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ORIGINAL ARTICLE

Confirmatory Factor Analysis of Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition

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Elite Futsal Athletes, Psychological Factors, Psychological Strategies, Psychological Questionnaire.

ABSTRACT

Background. In 2016, studies on the psychological characteristics of Futsal athletes in Thailand began to appear using the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition. However, it was found that the questionnaire mentioned above had not been analyzed for construct validity. Therefore, an additional assessment of the questionnaire, using the Confirmatory factor analysis, is required to validate the Construct Validity of the questionnaire. **Objectives.** This research aims to validate the construct validity of the questionnaire. **Methods.** The samples are professional Futsal athletes who participated in Thailand Futsal competitions in 2020 and 2021, with an average age of 24.35 years and an average career length of 4.62 years, for 303 players. The instruments used include the 41-item Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition. The questionnaire covers two aspects, namely, the psychological factors and the psychological strategies. The data was collected by asking the samples to complete the questionnaire, which takes approximately 20-25 minutes. **Results.** The result reveals that the model has a moderate level of Goodness-of-Fit (reasonable fit) (CFI=0.97, RMSEA=0.078, x^2/df=2.81) and that the psychological characteristics of elite Futsal athletes in competition can be divided into two aspects, namely, the psychological factors and the psychological strategies. The psychological factors consist of 6 elements: confidence and freedom from anxiety, motivation, remaining present, dedication and commitment, confidence in teammates, self-discipline, and ball-playing intelligence. The psychological strategies consist of 6 elements: positive self-talk, relaxation, encouragement, harmoniousness with teammates, cherishing models, motto, vision, thoughts, feelings, and playing behavior management. The questionnaire's overall reliability score – the Cronbach's alpha coefficient – is 0.96. **Conclusion.** The result confirms that the questionnaire can assess the psychological characteristics of elite Futsal athletes in competition.

INTRODUCTION

Futsal is a team sport that is quite popular among Thai people. Due to its play style, which is quite similar to football but with movements of a much faster pace, Futsal is more exciting and fun than football. In addition, Futsal is quite easily accessible for people interested in and who wish to play this sport, whether playing for recreation or competitive excellence. This is because Futsal can be played both outdoors and indoors. It does not require much space and only

requires a fraction of the number of players on each team compared to football (1, 2).

Many futsal fields have been created and can be found everywhere, and many futsal competitions, both official and non-official tournaments, are being organized (3).

For this reason, Futsal athletes can develop their abilities naturally and easily, even to the stage where they can become representatives of Thailand and participate in international Futsal competitions. If we look at the results of international Futsal tournaments, it can be seen that the skills and abilities of Thai Futsal players are not different from those of players from other countries (3, 4). Moreover, according to their past performance, it is safe to say that Thai Futsal teams are among the leading teams in Asia. Many Thai youths have a passion for Futsal. They dream of developing their skills until they can become representatives of Thailand and compete in the Futsal World Cup (5).

Three factors must be addressed when developing excellent Futsal athletes: the body, sports skill, and mind (1). Athletes can build and develop their bodies and sports skills independently, and the result is less likely to be affected by their situation, whether during practice or competition. On the other hand, athletes' minds can be affected and are prone to change according to their situations easily, both during practice and competition. Therefore, the mind is the most difficult to control. Moreover, athletes' minds can and will affect their overall performance; for example, if their minds are not in the proper state and ready for the game, their performance will be generally lower than the standard (1, 4). Therefore, if Futsal athletes wish to succeed and excel, they should simultaneously and adequately develop and maintain these three factors during practice and competition. As a result, trainers and athletes must possess knowledge of sport psychology. In this regard, Gill and Williams (2008) stated that sports psychology is the science that studies people and their behavior in sporting contexts, as well as the appropriate and beneficial uses of knowledge gained from such studies (6). The people in this context are those involved with that specific type of sport, whether the athletes, trainers, staff, sports fans, etc. The purposes of studies in sports psychology are to study and understand people's behaviors in order to predict such behaviors, whether before, during, or after the competition, as well as to control any undesirable behaviors and to apply the principles of sports psychology to sports activities, in order to explain the relationship between athletes' mind and their performance, their decisions to join, continue to play, or withdraw themselves from any sports (7), etc.

