JOMH
Journal of Men's Health

Validation of a Questionnaire that Surveys Confidence in Sports among Korean Competitive Athletes

Seyong Jang[1], Han-Joo Eom[1], Kyu-Dong Lee[1,2] , Won-Min Choi[1], Ye-Lim Choi[1], Hyun-Woo Kang[1], Eun-Hyung Cho[3]

[1]College of Sport Science, Sungkyunkwan University, Suwon, Republic of Korea

[2]Physical Education Section, Korean National Police University, Asan, Republic of Korea

[3]Korea Institute of Sport Science, Korea Sports Promotion Foundation, Seoul, Republic of Korea

Corresponding Author: Eun-Hyung Cho: taedori1974@hanmail.net

ABSTRACT

Background and Objective
This study aimed to verify the validity of a questionnaire that surveys confidence in sports among athletes in combat sports. The questionnaire addresses the concepts of persistence, calmness, hesitation, and physical prime.

Material and Methods
Purposeful sampling using non-probability sampling was conducted in 367 players participating in university- and business-level athletics in the Republic of Korea. The data were analyzed using a multi-group confirmatory factor analysis and a second confirmatory factor analysis with linear structural relations (LISREL) version 8.5. Concept reliability and average variance extracted (AVE) values were calculated using Excel 2010 (Microsoft Corporation, Redmond, WA, USA). Two-way (2×2) randomized group (RG) analysis of variance (ANOVA) was conducted using the SPSS 18.0 program (IBM Corp., Armonk, NY, USA).

Results
We proved that the sub-factors measured by the survey questions were relatively exact regarding self-confidence in combat-sport athletes. The questions relating to self-confidence in sports could be applied to both male and female athletes alike. The scores were higher in male athletes than in female athletes in the following factors: fighting spirit, calmness, and performing under pressure. The scores of the national athletes were higher compared to those of the non-national athletes with respect to the body preparation factor.

Conclusion

These results suggest that the competitive sports questionnaire developed in a previous study could be utilized without difficulty in a confidence-related study of competitive sports athletes. The questionnaire is particularly effective in evaluating the confidence level of athletes.

The successful performance of athletes during competitions changes dynamically under various settings and psychological factors. Therefore, the likelihood of successful performance in highly skilled athletes can be improved through an assessment of controllable psychological factors, as opposed to focusing on uncontrollable settings. Studies, therefore, should focus on spiritual dispositions and strengths.[1,2]

Personal confidence has been a favourite subject among sports psychologists, and its positive relationship with performance has been reported. The correlation between confidence and performance among athletes has been demonstrated in a myriad of papers that suggest that success in competition depends on the confidence levels of the athletes.[3–6] In addition, a meta-analysis on confidence in sports is based on studies that have indicated that the smaller the gap between assessed and ideal confidence, the better the athletes' performance.[3]

The sports questionnaire, developed after an evaluation of the athletes' confidence levels, is commonly used in confidence-related studies. However, psychology-based questionnaires should be carefully selected since different people's thoughts and behaviours in response to the same phenomena can vary, depending on the cultural and national characteristics and biases inherent in each person. Nonetheless, in sports confidence-related studies conducted in Korea, misinterpretations of questionnaires frequently occur, such that the properties of the questionnaire are not accurately reflected.

Confidence-related studies in athletics conducted in Korea typically use the Sources of Sport Confidence Questionnaire (SSCQ), which has 4 sub-factors (demonstration of ability, coach's leadership, physical/psychological preparation, and social support) and fifteen items. The Korean version of the questionnaire was developed in 1998 to identify the factors affecting the athletes' confidence. The questionnaire consists of 9 sub-factors, including mental and physical preparation, social support, mastering of performance, demonstration of ability, luck/superstition, vicarious experience, physical self-presentation, coach's leadership, and environmental comfort.[7]

The SSCQ aims to identify the factors that affect an athlete's confidence, as suggested by the title of the original questionnaire "Sources of Sport Confidence Questionnaire."[8] However, in the sport confidence-related studies performed in Korea, the sub-factors of the SSCQ are frequently misinterpreted as describing the athletes' confidence levels alone. In this context, survey tools are needed that can evaluate the Korean athletes' confidence levels, in consideration of cultural characteristics and the type of sport.[1]

