Remzija Šetić[1,2], Jadranka Kolenović-Đapo[3], Munir Talović[4]

VALIDATION SCALE STUDY FOR ASSESSMENT OF TACTICAL AND TECHNICAL COMPETENCIES AMONG FOOTBALLERS - ASSESSMENT BY TRAINERS

[1] *Public Health Centre of Sarajevo Canton, Centre for Mental Health, Stari Grad Sarajevo*
[2] *Sarajevo Football Club*
[3] *Faculty of Philosophy*
[4] *Faculty of Sport and Physical Education in Sarajevo*

Abstract

The aim of the paper is to verify the validity and reliability of Scale for measuring tactical and technical competences among football players - assessment of trainers (STTSKT). The research involved 165 players (N = 81 senior and 84 juniors) from seven junior teams and senior Premier League Bosnia and Herzegovina. The average age of the participants is 21.14 ± 4.91; The average age of the junior is 17.23 ± 0.49, while the average age of the senior is 25.15 ± 4.21. The analysis of the main components points to the existence of two factors which in total explain 68.874% of the variance of the specific competence skills of football players. According to the grouping of particles, the first factor was called the attack tactical-technical competence (NTTK); other one are defence tactical-technical competences (OTTK). The reliability of the instrument is determined by the coefficient of internal reliability. The obtained number of factors is not in accordance with the obtained factors on the Scale for assessment of tactical and technical competences among football players (STTSK), which was designed as a self-assessment of the competence of football players. Values of alpha reliability coefficients for the full scale and for subscales are high. The results point to the conclusion that the STTSKT scale possesses satisfactory metric characteristics, and that the trainers can use it as a measure of specific competencies among football players.

Keywords: **competencies, metric characteristics, football players.**

Introduction

Football is a sport that according to its structural complexity belongs to complex sports activities. This includes different technical performances in the conditions of mutual cooperation between all team members within the planned tactical framework. Success in football requires a great number of abilities, qualities and knowledge, and the most important are the anthropological characteristics (health status, morphological characteristics, motor and cognitive abilities), specific player's abilities and knowledge (technical abilities, specific motor skills, tactical skills and knowledge, theoretical knowledge as well as characteristics important for social adaptation) and situational efficiency and results in the competition (Dujmović, 2000). During their development, the models of the football game have changed, so today the system of football game is very elastic, and the schedule and ac-

tion of players increasingly depends on the position and movement of the ball during the attack and defence. In particular, today's football is playing an enhanced pace of play, which is reflected in the rapid transition from the phase of defence to the attack phase and vice versa. Because of the above, today's top football is looking for players of a universal character, considering all the components that are necessary for achieving good results in the football game, and all the players of one team participate in the realization of each stage of the game. The football game consists of four stages of the game and the associated sub phases (Bašić, Barišić, Jozak and Dizdar, 2015): the phase of the attack, the transition from defence attacks (transition to lost ball), the defence phase, the transition from defence to attack (transition after the winning ball). The attack phase begins when the players

of one team come into possession of the ball by subtracting of it or by mistake of the opponent on any part of the field (Bašić and associates, 2015). The attack phase is interrupted by the loss of possession of the ball. When losing possession of the ball, the main and basic goal is to return the ball to its own possession as soon as possible in order to establish control of the game again. That is the phase of a transition from an attack in defence where the first nearest player tries to take away the ball and return it to possession, and the other teammates automatically move towards the ball narrowing the free space. In this way, the opponent forces the mistake, that is, the loss of possession of the ball. The defence phase starts when the opposing players establish control over the ball on any part of the playground (Bašić and associates, 2015). The basic goal of the defence is to return the ball into the possession of the shortest possible time and not receive the goal. The transition from defence to attack is the transition from the defence phase to the attack phase. "Once the players of one team take the ball and take possession of it, they move from the defence phase to the attack phase. The transition takes place from the moment of taking the ball to the performance of some organized attacking action (Bašić and associates, 2015). The transition from defence to attack, if done well, can be crucial in terms of the outcome of the game.