According to the definitions and objectives of sports psychology, it can be seen that sports psychology is extremely important for athletes. However, understanding the psychological characteristics of athletes takes time. This is because the psychological characteristics of athletes are psychological factors born out of athletes' thoughts, emotions, feelings, and behaviors within the context of sports. Therefore, the psychological characteristics of athletes will be specifically related to their performance, both during practice and competition. However, sports psychology merely addresses general psychological factors in any sport without precisely determining the relationship between such factors and the performance of athletes of a specific sport. Therefore, studying the psychological characteristics of athletes aims to identify psychological factors that are specifically related to the performance of athletes in a specific kind of sport. According to previous studies, athletes who played different sports also had different psychological characteristics (8).

Moreover, the difference in athletes' psychological characteristics may occur even among athletes who played the same sport. Most importantly, the difference between them also depends on the athletes' level of success; for example, there is a difference between elite gymnasts who have been selected as representatives of the United States in international tournaments and general gymnasts who have not been selected (9). Moreover, the difference in psychological characteristics also depends on the athletes' level of competitiveness, for example, the difference between swimmers who compete in the Olympic swimming (10) and those who compete in the youth short-distance swimming tournaments (11).

When referring to the psychological characteristics of elite athletes or successful athletes, Gould and Maynard (2009) concluded that successful and unsuccessful elite athletes showed differences in their psychological characteristics and the use of psychological skills

(12). Based on the studies conducted thus far, the psychological characteristics of successful and unsuccessful elite athletes can be identified and categorized. However, past studies primarily focused on individual sports and not team sports. Meanwhile, some studies found no significant difference between the psychological characteristics of athletes who competed in team and individual sports (13). However, those results came from the assessment conducted using the sports psychological skills assessment questionnaire (The Psychological Skill Inventory for Sports: PSIS-R-5). According to data from past studies, the Psychological Skill Inventory for Sports did not cover the psychological characteristics of athletes (1, 4).

Meanwhile, the author found that researchers started focusing their interest on this sport in 2008 for psychological studies on Futsal athletes. Furthermore, according to the literature review, the author found that for the entire period from 2008 to 2014, there was not a single study that examined the psychological characteristics of Futsal athletes; that is, most studies about Futsal merely assessed specific psychological factors related to Futsal athletes (1, 14-17). However, in 2016, studies on the psychological characteristics of Futsal athletes began to appear. Those studies assessed the psychological characteristics of professional Futsal athletes in competition, using the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition developed by Yeemin et al. in 2016 (4). The questionnaire contains 41 items and can be used for assessing the athletes' psychological factors (confidence and freedom from anxiety, motivation, remaining in the present, dedication and commitment, confidence in teammates) and psychological strategies (positive self-talk, relaxation, receiving encouragement, harmoniousness with teammates, cherishing models, motto, and vision; and thoughts, feelings, and playing behavior management). The questionnaire yielded the item-specific reliability of 0.44–0.81 and the overall reliability of 0.95. Their result revealed that elite Futsal players, professional Futsal players who participated in the Thailand Futsal League, of different positions had different psychological factors, namely, motivation, self-discipline, and ball-playing intelligence. In terms of motivation, players with the highest level of motivation were goalkeepers, followed by wingers, forwards, and defenders, respectively. Regarding self-discipline and ball-playing intelligence, players with the highest level of these factors were the goalkeepers, followed by the wingers, forwards, and defenders, respectively. Moreover, their study revealed that the goalkeeper was a position that required players to use the highest level of psychological strategies, namely, positive self-talk, followed by receiving encouragement and harmoniousness with teammates, respectively (4).