Hence, a questionnaire having 4 sub-factors (persistence, calm, hesitation, and physical prime) and 24 items (6 items relating to each single factor) was developed to evaluate Korean athletes' confidence, based on the study of Jang and Cho.[1] However, the individual sport confidence questionnaire only included analyses of explanatory factors, reliability, and factor structure. Furthermore, the previous study did not focus on the sex-specificity of the survey tool for male and female athletes. Therefore, further study was needed to validate the reliability of the sport confidence questionnaire developed by Jang and Cho,[1] via a range of statistical processes, such as convergence and discriminant validities of sub-factors and measurement equivalence.

It is assumed that this approach has a very large impact ono correcting error by theory and test equipment from confidence-related advanced studies. Moreover, it is thought that this test equipment with verified validity measures of confidence level, which is closely related to player performance, indicates that this study can be very helpful to sports event fields. Consequently, this study aimed to provide fundamental knowledge for sport confidence-related research by compensating for the deficiencies in previous research with respect to measurement equivalence and range of reliability verifications.

METHODS

Participants

Among athletes in competitive sports enrolled in the Korean Olympic Committee as of 2013, those who had participated in the previous research were excluded by way of construct validation (n=127) and the exploratory factor analysis (n=297) of Jang and Cho.[1] A sample of 372 athletes were selected via purposeful sampling of a non-probability sampling, obtaining similar numbers of athletes in each differ-ent type of sport. After conducting the survey, the data of 367 athletes were utilized in the study. We excluded the data of 5 athletes who were unrespon-sive. The detailed accounts of 367 athletes were as follows: Taekwondo, n=212 (male: n=154, female: n=58); Judo, n=71 (male: n=53, female: n=18); box-ing, n=46 (male: n=41, female: n=5); and wrestling: n=38(male: n=34, female: n=4); University team, n=304; business team, n=63; male, n=290; female, n=77; average age, 21.72±1.85 years; and length of sports career, 8.64±3.41 years.

Research Instrument

Sports confidence questionnaire: The competi-tive sports confidence questionnaire used herein is based on the previous study of Jang and Cho,[1] and consists of 4 factors and 24 items using a 5-point rating scale. The results showed that factor loading (Kaiser-Meyer-Olkin [KMO] and Bartlett's Test: KMO = 0.867, χ^2 = 3053.478, degree of freedom (df) = 276, p = 0.001; goodness-of-fit test: χ^2 = 506.518, df = 186, p = 0.001. Q (χ^2/df) = 2.723; factor loading: persistence = 0.626~0.764; hesitation = 0.652~0.768; calm = 0.493–0.825; physical prime = 0.485–0.652; reliability analysis (persistence α = 0.844, r = 0.383– 0.647, hesitation α = 0.873, r = 0.399–0.738, calm α = 0.799, r = 0.285–0.618, physical prime α = 0.813, r = 0.232–0.445) and the factor structure analysis of the questionnaire were relatively fit. The model's goodness of fit was optimal when the questionnaire consisted of 4 factors and 16 items, inclusive of key items and second items. Based on these results, a reliability analysis was performed on 4 factors and 16 items, which showed the best goodness-of-fit (the questionnaire is presented as Appendix 1).

The operational definition of the 4 sub-factors in the questionnaire will be described next. Persistence is a sub-factor that is based on the raw materials of confidence including audacity, nerves of steel, and grit. Confidence here is defined as the will power to perform one's own skills boldly and be undaunted by one's opponent. Calm is consistent with the ability to maintain one's composure while overcoming crises or when faced with adversity, such as when met with an unexpected attack by an opponent. Hesitation represents feelings of anxiety and pressure in competitions, such as may occur when one is confronted by a renowned player with a myriad of career wins and allows oneself to be easily defeated without demonstrating one's own ability fully. Physical prime means being fully prepared for a competition by doing sufficient workouts, maintaining weight within the regulations for the type of sport in order not to be disqualified, and regularly conditioning oneself to sustain the best possible physical condition before a competition.

