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## Psychometric properties and validation of the Polish adaptation of the Trait Sport-Confidence Inventory(TSCI-PL)

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# Psychometric properties and validation of the Polish adaptation of the Trait Sport-Confidence Inventory (TSCI-PL)

## Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Data Interpretation
- E Manuscript Preparation
- F Literature Search
- G Funds Collection

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## abstract

- Background** The purpose of the study was to validate and adapt the Trait Sport-Confidence Inventory (TSCI-PL) for use in Poland. Robin Vealey created the original tool (TSCI), which consisted of 13 self-assessment items. The phases of the adaptation procedures are described in this paper.
- Material/Methods** 353 amateur and professional Polish athletes took part in the study. The participants filled in the TSCI-PL, SSCQ-PL and MSEI questionnaires as well as a short demographic survey.
- Results** Reliability of the TSCI-PL as well as the discriminatory power of the items turned out to be high. The internal validity of the TSCI-PL was confirmed using confirmatory factor analysis, as a single factor model of TSCI-PL was well matched to the data. The criterion validity of the TSCI-PL was confirmed, based on numerous correlations with SSCQ-PL and MSEI scales. Moreover, no significant correlation or difference regarding age and gender has been noted.
- Conclusions** Results confirmed satisfactory psychometric properties of the Polish adaptation of TSCI-PL. Therefore, the tool is ready for use among Polish sport psychologists.
- Key words** trait sport-confidence, self-confidence, self-esteem, adaptation, psychometric properties

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## INTRODUCTION

There are various diverse definitions and conceptualizations of self-confidence available in the literature [1, 2, 3, 4]. According to Vealey [5], self-confidence is an individual's belief that they possess abilities necessary to be successful. What is more, Siegrist, Gutscher, and Earle [6] consider it to be an expectation that some events will occur; it is based on past experiences or evidence. Some researchers agree that self-confidence can be an unstable construct, as it depends on gained experiences [5, 7, 8, 9]. Others believe that self-confidence is stable over time [10, 11]. Therefore, a distinction of general self-confidence into trait [10, 12] and state [13] has been introduced, basing on the knowledge gained from specific scientific fields (e.g. sport psychology, business) [5, 14, 15]. Studies confirm that sport-confidence is a key mental skill leading to improvement in sport results [16, 17, 18, 19]. It affects other skills, such as coping with stress, concentration, and motivation [20, 21].

In sport, self-efficacy has been commonly operationalized [22]. However, there was a need for developing a more sport-specific conceptualization. Vealey [5] established a model of sport-confidence. According to her, sport-confidence is divided into trait (SC-trait), state (SC-state), and competitive orientation. SC-trait refers to the general certainty about one's own ability to be successful. SC-state refers to the level of certainty at a particular moment. Competitive orientation measures the tendency for a person to strive toward achieving a goal. Vealey's studies [5, 23] have confirmed that SC-trait and competitive orientation influence SC-state. A measurement tool for trait sport-confidence was needed in order to develop knowledge about sport-specific confidence.

The Trait Sport-Confidence Inventory was created to help operationalize the conceptual model of sport-confidence [5]. At first, twenty items were generated for the TSCI, and judges with a background in sport psychology evaluated them. Sixteen items were retained after the review. Two hundred high school and college athletes participated in the first phase of the tool development process. The results supported that TSCI measured a unidimensional construct, while there was a need for a bigger variability in responses. At this point, the author decided to replace the 5-point Likert scale with a 9-point Likert scale and decided to change the labels. Moreover, from now on, the participant's task was to compare their confidence to the most confident athlete they know.

In the second phase, the study was replicated using the updated version of TSCI, and adequate variability was supported. Two hundred and nineteen high school and college athletes participated in the third phase, in order to establish test-retest reliability. Participants completed the TSCI after one day, after one week, and after one month. The reliability was acceptable ( $r = 0.86$ ). The aim of the fourth phase was to verify the criterion validity, and participants were administered the TSCI, as well as various scales measuring sport competition anxiety, self-efficacy, self-esteem, and internal-external control. Various correlations were significant in the predicted directions, supporting the predictions of the relationship between trait sport-confidence and other related constructs. In the last phase, the construct validity was verified by assessing relationships between constructs in Vealey's model [5]; therefore, satisfactory psychometric properties of the TSCI have been confirmed. 48 elite gymnasts participated in the last phase. The results indicated that SC-trait was related to performance; however, a replication of the study on a bigger

group of participants is recommended. A study conducted on 73 runners [24] confirmed that SC-trait was a good predictor of SC-state and performance. Another study conducted on 213 athletes [25] proved that SC-trait correlated positively with using problem-focused coping strategies, which in turn had a positive impact on sport results.