Although the questionnaire mentioned above can be immediately applied to assessing the psychological characteristics of elite Futsal athletes in the competition since it has been analyzed by the method of Exploratory factor analysis and found to possess a sufficient level of reliability, when considering the appropriate processes for developing sports psychological questionnaires, the author found that the questionnaire mentioned above has not been analyzed for its Construct Validity. Therefore, an additional assessment of the questionnaire, using the Confirmatory factor analysis, is required to validate the Construct Validity of the questionnaire. Doing so will also validate the model's accuracy and overcome any limitations due to the use of Exploratory factor analysis (18). Therefore, in order to further improve the quality of the Psychological Characteristics Questionnaire for Elite Futsal Athletes in competition and to make sure that the questionnaire will be able to measure the construct accurately, the author of the current study applies the Confirmatory factor analysis to validate the Construct Validity of the Questionnaire. The author hopes that the current study will produce a Psychological Characteristics Questionnaire for Elite Futsal Athletes in the competition that is appropriately constructed, as per all the related academic principles, and that the questionnaire will possess accuracy, reliability, and construct validity. The author also hopes that this Psychological Characteristics Questionnaire for Elite Futsal Athletes in the competition will help develop desirable psychological characteristics of Thai elite Futsal players in the future.

This research aims to validate the Construct Validity of the Psychological Characteristics Questionnaire for Elite Futsal Athletes in competition.

MATERIALS AND METHODS

Research Methodology. This is a quantitative research study. The author uses the Confirmatory factor analysis to validate the Construct Validity of the Psychological Characteristics Questionnaire for Elite Futsal Athletes in competition. This research is reviewed and approved for human research ethics by the Human Research Ethics Committee of Thammasat University (Science), Certificate of Analysis (COA) ID No. 128/2563. The details of the research methodology are as follows.

Population and Sample. The population comprised elite male Futsal players of Thai nationality who participated in Thailand Futsal competitions in 2020 and 2021, over 18 years old, for a total of 550 players. The population consisted of Futsal players who participated in the Futsal Thai League, for a total of 350 players (63.64 percent), and those who participated in the Championship Futsal Tournament, for a total of 200 players (36.36 percent).

The samples were elite male Futsal players of Thai nationality who participated in Thailand Futsal competitions in the years 2020 and 2021, with an average age of 24.35 years, for a total of 303 players. Their average career length as professional Futsal players was 4.62 years. The sample size was determined by considering criteria from Taro Yamane's Sample Size Calculation Table (19), with a confidence level of 95 percent, an acceptable level of error (e) of 5 percent, and a proportion of the population with characteristics of interest (P) of 0.5. The author also considered the recommendations regarding the appropriate sample size for confirmatory factor analysis (18, 20-22). Stratified Random Sampling was used in consideration of maintaining the appropriate proportion of samples, namely, Futsal players who participated in the Futsal Thai League, for a total of 193 players (63.64 percent), and those who participated in the Championship Futsal Tournament, for a total of 110 players (36.36 percent).

Research Instruments.

1. A General Questionnaire that collects general information, including sex, age, and experience as professional Futsal athletes.

2. The Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition by Wichai Yeemin et al. (4) has an item-specific reliability of 0.44–0.81 and an overall reliability of 0.95. The questionnaire is based on the 5-point Likert Scale, with the response options of 'Never' (1 point), 'Rarely' (2 points), 'Sometimes' (3 points), 'Frequently' (4 points), and 'Always' (5 points); and the total question items of 41 items. The question items can be divided into two categories: psychological factors and psychological strategies. The psychological factors consist of 6 elements, namely, 1.1) 'Confidence and Freedom from Anxiety' for Items 12, 24, 32, 36, 39, and 41. This component represents the athletes' belief in their abilities, the courage to show their abilities, and the ability to think and make decisions quickly, relax, be optimistic, and manage their emotions. 1.2) 'Motivation', for Items 11, 23, 31, 35, 38, and 40. This item represents factors that cause athletes to exhibit and maintain behaviors related to training and competition. 1.3) 'Remaining in the Present', for Items No. 10 and 22. This component represents the athletes' ability to focus on the present and prevent themselves from being preoccupied with their performance. 1.4) 'Dedication and Commitment' for Items 9, 21, and 30. This component represents the athletes' abilities to seriously and firmly develop themselves toward their goals and to maintain their dedication and commitment even in the face of obstacles. 1.5) 'Confidence in Teammates', for Items No. 8 and 20. This component represents the athletes' belief in the capability and performance of their teammates and teamwork. Lastly, 1.6) 'Self-Discipline and Ball Playing Intelligence', for Items No. 7 and 19. This component represents the athletes' abilities to think and present creative play styles most appropriate to the current situation while respecting and obeying the trainers' instructions. On the other hand, the psychological strategies consist of 6 components, namely, 2.1) 'Positive Self-Talk' for Items 6, 18, 29, 34, and 37. This component represents the athletes' abilities to communicate positively with themselves, using thoughts or words, to create knowledge and understanding, and to self-motivate and maintain their behaviors. 2.2) 'Relaxation' for Items 5, 17, 28, and 33. This component represents the athletes' abilities to initiate activities to relax their thoughts, emotions, feelings, and behaviors. 2.3) 'Receiving Encouragement' for Items 4, 16, and 27. This component represents the athletes' abilities to recognize kind words of encouragement from the people around them and use them as reasons and motivation to overcome obstacles and