Success in football is reflected in the technical and tactical performance of each individual player, regardless of the position in the team, within the four stages of the football game. For each of the stages of the game, certain technical-tactical requirements match the performance of players in the performance of tasks within these four moments of the football game. Of particular importance is the assessment of the success of each player for each of the elements that build the game. The technical requirements and tasks of each individual in the football team differ from whether the team owns or does not own the ball. Lately, the interest of the researchers for the individual technical performance of the players has increased and there are attempts for collecting data on it. Franks and McGarry (1996) have established with the provision of such data on individual technical performance and the formation of certain player profiles can change gaming behaviour and promote successful performance. According to Talovic, Fiorentini, Sporis, Jelešković, Ujević and Jovanović (2010) at the European Championship in 2004, an analysis of the individual technical abilities of the players was carried out based on a subjectively drawn continuum that analyses the techniques of player movement through the game. Comparisons are made between player's positions and between the profiles of successful and unsuccessful teams. The research was conducted with the help of manual notation analysis conducted by four researchers for each game. The researchers reviewed the video of 31 matches. Each element of the assessment is operatively defined (adding, receiving a ball, slamming, running with a ball, guiding, playing with a head, rolling in, cantering, sliding, free kick, punish-

ing, throwing a ball by hand). Each technical element is evaluated on a continuum of - 3 (unacceptable technical performance without pressure) to +3 (excellent technical design under pressure). At the end of the survey, giving all the technical ratings for each player, and each action can be defined as a technical rating for the team. The obtained grades are compared with the team's position at the end of the competition, and significant differences are shown. For example, Greece, which was at the 10th place in technical performance, won first place at this European Championship. That proves those who are best in technical performance does not have to be the winners at the largest international tournament in Europe. Organization, tactics and team connectivity provide the team with a solid platform for result and performance. Notation analysis in football is necessary from a range of needs that include assessment of tactics, techniques, motion analysis, database development and modelling, with the aim of trainers and players education. Today computer-based football analysis developed by the Church and Hughes (1986) are used, while Partridge and Franks (1993) developed a specialized computer system for the evaluation of football techniques. By using these systems for analysis in international competitions, it is possible to improve football, but it is also concluded that teams that are better psychologically prepared and have better motor skills are preferred at major international competitions (Reilly, 1993). In order for teams to achieve a high level of success, it is necessary to have a superior performance technique, but this is specified by team positions.

Interesting facts about factors contributing to sports performance are reported by sports economists. Authors González-Gómez and Picazo- Tadeo (2010) state that in previous studies of the effectiveness of athletes (especially footballers), had performed through different approaches. Some authors analysed the specific effectiveness of the players (Mazur, 1994, Torgler and Schmidt, 2007), while in some papers the authors measured the efficiency of the trainers taking into account the team's characteristics. Hoffler and Payne, (1997); Hadley, Poitras. Ruggiero and Knowles (2000) examined the individual performance of the footballers with regard to the performance of the team, taking into account the attacking versus defensive player's style.

Among the rare work of evaluating the performance of footballers, we highlight the work of the authors Šetić, Kolenović-Đapo and Talović (2017), which aimed at checking the validity and reliability of Scale for the (Self) Assessment of Tactical-Technical and Social Competences among Footballers (STTSK). According to the authors, 166 football players (N = 81 senior and 85 juniors) participated in the survey from several clubs of the Premier League of Bosnia and Herzegovina. The analysis of the main components points to the existence of four factors, which in total explain 78.78% of the variations of the specific competence skills among football players. According to the grouping of particles, the authors have called the attacking tactical-technical competence (NTTK) the

first factor; the second are defence-tactical competencies (OTK), third are technical competences (TK), and the fourth factor are social competences (SK). High reliability coefficients have established for the entire scale of .986, and subscales: attack tactical-technical competences .970, defensive tactical competences .982, for the subscale of technical competence in a duel of .943, while for the social competence sub-competence .970 were determined. The criterion validity of the STTSK is verified on the basis of the correlation with the measure of self-efficacy of the football players. The obtained are moderate to the low correlation between self-efficacy and three measures of competence skills. Consequently, the only correlation between self-efficiency and the subscale of technical competence has not been established. The results point to the conclusion that the STTSK scale has satisfactory metric characteristics and can be used as a measure of specific competences within football players. Based on the results from the previous study, the authors have designed a new study aimed at checking the validity and reliability of the Scale for assessing Tactical, Technical and Social Competencies among footballers, from the point of trainers. (STTSKT).