Convergent and discriminant validities of the individual sports confidence questionnaires were assessed using the Competitive State Anxiety Inven-tory-2 (CSAI-2) questionnaire developed by Martens et al.[9]; among the sub-factors of the CSAI-2, the state of self-confidence (8th item) and the status of anxiety (7th item) were employed since they are known to be positively or negatively correlated with competitive sports athletes' confidence.

Method of Data Collection

For data collection, the researchers first obtained informed consent after explaining the motive and purpose of research to the coaches of each team and appointed a date for the research. One researcher and one research assistant visited the athletes at the specified time and location. After each athlete signed an informed consent document indicating their agree-ment to participate in the research, the questionnaires were administered. Upon completion of the question-naires, the data were collected on the spot. The partici-pants were advised that collected data would not be used for any reason other than this specific research. The data were recorded by a team of 2 people, and a total of 367 data points were finally adopted, excluding the unfaithful 5 data points due to lack of response.

Statistical Analyses

The selected data were analyzed using the linear structural relations (LISREL) version 8.5 program, SPSS version 18.0 program (IBM Corp., Armonk, NY, USA), and Excel 2010 (Microsoft Corporation, Redmond, WA, USA).

Construct validity: An analysis of construct validity, which had not been undertaken in the previous research, was implemented, prior to the multi-group and confirmatory factor analyses. Construct validity was used to evaluate whether each construct corresponded to the actual variables assessing the construct, and represented how each construct was fully evaluated by the observable variables. The constructs were classified into convergent and discriminant validities; the former represented the correspondence between the observable variables by which the latent variables are evaluated, and the latter represented the differences between the latent variables. In the convergent validity analysis, when the value obtained by the evaluation of the standardized factor loading (λ) and standard deviation were statistically significant (t-value>2.0),[10] the questionnaire was considered to be valid. In addition, when the value of the construct reliability was > 0.7, and that of the AVE (Average Variance Extracted) was > 0.5, the convergent validity of the questionnaire was confirmed.[11] Discriminant validity of the data was evaluated when the AVE of latent variables surpassed the sum of the squares of the correlation coefficients between latent variables (AVE > α^2).[10] Another approach analyzed the difference between the free-form unconstrained and constrained models, in which covariance between 2 variables was set to 1.0.[12] The formula used in the calculation is as follows:

$$CR = \frac{\left(\Sigma\lambda\right)^2}{\left(\Sigma\lambda^2\right) + \left(\Sigma \ error \ variance\right)}$$

$$AVE = \frac{\left(\Sigma\lambda^2\right)}{\left(\Sigma\lambda^2\right) + \left(\Sigma \ error \ variance\right)}$$

Multi-group confirmatory factor analysis: A multi-group confirmatory factor analysis was implemented to analyze the cross validity of the competitive sports confidence questionnaire. Cross validity was used to analyze whether the results obtained from a sample of the population corresponded to the results obtained from another sample in the same population. In this study, factor structure equivalence and measurement equivalence using multi-group confirmatory factor analysis were evaluated to determine any discrepancy across the sexes. Specifically, in the measurement invariance analysis, after adopting the unconstrained model as a baseline model, the constrained model (the path coefficient of each variable over the latent variables were set as 1.0) was analyzed. In this case, the constrained model, latent in the baseline model, was validated by a chi-square evaluation. The chi-square validation, though normally used in comparing models of goodness-of-fit, is not reliable, since it is susceptible to the number of cases.[10–13] Therefore, the Non-Normed Fit Index (NNFI) and the Root Mean Square Error of Approximation (RMSEA) were taken into consideration along with the goodness of fit test, and the Confirmatory Fit Index (CFI) value was eliminated since it does not consider the simplicity of the model in multi-group validations.[14]

The second-order confirmatory factor analysis: The convergent and discriminant validities of the competitive sports confidence questionnaire were determined. In a correlation analysis, measurement error can occur when the mean value between 2 variables is included. However, the same measurement error does not exist in a correlation between latent variables. Therefore, the discrepancy of correlation exists depending on the size of the measurement error of the variables. To exclude the influence of measurement error, the convergent validity of the state of self-confidence variable, and the discriminant validity of the cognitive state of anxiety were evaluated. Considering the correlation between the latent variables presented as a result of a second-order factor, the confidence questionnaire was positively correlated with the state of self-confidence in theory and negatively correlated with the cognitive state of anxiety.