disappointments. 2.4) Harmoniousness with teammates for Items 3, 15, and 26. This component represents the athletes' abilities to cultivate their teammates' state of mind, feelings, and attitudes to encourage them to be focused, enthusiastic, willing, and united so that they may work together to achieve the goals efficiently. 2.5) 'Cherishing Models, Motto, and Vision' for Items 2, 14, and 25. This component represents the athletes' abilities to cherish and adhere to their motto to observe and implement religious concepts, principles, and practices; to encourage themselves and their teammates and bring fortune to their enterprise; and to observe and imitate behaviors of their favorite Futsal players. Lastly, 2.6) 'Thought, Feelings, and Playing Behavior Management' for Items No. 1 and 13.

This component represents the athletes' abilities to control and maintain their thoughts and feelings within the normal ranges in the face of various stimuli and to create an image of the situation they wish to perform or are about to perform in their minds before actual practice.

Data Collection. The author collected the data himself. The author contacted Futsal clubs that participated in the Futsal Thai League and the Championship Futsal in 2020 and 2021 and requested to meet Futsal athletes to explain the details of this research to them and collect data at each team's training field. During the meeting, the author explained the consent-giving process to the athletes and presented them with the consent letter. The author then asked the athletes to read and sign the consent letter before distributing the questionnaires.

Data Collection Process.

1. The author distributed the General Questionnaire and the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition to the athletes after explaining the details of both questionnaires. These questionnaires required 20-25 minutes to complete.

2. The author asked the athletes to complete the General and Psychological Characteristic Questionnaires for Elite Futsal Athletes in Competition. The author remained with the athletes until they completed both questionnaires.

Data Analysis. For the current study, the author used the Confirmatory Factor Analysis technique, namely, the Maximum Likelihood method, which is recognized as a method that yields reliable results efficiently while being independent of the measurement. The data was analyzed in terms of correlation or co-variation (20).

In order to assess the model's Goodness-of-Fit, the author used the Chi-square (X^2) statistic, the Non-Normed Fit Index (NNFI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RAMSEA). Moreover, the author also utilized the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) to assess the Construct Validity of elite Futsal athletes in competition, using off-the-shelf statistical analysis software (23). The assessment was divided into two parts. Firstly, the author conducted the First-order Confirmatory factor analysis to validate the construct validity of the psychological characteristics of Elite Futsal athletes in competition. The author then conducted the Second-order Confirmatory factor analysis to verify that the psychological characteristics of elite Futsal athletes in competition actually came from the 2 aspects of psychological characteristics for elite Futsal athletes in competition, namely, the psychological factors and the psychological strategies.

Finally, the author used Cronbach's alpha coefficient (24, 25) to determine the item-specific and overall reliability of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition.

