., 2022). Additionally, to be a successful athlete, dedication, effort, perseverance, and high discipline are required, along with a supportive environment for athlete development (Do Nascimento Junior et al., 2020). In the explanation of the Training Facilities aspect, effective training methods help athletes understand techniques and strategies, increase motivation, and prepare them to face competition better. The comprehensive training curriculum covers various important aspects of athlete training, such as technical, tactical, physical and mental skills material. Sports clubs that have a comprehensive and adaptive curriculum are able to ensure that each training session is beneficial and supports continuous improvement in athlete performance (O'Connor & Penney, 2021; Cho et al., 2023). Relationships between athletes also have an important role in creating a conducive training environment. Cooperation, support and healthy competition between athletes can motivate them to work harder and achieve better performance. Good team discipline reflects order, punctuality, and compliance with the rules in the training program. This discipline helps create a structured and professional environment, where athletes can focus on their training without distractions, thereby opening up greater opportunities for success (Moradi et al., 2020; Wibowo et al., 2024). The availability of adequate and high-quality training equipment is essential to support effective training. Good equipment allows athletes to train more safely and efficiently, and helps them master the necessary techniques and skills (Wan & Tang, 2022).

Therefore, for athletes to succeed in the field of sports, they must have access to a training environment that supports skill development and optimization (Dohme et al., 2019). Adequate environmental facilities can also indirectly influence athlete satisfaction. This is in line with the results of previous research, that athletes who feel satisfied with

the facilities provided will feel loyal, comfortable, train hard and quickly adapt to their teammates (Prabowo, 2024). Thus, individuals participating in systematic training centers have better training infrastructure and quality for athlete development (Dohme et al., 2019; Kunkel et al., 2022; Woods et al., 2021; Prabowo et al., 2024) . Previous studies have explained that environmental factors also play a crucial role in achieving optimal sports performance for athletes (Kean et al., 2017). Furthermore, the positive impact of environmental factors can also have a positive influence on the development of athletes' talents (Xiang et al., 2022). Even a study has elucidated that the training environment also affects the mental health of athletes (Rice et al., 2022).

Although this study makes a significant contribution regarding the "Family" and "Training Facilities" aspects within different training environments, some limitations should be considered. Previous research was conducted using online-based surveys using software (e.g., laptops, smartphones, etc.). In contrast, our research used offline-based questionnaires conducted during training sessions. Therefore, this study expands the application of offline-based training environment assessments. Additionally, the overall validity and reliability tests showed good data fit, supporting the use of this instrument in this population. However, some items related to the training environment aspect exhibited low factor loadings. These items inquire about the "Family" and "Training Facilities" aspects within the training environment of student athletes. Further research is needed to confirm these findings.

Conclusions

In summary, the results of this research study explain that the training environment, especially the "Family" and "Training Facilities" aspects, makes a significant contribution in supporting the performance and training sessions of student athletes in Indonesia. This is because the aspects and items that make up the training environment show a strong value for each item using confirmatory factor analysis. All of these aspects and indicators effectively reflect and contribute to the development of student athlete coaching. These results were obtained with a theoretical model of the training environment that was in good agreement with the empirical data, proven by analysis where 7 of the 14 fit indices showed strong model fit. Apart from that, the selection of these aspects in testing the measurement model is based on its ability to reflect the challenges faced by student athletes in Indonesia. Thus, through the data obtained, this research can test the harmony between the theoretical model of training environment variables and the empirical data contained in the training environment.

Conflict of interest

Authors do not have any conflicts of interest to declare.

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