In this paper, we are interested in whether the scale measures the expected main stages of the football game and whether the scale has the same factor structure as a scale for assessing tactical technical and social competences among football players - the self-assessment of STTSK (Šetić, Kolenović-Đapo, Talović, 2017).

Methods

Sample

The research involved 165 football players from six football clubs of the Premier League of Bosnia and Herzegovina, three teams (N = 81) competing in the Premier League of Bosnia and Herzegovina (FC Željezničar from Sarajevo, FC Radnik from Bijeljina and FC Krupa from Krupa on Vrbas), and four teams (N = 85) competing in the Youth League of the Junior League (FC Željezničar from Sarajevo, FC Sarajevo from Sarajevo, FC Sloboda from Tuzla and FC Mladost from Doboj near Kakanj). The research involved football players of all positions in the team, except goalkeepers. The average age of the respondents is 21.14 ± 4.91, while the average age of the seniors is 25.15 ± 4.21. and the average age of the junior is 17.23 ± 0.49. The assessment of STTSKT was carried out by trainers of the above teams, a total of 14 trainers.

Measuring instruments
General Data Questionnaire
The General Data Questionnaire was designed for this research. The questionnaire contains questions related to the age of footballers, selection (juniors / seniors), data about the club they play in, the length of playing in the current club, the position in the team, and the length of training the football.

Scale for the tactical, technical and social competence assessment - assessment of trainers
Scale for assessment of tactical, technical and social competences of football players - assessment of trainers (Šetić, Kolenović-Đapo and Talović, 2016) is an instrument constructed on the basis of elements of the football game, that is, an assessment of the technical-tactical and social competencies of football players in four stages of football game which is: an attack, a transition for a lost ball, a defence and a transition in the winning ball. The number of particles within each phase of the game was different, so the sub-scale elements of the game included 17 parts in the attack phase; six particles for the subscale "transition according a lost ball", 14 particles are included in the subscale "defence phase", and five subscale particles "transition after the won ball". The reason for this unequal number of subscales is the structure of the football game, which requires significantly more elements in the phases of attack and defence, and because of the longer duration of the "attack" and "defence" phases, compared to the other two phases. The transition phase lasts two to three seconds and therefore requires less elements of the football game.

Typical particles for the subscale of the attack phase are, for example, "Holds and keeps the ball under the pressure of an opponent's player"; "Creates a space for itself (discovering) and teammates." An example of a particle for a subscale of a transition in a conquered ball "It secures the ball and keeps it until the preconditions for the attack are met". In the subscale "defence" some of the particles are "Covering the opponents team players"; "Recognizes the moment of taking the ball and reacts adequately". Subscale *The elements of the transition in the transition after the lost ball* contain particles, for example, "Timely comes and establishes a basic defensive formation". A particle that repeats in all subscales is "Timely communicate with teammates during the game (verbal and non-verbal communication signs are quickly seen)". The content of this instrument is identical to the STTSK (Šetić, Kolenović- Đapo, Talović, 2017) in terms of the estimated elements of the football game, and the adaptation of the particles for evaluation by the trainers was carried out.

For all elements of the football game, the assessment was carried out on a seven-meter scale of Likert type, from 1 (poor performance) to 7 (excellent performance). The overall result is formed as a simple linear combination of estimates on the particles that define an individual subscale, elements within the phase of the football game, where the greater result signifies greater success.