RESULTS

The analysis results of means and standard deviations, aimed to identify the general characteristics of the samples, revealed that the basic stats of variables observed from using the 41-item Psychological Characteristic Questionnaire for Elite Futsal Athletes in the competition had similar means and standard deviations. That is, the means of between 1.03 and 4.51; the standard deviations of between 0.04 and 0.05; the Skewness of between (-1.44) and (-0.36); and the Kurtosis of between (-0.47) and 2.90. This result thus confirmed that the variables observed from the Psychological Characteristic Questionnaire for Elite Futsal Athletes in the competition had normal distribution since the Skewness was less than 2.00 and the Kurtosis was less than 7.00 (26). In addition, the author conducted the test of Goodness-of-Fit by analyzing the Kaiser-Mayer-Olkin Measure of Sampling Adequacy (KMO) index and Bartlett's test of sphericity. The result showed that the

KMO index score of the entire questionnaire was 0.95, which confirms the Goodness-of-Fit of the data for factory analysis since the KMO index score was more than 0.5 and approaching 1. On the other hand, the result of Bartlett's test of sphericity revealed that x^2 was 6385.50 and $p<0.001$, which confirms that the question items were significantly related and that the resulting response can be used for factor analysis (20).

In order to develop the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition, the author conducted the following data analysis to ensure the quality of the resulting questionnaire and to understand the psychological characteristics of elite Futsal athletes in competition.

The First-Order Confirmatory Factor Analysis of Psychological Characteristics of Elite Futsal Athletes in Competition: The author conducted this analysis to validate the construct validity of the psychological characteristics of elite Futsal athletes in competition, which consists of 12 components and 41 variables. The analysis revealed that the Chi-square value was statistically significant ($x^2=1903.29$, $p=0.0$), indicating no Goodness-of-Fit between the hypothetical model and the empirical data. However, it is known that the Chi-square statistic is sensitive to sample size and very sensitive when many variables are observed (27).

Therefore, other indices of Goodness-of-Fit were included. The result revealed that the model has a moderate level of Goodness-of-Fit (reasonable fit) ($x^2/df=2.68$, GFI 0.76, AGFI=0.71, NNFI=0.96, CFI=0.97, RMSEA=0.075) (28), with the standardized loading of 0.32-0.53 (Table 1).

Table 1. The Standardized Loadings and the Coefficient of Determination from the First-Order Confirmatory factor analysis of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition.

Question Items		λ	t-value	R^2
Confidence and freedom from anxiety (CA)				
CA12	Within a limited time frame, I can analyze and find the solution in time	0.45	11.94	0.40
CA24	During critical situations, I can come up with a solution.	0.44	11.42	0.37
CA32	I can control my negative emotions.	0.34	8.51	0.21
CA36	I believe I can always perform well while playing Futsal.	0.37	10.01	0.29
CA39	I believe I will succeed in whatever I set out to do.	0.39	10.50	0.32
CA41	I am not afraid even though I am facing difficult obstacles.	0.39	11.43	0.37
Motivation (MT)				
MT11	I think my abilities depend on the result of each game.	0.34	7.68	0.18
MT23	I play Futsal because it is fun. It requires one's creativity and unique abilities.	0.51	13.30	0.47
MT31	I do everything related to Futsal because it makes me a well-known person.	0.37	10.18	0.30
MT35	I do everything related to Futsal because I like/love playing Futsal.	0.41	12.49	0.43
MT38	I do everything related to Futsal to do better than other athletes.	0.37	9.60	0.27
MT40	I do everything related to Futsal because it is a well-paid career.	0.39	11.54	0.37
Remaining in the present (SP)				
SP10	No matter the result of today's game, I will always begin anew tomorrow.	0.49	11.81	0.47
SP22	I think the present is the most important. The past was gone and cannot be changed.	0.39	10.18	0.35
Dedication and commitment (DC)				
DC9	I always give my all doing everything related to Futsal.	0.43	11.62	0.39
DC21	I do whatever it takes to achieve my goals.	0.46	12.79	0.45
DC30	I practice all skills and play styles to the best of my ability.	0.48	13.03	0.47
Confidence in teammates (TC)				
TC8	I believe that working as a team will lead to success in playing Futsal	0.38	7.49	0.31
TC20	I cannot play well without my teammates to support me.	0.35	5.91	0.15
Self-discipline and ball-playing intelligence (DI)				
DI7	I choose the play style that is most appropriate to the situation.	0.39	9.15	0.31
DI19	I perform the tasks assigned to me rigorously.	0.42	9.59	0.35
Positive self-talk (PT)				
PT6	I still have many things to improve to achieve the highest possible success.	0.49	12.51	0.42
PT18	I choose to look at the positives that come from the activities I do.	0.44	11.85	0.39