The current study is a continuation of the authors' previous pilot study [26]. Participants were 25 women and 75 men ( $N = 100$ ), and all were Polish athletes aged 16-60 years ( $M = 27.26$ ;  $SD = 10.95$ ). The study consisted of a short demographic survey, and TSCI-PL and MSEI (Multidimensional Self-Esteem Inventory) questionnaires. In Poland there is no standardized tool for measuring self-confidence so the authors chose MSEI as it measures self-esteem, which was believed to be a theoretically similar construct. The reliability of TSCI-PL turned out high, as well as the construct validity, analysed through the exploratory factor analysis. Significant, weak correlations have been noted between the scales of TSCI-PL and MSEI; therefore, the criterion validity could not be considered satisfactory. As a result, a further adaptation process was required, in order to reach the satisfying level of psychometric properties.

## METHOD

### PARTICIPANTS

Participants in this study included 353 native-speaking Polish athletes (34% females and 66% males) aged 16-60 ( $M = 24.39$ ;  $SD = 8.99$ ). The participants were amateurs and professionals, practicing different sports (both individual and team). Forty-eight percent of the participants were individual sport athletes ( $n = 169$ ), and fifty-two percent participated in team sports ( $n = 184$ ). Participants' disciplines are listed in Table 1. Participants had been practicing their sport for 10 years on average ( $M = 10.34$ ;  $SD = 7.71$ ).

Table 1. Disciplines practiced by participants ( $N = 353$ )

Sports discipline	N	Percent
American Football	52	14.7
Soccer	47	13.3
Golf	30	8.5
Volleyball	28	7.9
Triathlon	24	6.8
Table Tennis	23	6.5
Basketball	17	4.8
Other <sup>1</sup>	17	4.8
Handball	16	4.5
Swimming	16	4.5
Ultimate Frisbee	14	4
Equestrian	12	3.4
Speed Skating	11	3.1
Tennis	9	2.5
Kendo	7	2
Ice Hockey	7	2
Badminton	5	1.4
Cycling	5	1.4
Dancing	5	1.4
Archery	4	1.1
Boxing	4	1.1

## MATERIALS

### TSCI-PL

The adaptation process consisted of stages described below [26]. Two professional translators translated the inventory into Polish independently, then one version was established. It was back-translated into English and, at the same time, a transcription of the questionnaire was done by a psychologist. All three versions of the tool have been compared, and their clarity and readability has been judged by a group of students. As a result, a final Polish version of Trait Sport-Confidence Inventory was established. It consisted of 13 items, assessed on a nine-point Likert scale (1: low, 9: high), where the participant is asked to state how self-confident he or she feels in sport-specific situations, compared to the most self-confident athlete they know (i.e. "Compare your confidence in your ability to execute the skills necessary to be successful to the most confident athlete you know", "Compare your confidence in your ability to perform under pressure to the most confident athlete you know").

### SSCQ-PL

Vealey, Hayashi, Garner-Holman, and Giacobbi [23] created the Sources of Sport-Confidence Questionnaire. The tool identifies the sources of an athlete's sport-confidence and their significance. In this study, an experimental Polish version of SSCQ was used [27]. The results of the pilot study [28] confirm satisfactory psychometric properties in the case of reliability, construct validity, and internal validity of the experimental version of the tool. SSCQ-PL consists of 41 items grouped into 9 subscales, each describing individual sources of sport-confidence, assessed on a seven-point Likert scale (1: not at all important, 7: of highest importance). The participant is asked to rate when they gain self-confidence in their sport (i.e. "Master a new skill in my sport", "Know that I am mentally prepared for the situation").