Validity on confidence profile of individual sport athletes: A two-way (2×2) randomized group (RG) analysis of variance (ANOVA) was implemented to validate the profiles of sports confidence according to the sexes and to validate the performance levels

J Mens Health Vol 14(2):e30-e41; April 24, 2018
This article is distributed under the terms of the Creative Commons Attribution-Non Commercial 4.0 International License.

e33

of individual sport athletes. Statistical significance was set at p < 0.05.

Due to the discrepancy of the number of cases in the A and B effects, the total variance was calculated using the following formula:

$$\frac{\Sigma(n-1)S_j^2}{(\sum_{i=1}^{k} n_j) - k}$$

RESULTS

Construct Validity

Construct reliability and AVE were computed by entering a formula into Excel 2010 (Microsoft Corporation, Redmond, WA, USA). Table 1 shows the results of the standardized factor loadings and standard deviations were statistically significant (t-value > 2.0), and the values of construct reliability and AVE exceeded standard values, thereby confirming convergent validity. This result indicates that the observable variables correctly represented the construct.

Discriminant Validity

As shown in the results of discriminant validity in Table 2, the AVE values exceeded the values of persistence and physical prime, which are the most closely correlated. The discrepancy values between the unconstrained and constrained models exceeded the rejection critical value [$\chi^2 = 3.84$ ($\alpha = 0.05$, df = 1)], thereby verifying convergent validity. This result meant that the discrepancy across factors existed without multicollinearity.

Result of Factor Structure Equivalence

As shown in Figure 1, the factor 1 and 4 models were established as comparative models and confirmed whether the fittest models for men correspond to those for women.

Table 3 shows that in both men and women the value was sharply reduced, although the degree of freedom decreased by 6, from 104 in factor 1 to 98 in factor 4.

TABLE 1 Results of Convergent Validity

Factor	Item	λ	t	R^2	C.R.	AVE
P	P1	0.73	14.88	0.54	0.842	0.575
	P2	0.77	15.93	0.60		
	P3	0.75	15.24	0.56		
	P6	0.55	10.40	0.30		
C	C1	0.81	16.32	0.66	0.798	0.500
	C2	0.64	12.16	0.40		
	C3	0.59	11.13	0.35		
	C4	0.63	12.01	0.40		
H	H1	0.85	19.10	0.72	0.874	0.638
	H2	0.88	19.96	0.77		
	H3	0.66	13.43	0.43		
	H6	0.68	14.12	0.46		
PP	PP1	0.84	18.57	0.71	0.859	0.609
	PP2	0.60	12.00	0.36		
	PP4	0.67	13.71	0.45		
	PP6	0.87	19.39	0.75		

P = persistence; C = calm; H = hesitation; PP = physical prime; C.R. = construct reliability; AVE = average variance extracted

FIG. 1 Test equality of factor structure model. SC = sport confidence; P = persistence; C = calm; H = hesitation; PP = physical prime.
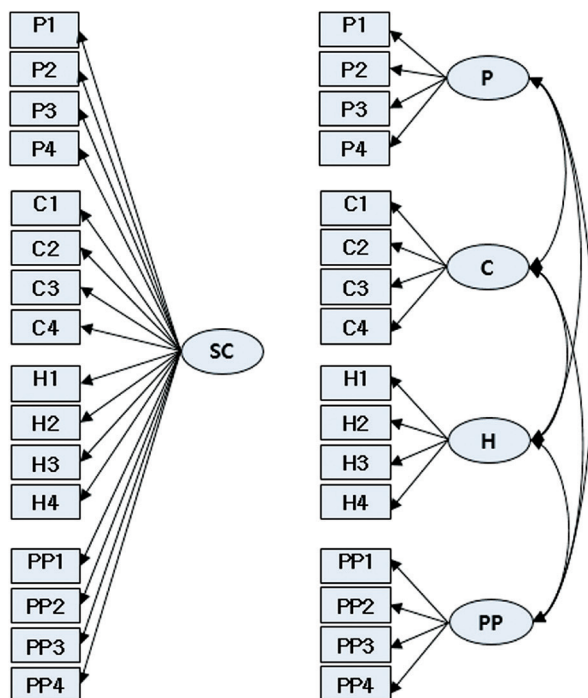

TABLE 2 Results of Discriminant Validity

Test	Factor	AVE	≠	Ø²(P↔PP)2
AVE > Ø²	P	0.575	>	0.220
	PP	0.609	>	
Δχ² > χ²	Model	χ^2	df	$\Delta\chi^2$
	Free	214.530	98	229.500
	1	444.030	99	

Note. χ^2 Rejection region for 0.05(df =1) = 3.84, Ø²: square of the Pearson correlation coefficient.
AVE = average variance extracted; P = persistence; PP = physical prime.