	Question Items	λ	t-value	R^2
PT29	I told myself that the result of any match can be either fulfilling or disappointing.	0.45	12.57	0.43
PT34	I think ahead about how to handle things when they occur.	0.43	11.42	0.37
PT37	When I feel down, I give myself encouraging words.	0.39	10.89	0.34
Relaxation (RL)				
RL5	Talking with family members improved my mental state.	0.43	10.47	0.33
RL17	When I feel anxious, stressed, or pressured, I discuss my feelings with my family. This helps me relax.	0.51	10.75	0.35
RL28	I have my ways of physical and mental relaxation, such as walking in the malls, watching movies, listening to music, or traveling.	0.47	10.13	0.31
RL33	I have relaxed conversations with my teammates.	0.32	8.88	0.25
Receiving encouragement (GE)				
GE4	When I face Futsal-related problems, I think about positive words from the people around me.	0.47	12.36	0.45
GE16	When I feel down and disappointed, I think about positive words from the people around me.	0.49	11.96	0.42
GE27	I use positive words and encouragement from the people around me to motivate myself.	0.53	14.34	0.56
Harmoniousness with teammates (CH)				
CH3	If the team makes mistakes, I communicate positively with teammates rather than negatively.	0.48	12.81	0.47
CH15	I always encourage my teammates and staff.	0.46	12.29	0.44
CH26	I call for a boom to strengthen our morale and to encourage myself and my teammates.	0.51	12.46	0.45
Cherishing models, motto, and vision (MMD)				
MMD2	I observe the ideas and practices of my religion to create positive feelings when I play Futsal.	0.53	13.09	0.49
MMD14	I have my motto for playing Futsal.	0.50	13.02	0.48
MMD25	I use the same play styles as my Futsal idols.	0.50	11.29	0.38
Thoughts, feelings, and playing behavior management (TBM)				
TBM1	Face with pressure, I can control myself and bring myself back to normal quickly.	0.44	11.46	0.44
TBM13	I imagine the performance before actual playing.	0.44	11.19	0.42

The Second-Order Confirmatory Factor Analysis of Psychological Characteristics of Elite Futsal Athletes in Competition: the author conducted this analysis to confirm whether all components of the psychological characteristics of elite Futsal athletes in competitions came from the two aspects of psychological characteristics for elite Futsal athletes in competition, namely, the psychological factors and the psychological strategies. The analysis revealed that the Chi-square value was statistically significant (x^2=2140.38, p=0.0), indicating no Goodness-of-Fit between the hypothetical model and the empirical data. However, it is known that the Chi-square statistic is sensitive to sample size and very sensitive when many variables are observed (27). Therefore, other indices of Goodness-of-Fit were included. The result revealed that the model has a moderate level of Goodness-of-Fit (reasonable fit) (x^2/df=2.81, GFI 0.74, AGFI=0.71, NNFI=0.96, CFI=0.97, RMSEA=0.078) (28). These components can be divided into two categories: psychological factors and psychological strategies. The psychological factors consist of 6 elements, namely, confidence and freedom from anxiety (CA), motivation (MT), remaining in the present (SP), dedication and commitment (DC), confidence in teammates (TC), and self-discipline and ball playing intelligence (DI). The psychological strategies consist of 6 elements, namely, positive self-talk (PT), relaxation (RL), receiving encouragement (GE), harmoniousness with teammates (CH), cherishing models, motto, and vision (MMD), and thoughts, feelings, and playing behavior management (TBM).