### MSEI

O'Brien and Epstein [29] created the Multidimensional Self-Esteem Inventory. Diana Fecenec adapted the tool for use in Poland [30]. MSEI assesses self-esteem and consists of 116 items (i.e. "I sometimes doubt that I will be successful in life", "I am commonly liked and popular") assessed on a five-point Likert scale (1: fully disagree, 5: fully agree) divided into 11 scales, such as Global Self-Esteem, Competence, Lovability, Likability, Personal Power, Self-control, Moral Self-Approval, Body Appearance, Body Functioning, Identity Integration, and Defensive Self-Enhancement. The norms are provided for respondents aged 16-69. The tool is characterized by satisfactory internal consistency (Cronbach's alpha between 0.70 and 0.90), as well as high stability (pre-test/post-test relationship between 0.73 and 0.96).

### DEMOGRAPHIC SURVEY

Apart from the psychological tools, participants were also asked to answer five simple questions in the demographic survey, starting with gender and age. They were asked to name the discipline that they are practicing, as well as to state how long they have been practicing it. Finally, there was a space to write down their biggest sport accomplishments, in order to verify whether the person was really actively involved in sport.

## PROCEDURE

Testing materials were distributed either through an Internet testing platform "Ankietka" or during direct meetings with the athletes. Each set consisted of an informed consent form, a demographic survey, TSCI-PL, SSCQ-PL, and MSEI. The researchers contacted sport federations, clubs, and coaches in order to recruit the athletes. Every athlete could get their own results profile after filling the questionnaires. Participants completed the study in a non-competitive setting. On average, completing all questionnaires took 30 minutes. The study was conducted for six months, from July 2015 until January 2016.

## RESULTS

In order to assess the psychometric properties of TSCI-PL, analyses have been conducted using IBM SPSS Statistics 23.0. The reliability was assessed using Cronbach's Alpha coefficient. The internal validity was verified using Exploratory Factor Analysis (maximum likelihood - ML) and Confirmatory Factor Analysis (> 1.000 bootstrap samples). The criterion validity was estimated through mutual correlations of SSCQ's and TSCI's scales as well as correlations with MSEI scales.

### DESCRIPTIVE STATISTICS AND RELIABILITY

Statistically significant results of Kolmogorov-Smirnov Z test revealed that the assumption of normal distribution of TSCI-PL has been violated. Basing on the value of skewness (-0.62) and kurtosis (0.90), a slight deviation from a normal distribution can be seen. It is caused by a negative skew in the data distribution, which shows that a large number of participants obtained relatively low mean results.

Reliability of the TSCI-PL was found to be relatively high (0.94). The individual items showed high discriminatory power, ranging between 0.64 (item 13) and 0.76 (item 8). The construct validity of the scale was confirmed.

### INTERNAL VALIDITY

In order to determine the internal structure of the TSCI-PL, an exploratory factor analysis was conducted using Principal Component Analysis with Oblimin rotation ( $\delta = 0$ ) and Kaiser Normalization. Univariate structure of TSCI-PL, explaining 57.8% of variance, was confirmed. The factor loadings' value of the items was high and exceeded 0.69.

A confirmatory Factor Analysis confirmed the validity of a single factor structure of TSCI-PL. The RMSEA (Root Mean Square Error of Approximation) value does not exceed 0.08 (0.076), whereas GFI (Goodness of Fit Index = 0.923), NFI (Bentler-Bonett Normed Fit Index = 0.923), and CFI (Comparative Fit Index = 0.954) exceed the reasonable fit of 0.9. Considering the accepted criteria, this model provides a good fit for the data ( $\chi^2(63) = 192.27$ ;  $p < 0.001$ ).

Figure 1 shows the path diagram of Confirmatory Factor Analysis of TSCI-PL in accordance with the original version of the tool.