TABLE 3 Results of Factor Structure Equivalence

Model	χ^2	df	NNFI	RMSEA
Male				
1	1504.64	104	0.44	0.220
4	194.69	98	0.93	0.058
Female				
1	290.97	104	0.43	0.150
4	138.58	98	0.90	0.074

NNFI = non-normed fit index; RMSEA = root mean square error of approximation.

TABLE 4 Results of Factor Loading Equivalence

Model	χ^2	Df	NNFI	RMSEA (90%CI)	$\Delta\chi^2$	p
Free	333.26	196	0.91	0.062 (0.050, 0.073)	–	–
λ	256.25	212	0.92	0.062 (0.046, 0.068)	22.99	p>0.05

χ^2: Rejection region for 0.05(df =16)=26.30, λ: factor loading equivalence.
NNFI = Non-normed fit index; RMSEA = root mean square error of approximation; CI = Confidence interval.

FIG. 2 Second-order factor model.
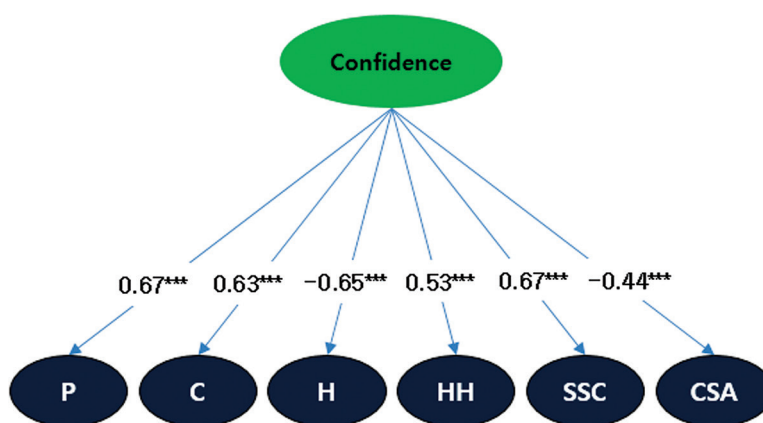
***p<0.001
P = persistence; C = calm; H = hesitation; PP = physical prime; SSC = state self-confidence; CSA = cognition state anxiety.

This result showed that both men and women could be identified equally within the structure of factor 4.

Result of Measurement Equivalence Validity

Table 4 shows that in both men and women, the value was sharply reduced, although the degree of freedom decreased by 6, from 212 in factor 1 to 196 in factor 4. Table 4 shows that for measurement equivalence, the goodness-of-fit of the unconstrained and constrained models were fit, and the discrepancy value did not surpass the rejection critical value (χ^2 = 26.30, df = 16, α = 0.05). This result indicated that the competitive sports confidence questionnaire is applicable to both male and female athletes alike.

Result of Convergent and Discriminant Validities

In the second-order confirmatory factor analysis for convergent and discriminant validities, the second factor was established to exist on top of the first factor (competitive sport confidence), as shown in Figure 2 (the observable variables were excluded due to page restrictions).

The results showed that in sports confidence, the latent variable in the competitive sports confidence questionnaire was positively (0.67) correlated with the state of confidence CSAI-2 sub-factor and negatively (−0.44) correlated with recognition anxiety. Therefore, as expected, the latent variable in the sports confidence questionnaire that was developed in the previous research showed a positive correlation with the state of confidence, and a negative correlation with cognition state anxiety, thereby confirming convergent and discriminant validities. In addition, the correlation of latent variables corresponded to the results of the second-order confirmatory factor analysis. That is, as

expected in theory, the hesitation sub-factor (H) and cognition anxiety sub-factor (CSA) in the confidence questionnaire showed negative correlations with all variables, and positive correlations with the other factors, as seen in Table 5.