For the purposes of the preliminary analysis, a pilot survey was conducted involving 53 football players from two clubs of the First League of the Federation of Bosnia and Herzegovina (FBIH), namely FK Rudar Kakanj and FK Bosna Sema Sarajevo, while four trainers assessed the performance on the preliminary version of STTSKT. The value of the coefficient of internal reliability for the entire scale was α = 0.974, the average correlation among the particles was 0.491, while for the subscale the coefficient of internal reliability was: attack α = 0.961; transition per

won ball α = 0.926; defence α = 0.963; transition after lost ball α = 0.944. The average correlation among subscale particles was: attack 0.631; transition after the winning ball 0.673; defence 0.728; transition after the lost ball 0.941. After the pilot survey, a linguistic and technical adjustment was made for better clarity of the scale. This modified STTSKT was applied in the main research where the team coaches made an estimate for 165 players of all positions in the team except the goalkeeper. Estimates were made by the main and assistant trainers from the expert staff. In teams where the assessment was carried out by two or three trainers, the average score for each of the particles from the applied scale was calculated. The degree of agreement between the estimators was checked by calculating the alpha coefficient where the value for the whole sample α = 0.975 was obtained. The resulting coefficient indicates a high matching index. On a sample of 165 players, the coefficient of internal confidence for the entire scale was α = 0.983, while the average correlation among the particles was 0.601. For the sub-assertiveness assessment, the coefficient of internal reliability was α = 0.968, while the average correlation between the particles was 0.604. For the subscale transition in winning balls, the coefficient of internal reliability is α = 0.927, and the average correlation between the particles is 0.710. For the subscale the coefficient of internal reliability is α = 0.971, while the average correlation between the particles was 0.704. For the subscale, the transition in a lost ball, the coefficient of internal confidence is α = 0.933, and the average correlation is 0.731.

Procedure

The research was conducted individually. Participants are familiar with the general and specific instructions for responding to the applied scale. Each football player specially encrypts the questionnaire and according to the instructions of the researcher filled in the questionnaire (system paper - pen). According to the previously identified codes entered by the respondents, the coaches used the same codes when assessing STTSKT. Data collection was not time-limited, but on average it took about fifteen minutes per respondent

Results

For the purpose of assessing the constructive validity of STTSKT, we conducted the process of exploratory factor analysis. The Kaiser-Meyer-Olkin test and the Bartlett spherical test were conducted to verify the suitability of the correlation matrix for carrying out factor analysis. The value of the Kaiser-Meyer-Olkin sample adequacy test is 0.948, which indicates that our data are suitable for carrying out factor analysis. The Bartlett test of sphericity determined over the approximate hi-square is 8005.454 and statistically significant at 99.9%, indicating that data are like factorization, and the assumption about the equality of correlation matrices and identity matrices is rejected. Exploratory factor analysis was performed using the

main component method. On the set of manifest variables using the Kaiser-Gutmann criterion, two components with characteristic root greater than one were determined, which explains 68.874% of the total variance. By overview of the transient diagram, the fracture point for the second component was determined, and according to the obtained results shown in Table 1.1. where the factor saturation, the distribution of individual particles from individual subscales by the components obtained, the values of the characteristic roots and the percentages of the explanation of the variance of each component after applying Varimax rotation are shown. The resulting factor structure is interpretable and consistent with the expected. Obtained two factors explain 68.874% of the total variance.

The first factor involves particles from the domain of attack and transition after winning the ball, so it is called Attack tactical-technical competence (NTTK). It encompasses the competencies and skills that are needed in the attack and transition phase by winning the ball, which includes abilities such as, long-playing, dribbling, running the ball, achieving goals, fast-tracking in order to exploit a weak organization of defending opponents of ability, keeping the ball while do not open the "space for attack. This factor explains 56.667% variance. Among 22 particles that belonged to subscales of attack and transition in the conquered ball, only particle N10 (Game Head) after the factor analysis, did not belong to this factor, but to the factor of defensive technical-tactical competences.

The second factor explains 12.21% of the variance of the results and includes particles from the domain of defence and transition after a lost ball, and it is called Defensive Technical - Tactical Competence (OTTK). This factor includes capabilities such as: subtracting the ball into a duel, one-on-one duel, covering the opponents, putting pressure on the player, reducing the opponent's space for action, timely coming behind the ball, and establishing a defensive formation.