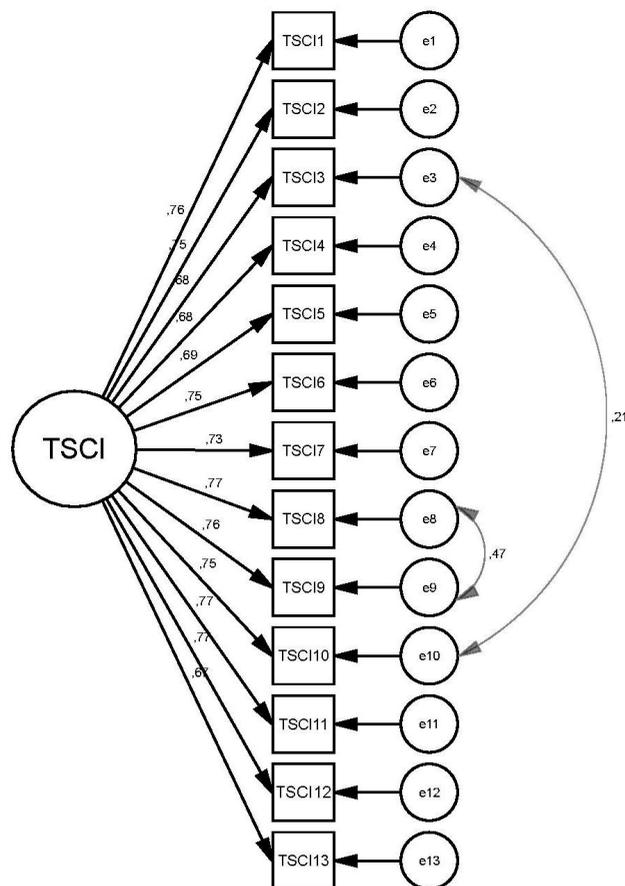


Fig. 1. Path diagram of Confirmatory Factor Analysis of TSCI-PL (with standardized estimates) in accordance with the original version of the tool

### CRITERION VALIDITY

Criterion validity of TSCI-PL was verified using nonparametric correlation coefficient Spearman's rho between the scales of TSCI-PL and MSEI (Table 2). Numerous poor or moderate correlations between TSCI and the scales of MSEI have been noted, with the exception of the Defensive Self-Enhancement Scale.

Nonparametric correlation coefficient Spearman's rho between the scales of TSCI-PL and SSCQ-PL was calculated (Table 2). Significant, poor, and positive correlations between TSCI-PL and SSCQ-PL scales (Mastery, Demonstration of Ability, Mental And Physical Preparation, Support, Vicarious Experience, Situational Favorableness, and Leadership) were noted. A lack of significant correlations was only observed between TSCI-PL and both Physical Self-Perception and Environmental Comfort.

### BALANCE IN TERMS OF AGE

Rho Spearman correlation was conducted between age and TSCI-PL (Table 2). No significant correlation was observed ( $p = 0.007$ ).

### BALANCE IN TERMS OF GENDER

Mean results of males and females regarding TSCI-PL results were compared using the nonparametric Mann-Whitney U test ( $U = 12306.00$ ;  $p = 0.07$ ). No significant differences have been noted.

Table 2. Correlation coefficients Spearman's rho between age, the scales of TSCI-PL, MSEI, and SSCQ-PL