Sport Confidence Profile

After the construct and reliability validities were verified, a two-way (2×2) RG ANOVA was performed to validate discrepancies in sports confidence according to sex and performance level. The result is shown in Table 6.

Table 7 shows that with respect to the persistence, calm, and hesitation factors, among other sub-factors of confidence, the mean value was higher in male athletes than in female athletes in a single effect (persistence: A > B, F = 7.038, p = 0.008; calm: A > B, F = 11.010, p < 0.001; hesitation: A > B, F = 6.015, p = 0.015). The values for athletes with national careers were higher than those for athletes without national careers in effect B (physical prime C > D, F = 5.581, p = 0.019). In addition, the correlation effect (A×B) across sexes and careers was not statistically significant in all factors ([① − ②] = [③ − ④]), as seen in Table 6.

DISCUSSION

This study aimed to verify the validity of a competitive sports confidence questionnaire developed by the Jang and Cho.[1] The results indicated that the construct validity, construct invariance, measurement invariance, convergent validity, and discriminant validity of the questionnaire developed in the previous research were relatively fit for evaluation purposes.

First, with respect to the construct validity of the sports confidence questionnaire, the 4 sub-factors presented in the questionnaire were relatively well measured by the items that are designed to explain the sub-factors. Moreover, in male and female athletes, where a discrepancy supposedly exists, the construct equivalence and measurement equivalence validities indicated that there is no discrepancy between the 2 groups. This finding suggested that the competitive sport confidence questionnaire is applicable to male and female athletes alike, and that the questionnaire can be utilized in subsequent studies without any concern over a discrepancy between the sexes.

Second, in the convergent and discriminant validities examined by analyzing the correlation between

TABLE 5 Result of Correlation for Latent Variables

	P	**C**	**H**	**PP**	**SSC**	**CSA**
P	1.00					
C	0.42**	1.00				
H	−0.43**	−0.41**	1.00			
PP	0.35**	0.34**	−0.34**	1.00		
SSC	0.44**	0.42**	−0.43**	0.35**	1.00	
CSA	−0.29**	−0.28**	0.28**	−0.23**	−0.29**	1.00

**p<0.01
P = persistence; C = calm; H = hesitation; PP = physical prime; SSC = state self-confidence; CSA = cognitive state anxiety.

TABLE 6 Two-Way (2×2) Analysis of Variance Layout

	Yes	**No**	**aMM**
Male	①	②	Ⓐ
Female	③	④	Ⓑ
bMM	Ⓒ	Ⓓ	

aMM = a margin means; bMM = b margin means. Jung and Eum[20]

TABLE 7 Result of 2-way (2×2) randomized group analysis of variance

Variables		Mean(SD)	Source	SS	df	MS	F
P	①	3.43(0.71)	A	3.196	1	3.196	7.038**
	②	3.55(0.66)	B	1.587	1	1.587	3.495
	③	3.14(0.56)	A×B	0.143	1	0.143	0.315
	④	3.36(0.48)	error	164.849	363	0.454	
C	①	3.06(0.72)	A	5.473	1	5.473	11.010***
	②	3.16(0.66)	B	1.515	1	1.515	3.047
	③	2.67(0.60)	A×B	0.212	1	0.212	0.427
	④	2.91(0.77)	error	180.460	363	0.497	
H	①	2.80(0.77)	A	3.475	1	3.475	6.015*
	②	2.83(0.83)	B	0.029	1	0.029	0.050
	③	2.60(0.59)	A×B	0.134	1	0.134	0.232
	④	2.53(0.66)	error	209.717	363	0.578	
PP	①	3.43(0.77)	A	0.311	1	0.311	0.593
	②	3.66(0.63)	B	2.962	1	2.962	5.581*
	③	3.35(0.67)	A×B	0.003	1	0.003	0.005
	④	3.59(0.59)	error	190.346	363	0.524	

***p<0.001, **p<0.01, *p<0.05
SD = standard deviation; SS = sum of square; MS = mean square; P = persistence; C = calm; H = hesitation; PP = physical prime;
A = sex; B = member of national team.

the sports confidence questionnaire's similar or contrasting concepts, sports confidence comprising second factors were negatively correlated with cognition anxiety and positively correlated with the state of self-confidence. This result suggested that when assessing the confidence level of a competitive sports athlete, the questionnaire developed in the previous research was reliable for evaluating construct validity based on the theoretical foundation.

