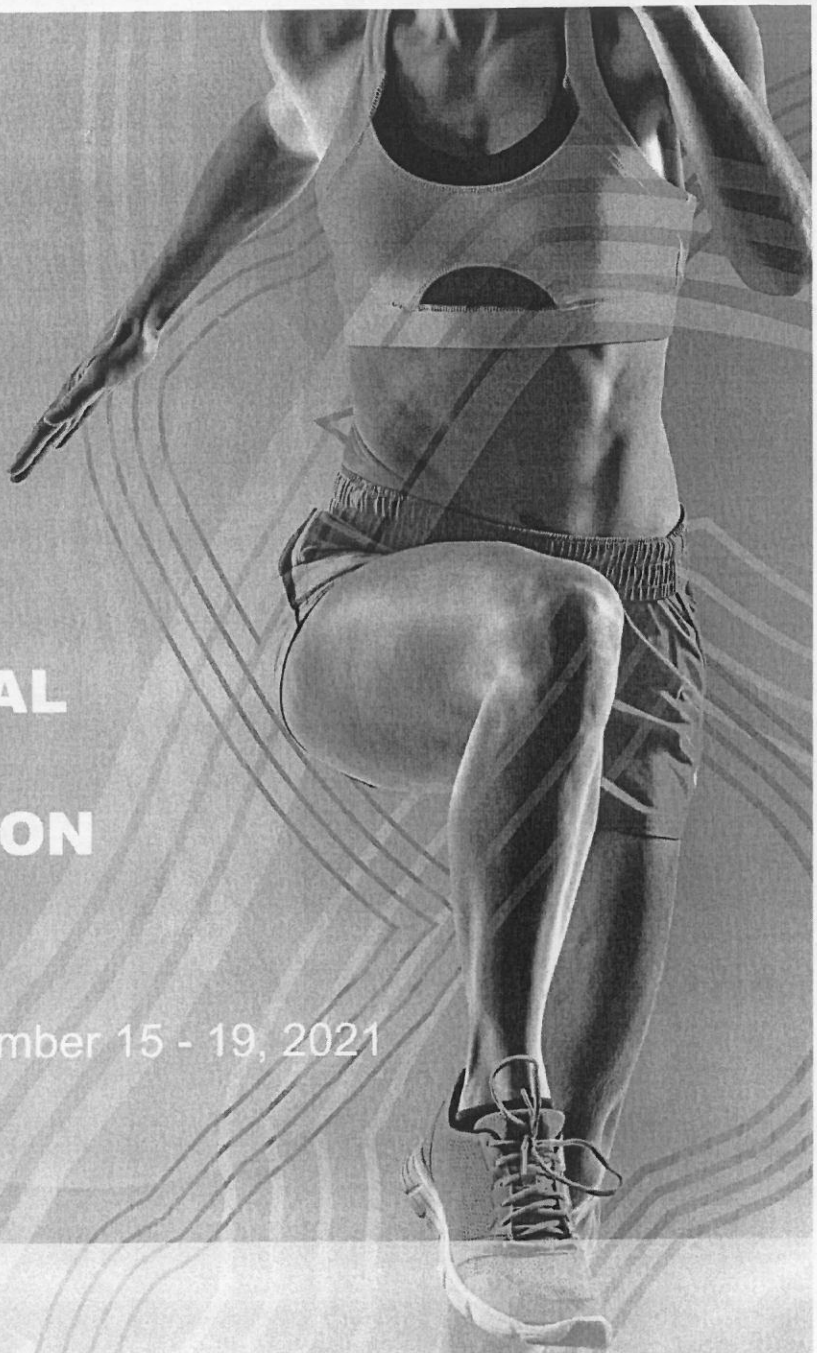

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PRIORITIES AND RANKINGS FOR OFFENSIVE BASELINER TENNIS PLAYER: THE ANALYTIC HIERARCHY PROCESS (AHP)

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Abstract

The aim of this study was to establish and explain priorities for offensive baseliner tennis players in offence and defence. Based on the expertise performed by seven tennis experts, the relative importance coefficients in regard to offensive baseliner style were determined for eighteen overall performance evaluation criteria. From each given matrix, important coefficient vectors defined by each of the experts were calculated by means of the Geometric Mean Method and used to form an importance coefficient matrix for an offensive baseliner player. Vectors of the arithmetic means, and standard deviations were computed from the obtained indices. Top of the offensive hierarchical structure indicates that the *quality of taking initiative in rallies* and *quality of first serve* have very high importance (AM 0,171; AM 0,167) and *quality of offensive forehand* has high importance (AM 0,140). Top of the defensive hierarchical structure indicates that the *quality of second serve return* has very high importance (AM 0,192), and *quality of defensive forehand, quality of baseline movement / defensive task, quality of defensive backhand* and *quality of first serve return* have medium to high importance (AM 0,159; AM 0,149; AM 0,147; AM 0,136). The results of this research can be applied by coaches for the selection of the most efficient tactical solutions and the optimization of the training process among elite tennis players.