Discussion

The aim of the research was to verify the reliability and validity of the Scale for the assessment of tactical and technical competences of football players – the assessment of trainers. In order to examine the factor structure of the scale, we carried out factor analysis on the scale particle, by the method of the main components on the sample of football players. The competence assessment was carried out by trainers. The obtained results indicate the existence of two factors, which explain 68.874% of the total variance of the competencies of football players. Considering the grouping of particles into two interpretable factors, the first factor was called attack tactical technical competence (NTTK), while the second factor was called defensive tactical-technical competences (OTTK). The highest percentage of total variance is explained by NTTK (56.667%) and includes particles that included the elements of the game in attack and the transition after

Table 1. Factor saturation, distribution of individual particles from individual subscales by components obtained, values of characteristic roots and percentages of explained variance of each component after applying Varimax rotation.

Particles by subscales	Components	
	1	2
N8. Playing back pass	.964	
N6. Scoring goals	.890	
N14. Trick movement	.887	
N9. Controls the ball	.863	
TOL20. Playing fast pass in order to abuse opponents' weak defence mechanism	.855	
N12. Dribbling	.855	
N3. Receives and retains the ball under the pressure of opponent player.	.836	
N7. Reacts at first.	.829	
N15. Self opens space for teammates and himself.	.828	
TOL19. Makes himself open.	.787	
N11. Precisely inserts long balls.	.768	
TOL21. Secures the ball and retains it until the preconditions for the attack are met.	.748	
N13. Precisely shoots.	.724	
N4. Realises short passes.	.704	
N2. Timely plays (Speed of ball circulation)	.658	
N16. Cooperates with players from own and the other team lines.	.620	.391
N5. Realises a long pass technique	.619	
TOL22. Timely communicates with team mates during the game.	.612	.410
N17. Timely communicates with team mates during the game.	.591	.394
N1. Covers the field within its team's role.	.556	.447
TOL18. Goes out in front of the ball.	.428	
O35. Blocks the shot.		.882
O29. Successful on «1 to 1».		.872
O31. He subdues the ball in the duel.		.867
O32. Removes the ball in the duel.		.809
O25. Covers the players of the opposing team.		.806
TIL40. Timely returns back and sets up defence mechanism.		.798
O28. Pressurizes opponent with the ball.		.795
O24. Narrows the vacant field space.		.796
O33. Takes the ball by sliding tackle.		.762
O27. Pressurizes the opponent near ball.		.760
O23. Moves towards the ball when the ball is in the possession of the opponent.		.756
TIL39. Timely comes behind the ball.		.741
O26. Recognises the moment of taking the ball and responds adequately.		.727
O34. Removes the ball by sliding tackle.		.718
O30.Successful in aerial duels.		.700
TIL41. Recognises and realises the pressing.	.318	.668
TIL38 Realises the current pressure on the player near the ball.	.366	.635
TIL37. Realises the current pressure on the player with the ball.	.395	.606
TIL42. Timely communicates with team mates during the game.	.433	.592
O36 Timely communicates with team mates during the game.	.439	.572
N10. He plays with his head.		.526
Eigen-value	23.800	5.127
% the explained variance	56.667	12.207

the winning ball. The OTTK includes the elements of the game of defence and transition for a lost ball and includes 12,211% of the total variance.

The reliability of the instrument was verified by the reliability coefficient, where high reliability values of the α reliability coefficient were determined, for the full scalar coefficient α = 0.983, for the subscale of competence estimation NTTK coefficient α = 0.968, for the OTTK coefficient, the internal reliability coefficient is α = 0.971. Compared with STTSK (Šetić, Kolenović-Đapo, Talović, 2017), which was used as a scale of self-assessment of football players and which extracted four interpretive factors (attacking tactical-technical competences (NTTK), defensive tactical competences (OTK), technical competences TK), social competences (SK)), the results of factor analysis of STTSK (T), show the separation of two interpretive factors. Obviously, there are differences in the perception of certain elements of football games by footballers in relation to coaches. Various factor solutions between the self-assessment (STTSK) of the scope of football game and the evaluation by the trainer STTSK (T) can be interpreted in several ways. We assume that there were several sources of variability in the self-assessment situation, since the examined players playing in different positions clearly differentiate these four elements of the football game. When comes to the assessments by trainers we can assume that the matching elements of the game have been consolidated (defence and transition the lost ball, on the one hand, and the attack and the transition on the winning ball, on the other hand), and for that reason two separated factors emerged as "Defence" and "Attack". It is obvious that coaches involved in the research have a more global and dichotomous perception of the football game. The obtained result is not appropriate to the modern settings of the phase of the football game (Bašić and associates, 2015). Ultimately, such research contributes to a realistic assessment of the competencies of football players. However, in addition to assessing competencies, it is important for us to gain insight into the grouping of certain elements of football games from the angle of the football players and the angle of trainers. The two above-mentioned research and applied scales make us conclude that views of the football game from these two perspectives are clearly different and are not fully integrated into modern football concepts. In future research, it is necessary to direct research efforts in modifying the scale so that particles could be discriminatory for other stages of football, which should include other competing skills (cognitive abilities and social skills) that are indispensable in a complex system of football performance. Although the scale is saturated with particles related to the processing of visual information, the speed of information processing, concentration, and selective attention related to the stages of the football game, we consider that the particles from this set of variables should be more precisely defined, in order to ultimately get the best measure for assessing the individual performance of footballers, and evaluations by