The abovementioned analysis revealed that the Psychological Characteristic Questionnaire for Elite Futsal Athletes in the competition was based on the two aspects of psychological characteristics, divided into 12 components and presented through 41 question items, namely, the psychological factors and the psychological strategies. The psychological factors consist of 6 components, namely, 1.1) confidence and freedom from anxiety, 1.2)

motivation, 1.3) remaining in the present, 1.4) dedication and commitment, 1.5) confidence in teammates, and 1.6) self-discipline and ball-playing intelligence. The psychological strategies consist of 6 elements, namely, 2.1) positive self-talk, 2.2) relaxation, 2.3) receiving encouragement, 2.4) harmoniousness with teammates, 2.5) cherishing models, motto, and vision, and 2.6) thoughts, feelings, and playing behavior management.

The author then examined the reliability of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition (41 question items) and found that the questionnaire had decent reliability or Internal Goodness-of-Fit scores (24, 25). In contrast, the overall reliability score of the questionnaire was 0.96, and the item-specific reliability scores were between 0.35 and 0.76. (Table 2).

Table 2. The Reliability Scores of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition.

Aspects	Components	No. of question items	Reliability
Psychological factors	1. Confidence and freedom from anxiety	6	0.78
	2. Motivation	6	0.75
	3. Remaining in the present	2	0.57
	4. Dedication and commitment	3	0.70
	5. Confidence in teammates	2	0.35
	6. Self-discipline and ball-playing intelligence.	2	0.50
Psychological strategies	7. Positive self-talk	5	0.76
	8. Relaxation	4	0.64
	9. Receiving encouragement	3	0.73
	10. Harmoniousness with teammates	3	0.71
	11. Cherishing models, motto, and vision	3	0.71
	12. Thoughts, feelings, and playing behavior management.	2	0.61
Overall		41	0.96

DISCUSSION

This research study examines the construct validity of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition. The result reveals that the psychological characteristics of elite Futsal athletes in competition come from 2 aspects of psychological characteristics, namely, 1) the psychological factors and 2) the psychological strategies; and that individual factor consists of components and question items which are in line with the questionnaire proposed by Yeemin et al. (4). However, the result of the First-order and Second-order Confirmatory factor analysis reveals that the model mentioned above has a moderate level of Goodness-of-Fit. That is, the Root Mean Square Error of Approximation (RAMSEA) of 0.05-0.08, the Goodness of Fit Index (GFI) of less than 0.90 (28), and the Adjusted Goodness of Fit Index (AGFI) of less than 0.90. This is possible because the standardized factor loadings of variables are pretty low. Moreover, the factor loadings of some variables are relatively close to the minimum acceptable ranges (λ=0.3), and, as a result, those question items are not excluded as their loading factors are within the acceptable ranges. However, if we look at the Comparative Fit Index (CFI) and the Non-normed Fit Index (NNFI), we will see that these indices are higher than 0.90. This means the model has a decent level of Goodness-of-Fit with the empirical data (27). In addition, the result of the current study is in line with the results of other research studies that also studied the development of psychological characteristic questionnaires for athletes. In contrast, those studies also found that the loading factors of some variables were lower than the minimum acceptable ranges (29) and that the Second-order Confirmatory factor analysis model merely yielded a fair level of Goodness-of-Fit (30).

When considering the reliability scores (Cronbach's alpha reliability coefficient) of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition produced by the current study, we will see that the questionnaire's overall reliability score was 0.96, which is acceptable. This is in line with the criterion for considering the reliability scores of questionnaires; that is, the reliability score must be more than 0.70 (24, 25) for the questionnaire to be acceptable. When

considering the reliability scores of components of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition, we will see that they are between 0.35 and 0.78. Anyway, the item-specific reliability of some question items is too low (20). In this regard, the component with the lowest reliability score is 'confidence in teammate', which has to question items with loading factors that are too low or correlation scores between the variables and factors, at merely 0.38 and 0.35, respectively. These question items are No. 8 (I believe working as a team will lead to success in playing Futsal) and No. 20 (I cannot play well without my teammates to support me). Such low scores mean that these 2 question items are the least efficient for assessing the psychological characteristics, that is, the confidence in teammates, of elite Futsal athletes in competition. However, examining the construct validity of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition reveals that the produced questionnaire maintains the same structural components as the original questionnaire. This means the produced questionnaire can be used to assess the psychological characteristics of elite Futsal athletes in competition, and it can be helpful for trainers, athletes, and people related to Futsal. The current study also provides a guideline for further improving the Psychological Characteristic Questionnaire for Elite Futsal Athletes in competition, making the questionnaire cover different cultural contexts. Doing so will be beneficial as it will allow athletes from different cultural contexts to be compared.