Third, in the results of the analysis of the confidence profile of the questionnaire, the persistence, calm, and hesitation sub-factors of confidence varied between the sexes and between athletes with or without national team careers. The values for male athletes and athletes with national team careers were more positive than those for female athletes and those

without a national team career. This result partially supported the results of a previous study, which suggested that the confidence level of male athletes was higher than that of female athletes.[15,16] In addition, given the finding that male athletes were apparently cooler and tougher than female athletes,[17] the result showing that male athletes had higher values in the calm and persistence sub-factors indicated that the competitive sport confidence questionnaire correctly evaluates factors that apparently truly belong in the competitive sport confidence questionnaire.

Likewise, the result indicating that the scores of athletes with national careers exceeded those of athletes with no such career suggests that athletes' physical preparation plays a key role in successful performances. The result partially supported the finding of the previous

study where Olympic medalists were better prepared physically and mentally compared to other athletes.[18] It also supported the finding of the previous study that indicated that athletes with an increasingly winning career were more likely to have higher confidence by managing themselves thoroughly.[19]

This study aimed to verify the validity of the competitive sports confidence questionnaire that was designed to assess athletes' confidence level. Our study has significance in that it provided fundamental knowledge regarding enhanced athleticism obtained from a confidence-related study. However, this study showed limitations in that the sample only included the athletes in 4 types of official Olympic sports among all competitive sports athletes affiliated with university and business teams. Therefore, the results of this study are inappropriate for athletes in team and personal record sports. Additionally, only the sub-factors of CSAI-2 were utilized to verify the validity of the questionnaire. Any follow-up studies, therefore, should include athletes of all ages, those in team sports and personal record sports, as well as a broader range of competitive sports. Such a study is expected to contribute to more scientific and objective knowledge in the sports arena, along with increasing the knowledge of disciplinary achievement and sports psychology. The study that verifies a direct link between sports confidence and a range of psychological variables would also have significance. Finally, the sports confidence questionnaire can be more effectively used in drawing reliable results with all 4 factors and 24 items used. If it is determined that there is a need for eliminating items based on the findings of the explanatory factor analysis, key items and second items should not be deleted, so that the athletes' confidence can be evaluated with accuracy, when interpreting the value of the negatively correlated hesitation factor, the higher scores were consistent with more negative factor effects. In addition, the competitive sport confidence questionnaire should be utilized in a study with a sample of competitive sport players affiliated with both university and business teams, to minimize the possibility of misinterpretation.

LIMITATIONS

This study also has several limitations. First, the questionnaire was completed by the athletes of individual events; thus, it is still unknown whether it can be applicable to team sports. Second, the lower reliability and validity values found in the small number of female athletes compared with those in male athletes indicate that studies with a large population should be warranted.

CONCLUSION

There are several conclusions to be drawn from this study. First, the sub-factors of competitive sports confidence, as developed in a previous study, were measured comparatively well by the items designed to demonstrate each sub-factor. Second, the sports confidence questionnaire is applicable to both male and female athletes, but also converged construct validity comparatively validly. Third, the scores for persistence, calm, and hesitation among the sub-factors, were higher in male athletes than in female athletes. With respect to the physical prime factor, the scores of athletes with national team careers were higher compared to that of their counterparts without national team careers. These results suggest that the competitive sport questionnaire developed in a previous study could be utilized without difficulty to evaluate sports confidence in related studies of competitive sport athletes. This questionnaire is particularly effective for evaluating the confidence levels of athletes. Future studies should investigate whether the completed questionnaire in this study would be able applicable to team sports athletes.

ACKNOWLEDGEMENTS

REFERENCES

1. Jang SY, Cho EH. An analysis of the sport confidence construct: competitive sports. Korean J Meas Eval Phys Educ Sport Sci 2014;16(1):23–36.
2. Jang SY. Reconceptualization of SSCQ (Sources of Sport Confidence Questionnaire). Korean J Phys Educ 2014;53(5):171–83.
3. Beattie S, Hardy L, Woodman T. Precompetition self-confidence: The role of the self. J Sport Exer Psychol 2004;26(3):427–41.