the trainers. In this work, the analyses have been done on the overall sample (seniors and juniors), which could also have influenced different factor solutions between assessments and self-evaluators.

Conclusion

Based on the above, we can conclude that there are two interpretive factors in STTSKT explaining 68.874% of the total variance of competencies of football players. The first factor includes attacking tactical technical competencies (NTTK), and the second factor includes defensive tactical and technical competencies (OTTK). The highest percentage of total variance is explained by NTTK (56.667%) and includes particles that included the elements of the game in attack and the transition after the winning ball. The OTTK includes the elements of the game of defence and transition for a lost ball and includes 12,211% of the total variance. We can conclude that the scale thus constructed has the potential for application by trainers and researchers, but its application and research need to be replicated, and complemented by the above recommendations.

References

Bašić, D., Barišić, V., Jozak, R. i Dizdar, D. (2015). *Notacijska analiza nogometnih utakmica*. Zagreb: Leonardo media.

Bierman, C. (2011). *Fudbalska matrica*. *Beograd*: Laguna.

Church, S., Hughes, M.D. (1986). Paterns of Play in Association Football – A computerised Analysis. *Communication to First World Congress of Science and Football*, Liverpool.

Dujmović, P. (2000). Škola *nogometa*. Zagreb, Zagrebački nogometni savez.

González-Gómez, F., Picazo-Tadeo, A.J. (2010). Can we be satisfied with our football team? Evidence from Spanish professional football. *Journal of Sports Economics, 11*, 418-442.

Hadley, L.; M. Poitras; J. Ruggiero and S. Knowles (2000) "Performance evaluation of National Football League teams", *Managerial and Decision Economics, 21*, 63-70.

Harter, S. (1978). Effectance motivation reconsidered: Towards a developmental model. *Human Development, 21*, 34-64.

Hofler, R.A. and J.E. Payne (1997). Measuring efficiency in the National Basketball Association. *Economic Letters, 55*, 293-299.

Mazur, M.J. (1994). Evaluating the relative efficiency of baseball players, in Data Envelopment Analysis: theory, methodology and application, (Eds.) A. Charnes, W.W. 24 Cooper, A.Y. Lewin and L.M. Seiford, Boston. Kluwer Academic Publishers, 369- 391.

Šetić, R; Kolenović-Đapo,J; Talović, M (2017) Validation study of the tactical-technical and social competencies of football players scale, *Sportski logos, 28-29*; 11-19.

Talović, M., Fiorentini, F, Sporiš, G, Jelešković, E., Ujević, B,., Jovanović, M. (2011). *Notacijska analiza u nogometu*, Fakultet sporta i tjelesnog odgoja, Sarajevo

Torgler, B., Schmidt, S.L. (2007) "What shapes player performance in soccer? Empirical findings from a panel analysis", *Applied Economics, 39*, 2355-2369.

Corresponding author:
Remzija Šetić
Public Health Centre of Sarajevo Canton,
Centre for Mental Health, Stari Grad Sarajevo
Vrazova 11, 71000 Sarajevo, BiH
E-mail: rsetic@yahoo.com