CONCLUSION

This research project uses confirmatory factor analysis to validate the construct validity of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition. The first-order and the second-order confirmatory factor analysis revealed that the model of psychological characteristics of elite Futsal in competition has a moderate level of Goodness-of-Fit. The result also reveals that the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition has a decent internal goodness-of-fit, with an overall reliability of 0.96. Therefore, this questionnaire can be used to evaluate 2 aspects of the psychological characteristics of elite Futsal athletes in competition: the psychological factors and the psychological strategies. The psychological factors consist of 6 elements: confidence and freedom from anxiety, motivation, remaining present, dedication and commitment, confidence in teammates, self-discipline, and ball-playing intelligence. The psychological strategies consist of 6 elements: positive self-talk, relaxation, encouragement, harmoniousness with teammates, cherishing models, motto, vision, thoughts, feelings, and playing behavior management. According to the results mentioned above, it has been confirmed that the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition possesses the desirable construct validity and reliability level and can be used to assess the psychological characteristics of elite Futsal athletes in competition.

In terms of suggestions for future research and development of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition, the author recommends that the Structural Equation Modeling Analysis should be applied to the psychological characteristics of elite Futsal athletes in competition in order to study the causal relationship of various variables of the psychological characteristics of elite Futsal athletes in competition. The author also suggests that other aspects that are related to the psychological characteristics of elite Futsal athletes, such as positions, athletes' experience, team performance, etc., should be included with the psychological characteristics assessment in order to expand the knowledge about different aspects and effects of psychological characteristics of Futsal athletes in competition. Moreover, the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition produced herein can be translated into other languages and used with Futsal athletes from different cultural backgrounds, allowing the comparison of athletes from different cultural contexts in the future.

APPLICABLE REMARKS

- The psychometric properties of the Psychological Characteristic Questionnaire for Elite Futsal Athletes in Competition can be used to evaluate two aspects of the psychological characteristics of elite Futsal athletes in competition: the psychological factors and the psychological strategies.
- The questionnaire can also provide helpful information on the psychological characteristics of elite Futsal athletes with different positions, experiences, and performances.
- The questionnaire can be translated into other languages and used with Futsal athletes from different cultural backgrounds, allowing the

comparison of athletes from different cultural contexts in the future.

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AUTHORS' CONTRIBUTIONS

Study concept and design: Wichai Yeemin, Supatcharin Kemarat, Apiluk Theanthong. Acquisition of data: Wichai Yeemin. Analysis and interpretation of data: Wichai Yeemin. Drafting the manuscript: Wichai Yeemin. Critical revision of the manuscript for important intellectual content: Wichai Yeemin. Statistical analysis: Wichai Yeemin. Administrative, technical, and material support: Wichai Yeemin, Supatcharin Kemarat, Apiluk Theanthong. Study supervision: Wichai Yeemin, Supatcharin Kemarat, Apiluk Theanthong.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

FINANCIAL DISCLOSURE

The authors have no financial interests related to the material in the manuscript.

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ETHICAL CONSIDERATION

All participants signed the informed consent form. The Human Research Ethics Committee of Thammasat University (Science) approved, and the study complied with the Declaration of Helsinki (COA) ID No. 128/2563).

ROLE OF THE SPONSOR

The funding organizations are public institutions and have no role in the design and conduct of the study, collection, management, and analysis of the data, or preparation, review, and approval of the manuscript.

ARTIFICIAL INTELLIGENCE (AI) USE

There was no use of artificial intelligence (AI) for preparation, writing, or editing this manuscript.

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