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Age	24.22	9.16	-																					
2. TSCI-PL	5.87	1.38	0.01	-																				
3. GSE	3.22	0.72	0.17**	0.38**	-																			
4. C	3.68	0.54	0.25**	0.36**	0.58**	-																		
5. LO	3.47	0.77	0.17**	0.16**	0.56**	0.38**	-																	
6. LI	3.42	0.57	0.21**	0.23**	0.59**	0.47**	0.53**	-																
7. PP	3.51	0.58	0.17**	0.35**	0.53**	0.61**	0.38**	0.47**	-															
8. SC	3.33	0.58	0.11*	0.27**	0.50**	0.39**	0.30**	0.28**	0.27**	-														
9. MSA	3.86	0.64	0.33**	0.13*	0.34**	0.37**	0.36**	0.31**	0.28**	0.47**	-													
10. BA	3.25	0.63	0.15**	0.23**	0.62**	0.40**	0.47**	0.52**	0.44**	0.37**	0.22**	-												
11. BF	3.78	0.58	0.14*	0.28**	0.40**	0.47**	0.31**	0.39**	0.38**	0.41**	0.33**	0.50**	-											
12. II	3.29	0.67	0.25**	0.22**	0.65**	0.45**	0.45**	0.38**	0.40**	0.53**	0.37**	0.42**	0.32**	-										
13. DSE	2.98	0.55	0.05	0.03	0.23**	0.12*	0.18**	0.25**	0.04	0.42**	0.35**	0.17**	0.18**	0.31**	-									
14. M	5.71	0.83	-0.03	0.29**	0.18**	0.16**	0.23**	0.10	0.15**	0.19**	0.14**	0.06	0.14**	0.16**	0.07	-								
15. DA	5.19	1.15	-0.06	0.22**	0.10	0.13*	0.03	0.05	0.15**	-0.01	-0.09	0.14**	0.17**	-0.07	-0.19*	0.13*	-							
16. MPP	5.71	0.81	0.09	0.30**	0.19**	0.24**	0.19**	0.12**	0.18**	0.20**	0.19**	0.12**	0.21**	0.19**	0.03	0.54**	0.24**	-						
17. PSP	3.93	1.52	0.09	0.07	0.06	0.01	0.02	0.01	0.07	-0.01	-0.08	0.05	-0.01	-0.01	-0.06	0.12*	0.23**	0.13**	-					
18. SS	5.24	1.09	-0.13*	0.12*	0.09	0.05	0.16**	0.13*	-0.01	-0.03	-0.03	0.10	0.04	-0.02	-0.06	0.25**	0.14**	0.33**	0.23**	-				
19. VE	4.17	1.33	-0.15*	0.23*	0.03	-0.05	-0.03	0.03	-0.10	0.01	-0.12*	-0.05	-0.19*	-0.04	0.07	0.33**	0.13*	0.28**	0.24**	0.34**	-			
20. EC	4.71	1.46	-0.07	0.06	0.07	0.00	0.04	0.00	0.02	0.05	-0.18*	0.06	-0.07	0.05	-0.08	0.13*	0.16**	0.19**	0.35**	0.32**	0.31**	-		
21. SF	4.73	0.93	-0.09	0.12*	0.06	-0.04	0.01	0.06	0.07	-0.03	-0.04	0.09	-0.01	-0.02	-0.06	0.20**	0.29**	0.25**	0.33**	0.37**	0.23**	0.41**	-	
22. L	5.02	1.37	-0.12*	0.10	0.02	-0.06	0.07	0.04	-0.09	-0.01	-0.07	-0.12*	-0.04	0.00	0.02	0.26**	0.06	0.31**	0.16**	0.48**	0.37	0.27**	0.29**	-

The scales of MSEI: GSE - global self-esteem; C - competence; LO - lovability; LI - likability; PP - personal power; SC - self-control; MSA - moral self-approval; BA - body appearance; BF - body functioning; II - identity integration; DSE - defensive self-enhancement;

The scales of SSCQ-PL: M - Mastery; DA - Demonstration of Ability; MPP - Mental and Physical Preparation; PSP - Physical Self-Perception; S - Support; VE - Vicarious Experience; EC - Environmental Comfort; SF - Situational Favorableness; L - Leadership

\*\* p < 0.001; \* p < 0.05

## DISCUSSION

TSCI-PL preparation was consulted with the author of the original tool [5, 26]. The results confirmed satisfactory psychometric properties of the Polish adaptation of the TSCI. Reliability, measured by Cronbach's alpha, turned out to be high in the case of TSCI-PL. High discriminatory power of the items proves a high internal correspondence, and confirms the construct validity of the tool.

Internal validity of TSCI-PL has been confirmed. Exploratory and Confirmatory Factor Analysis proved compatibility of the internal structure of the adaptation with the structure of the original version. Single factor model of TSCI-PL was well matched to the data.

Basing on numerous correlations between TSCI-PL and SSCQ-PL scales (i.e. Mastery, Demonstration of Ability, Mental and Physical Preparation) and most of MSEI scales, the criterion validity was confirmed. TSCI-PL turned out to be balanced regarding the tested respondents' age and gender.

The obtained results turned out to be similar to those in the original study [5], providing satisfactory psychometric properties.

As mentioned before, self-efficacy is frequently operationalized [22], however it does not refer to the specific construct of sport-related self-confidence. The

TSCI [5] is commonly used in the United States. Therefore, the authors decided that it would be beneficial to adapt the tool for use in Poland, especially that sport-confidence affects sport performance as well as other mental skills [16, 17, 18, 19, 20, 21].

## CONCLUSIONS

Psychometric properties of the adapted tool are satisfactory. This allows us to conclude that TSCI-PL is a verified measurement inventory, ready for use in Polish circumstances. It can undoubtedly contribute to the development of sport-confidence related research, being the only adapted, available questionnaire measuring trait sport-confidence. It will definitely be a very precious inventory, giving instant feedback about the level of SC-trait in Polish athletes.

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