4. Bull SJ, Shambrook CJ, James W, Brooks JE. Towards an understanding of mental toughness in elite English cricketers. J Appl Sport Psychol 2005;17(3):209–27.

5. Edward T, Kingston K, Hardy L, Gould D. A qualitative analysis of catastrophic performance and the associated thoughts, feeling, and emotion. Sport Psychol 2002;16(1):1–19.

6. Hanton S, Connaughton D. Perceived control of anxiety and its relationship to self-confidence and performance: A qualitative inquiry. Res Quart Exer Sport 2002;73(1):87–97.

7. Kim WB. Verification on the validity of sources of sport confidence questionnaire. Korean Soc Sport Psychol 1999;10(2):107–22.

8. Vealey RS, Hayashi SWF, Giacobbi P. Sources of sport-confidence conceptualization and instrument development. J Sport Exer Psychol 1998;20(1):54–80.

9. Martens R, Vealey RS, Burton D. Competitive anxiety in sport. Champaign, IL: Hum Kinet 1990.

10. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. Psycholog Bull 1988;103(3):411–23.

11. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Market Res 1981;18(3):39–50.

12. Steenkamp JEM, Van Trijp HCM. The use of LISREL in validating marketing constructs. Int J Research Market 1991;8(4):283–99.

13. Marsh HW, Grayson D. Public/Catholic differences in high school and beyond data: A multigroup structural equation modeling approach to testing mean differences. J Educ Stat 1990;15(3):199–235.

14. Tucker LR, Lewis C. The reliability coefficient for maximum likelihood factor analysis. Psychometrika 1973;38(1):1–10.

15. Yang ES, Kim JH. The analysis of competitive state anxiety for Taekwondo athletes by CSAI-2. Korean Soc Sport Psychol 2010;21(1):69–84.

16. Chung YM, Cho IC. The study of the competitive state anxiety in high school Judo players. Korean Soc Phys Growth Motor Dev 1998;6(1):216–25.

17. Kim WB, Sung CH. Personality profiles of high school players in Korea: sixteen personality factor questionnaire. Korean Soc Sport Psychol 2002;13(1):49–66.

18. Hays K, Maynard I, Thomas O, Bawden M. Sources and types of confidence identified by world class sport performance. J Appl Sport Psychol 2007;19(4):434–56.

19. Kim WB. An analysis of the sport mental power construct and development of the sport mental power inventory in Korean competitive sports. Korean Soc Sport Psychol 2002;13(3):21–41.

20. Jung MM, Eom HJ. Understanding and interpretation of interaction effects in mutli-factor. ANOVA designs. Korean J Meas Eval Phys Educ Sport Science 2011;13(2):1–15.

Appendix 1.

Factors	No.	Item	Key & 2nd	No analysis item
Persistence	P1	I can beat opponent in a war of nerve.	Key item	
	P2	I can appear strong to opponent.		
	P3	I have grit to put opponent under pressure.	2nd item	
	P4	I am not threatened by opponent.		No analysis
	P5	I am not afraid.		No analysis
	P6	I am undaunted by opponent.		
Hesitation	H1	I cannot attack even at the chance.	Key item	
	H2	I am not bold.	2nd item	
	H3	I cannot make decisive movement.		
	H4	I am withdrawn in competition.		No analysis
	H5	I am outplayed by opponent in competition.		No analysis
	H6	I hesitate even at the chance.		
Calm	C1	I am not embarrassed.	Key item	
	C2	I am not upset.		
	C3	I am not nervous.		
	C4	I can remain calm in the face of crisis.	2nd item	
	C5	I can get opponent's movement at one glance.		No analysis
	C6	I focus only on what I should do in competition.		No analysis
Physical Prime	PP1	I am ready to compete.	Key item	
	PP2	I maintain proper weight.	2nd item	
	PP3	I work out enough.		No analysis
	PP4	I am in good condition.		
	PP5	I had my special skill enhanced by training.		No analysis
	PP6	I feel refreshed.		

P = persistence; C = calm; H = hesitation; PP = physical prime.