Key words: *elite tennis, hierarchies in sport, multi-criteria decision making*

Introduction

Many sports matches are complex systems consisting of at least two players, and each player has a large number of alternatives (options) for how to react at a particular point in the match (Lames and McGarry, 2007). The cited authors believe that such complex systems consist of a subsystem in which dynamic interactions predominate. The interactions are of dynamic nature because they are changing during the whole match. Therefore, tennis can be classified into those sports that involve two parties (couples or singles matches), which dynamically act in order to win points and simultaneously to prevent the opponent from achieving points (Lames, 1991). A new way of thinking about the behaviour of sports games in terms of the theory of dynamic systems, is gaining more importance among scientists (McGarry et al., 1999, McGarry et al., 2002), as well as in Palut and Zanone (2005) for a demonstration of tennis as a dynamic system. Accordingly, in order to explain the above dynamic interaction processes, it is necessary to connect the quantitative research which dominate in sports games with qualitative research. Namely, some authors (Denzin and Lincoln, 1994) believe that qualitative approaches have an interpretative and reconstructive view of the social reality which is considered appropriate for mastering the steps needed to analyse the practical success. While quantitative hypotheses are tested through numerous statistical analyse and interpreted as phenomena as an objective image independent of the observer's vision, the qualitative method examines phenomena in the natural environment, giving meaning to them based on the meaning given to humans (Lames and McGarry, 2007). Given that it is not possible to explicitly form theories and models in kinesiology without a standard error, it is possible to conclude that there is no single model of tennis match success that represents the kinesiological reality completely (Trninić et al., 2009). In this regard, in order to increase the predictive value and validity of tennis players' performance models, a greater number of sport-specific variables and external factors should be covered.

This study is a continuation of research efforts that deal with construction and evaluation of methods of overall quality assessment for elite tennis players (Djurovic et al., 2015). In modern tennis, coaches and scientists can clearly distinguish four dominant types of motor behaviour (Roetert and Kovacs, 2011).

In this study, priorities for "offensive baseliner" style using the hierarchical AHP method were analysed. By observing elite tennis players, from the "Open Era" to date, the number of specialists who prefer "offensive baseliner" style is relatively high.

Material and Methods

The hierarchical AHP model for the assessment of tennis offensive baseliner players' overall quality was proposed and described in detail by Djurovic et al. (2015) study. Proposed criteria for the assessment of overall quality of tennis players are ten criteria for the assessment of overall quality of top-level tennis players on offence (quality of first serve; quality of second serve; quality of netgame movement; quality of netgame shots; quality of baseline movement / offensive tasks; quality of offensive forehand; quality of offensive backhand; quality of taking initiative in rallies; quality of transition attack; quality of playing multiple styles) and eight criteria for the assessment of overall quality of top-level tennis players on defence (quality of first serve return; quality of second serve return; quality of passing shots; quality of baseline movement / defensive tasks; quality of defensive forehand; quality of defensive backhand; quality of performance in long rallies; quality of uncommonly situation shots).

Persons regarded as tennis experts/judges (seven) in this research were coaches who had met at least one of the three required conditions: I. one of the top four places at the global competition (Fed Cup, Davis Cup, Grand Slam, Hopman Cup); II. one of the first four places in the tournament ITF Pro Circuit; III. one of the top two spots in the National Championship as a head coach.

Coefficients of importance within the defined set of criteria for the overall quality of offensive baseliner tennis players on defence and offence were determined by means of the AHP (Analytic Hierarchy Process) method for the multi-criteria decision making (Saaty, 1987; Dezman et al., 2001; Hraste et al., 2008). Application of the AHP method was executed through the following four steps: 1. Every tennis expert numerically evaluated the importance of each criterion by comparing it with the other ones in pairs and registering the relative importance for offensive baseliner players. For example, if the criterion A is twice as important as the criterion B, then in the matrix of pairwise comparisons value 2 was assigned at the position AB, while ½ was assigned at the position BA. Thus, each tennis expert produced a square reciprocal matrix of grades for all serve-volley players; 2. From each matrix, the criterion coefficient of importance was completed by employing the geometric mean method (GMM). In that way one vector of the coefficient of importance for each criterion was obtained from every expert and the matrix of coefficients of importance was formed for all offensive baseliner players; 3. Vectors of the arithmetic means and standard deviations of the importance coefficients for this particular style of play were then computed from the obtained matrices (1 vector for defence, 1 vector for offence). 4. Vectors of the arithmetic means of the coefficients of importance were then rescaled in the manner that their sum equals one. The reliability of the established importance coefficients (weights) of the performance criteria for "offensive baseliner" style was determined by computing: correlation means of experts' (RMS – rank means scores) agreement (inter-observers' agreement) and Cronbach's reliability coefficient (α).

Results

Table 1 presents arithmetic means (AM) and standard deviations (SD) of grades, obtained from the 7 judges, for the relative importance of 18 criteria per offensive baseliner tennis player on offence and defence. Average Cronbach's measure of reliability (α) per offence play is 0.974 and per defence play is 0.976. The average correlation of judges amounts per offence play is 0.901 and per defence play is 0,874. These results indicate a high degree of inter-observers' agreement.

Offensive baseliner player (defence) – QSSR the quality of second serve return has very high importance (AM 0,192), QDF quality of defensive forehand, QBM-DT quality of movement / defensive tasks, QDB quality of defensive backhand and QFSR quality of first serve return have medium to high importance (AM 0,159; AM 0,149; AM 0,147; AM 0,136), QPLR quality of performance in long rallies has low to medium importance (AM 0,098), QPS quality of passing shots and QUSS quality of uncommonly situation shots has low importance (AM 0,071; AM 0,047).

Offensive baseliner player (offence) – QTIR quality of taking initiative in rallies and QFS quality of first serve have very high importance (AM 0,171; AM 0,167), QOF quality of offensive forehand have high importance (AM 0,140), QBM quality of baseline movement / offensive tasks has medium to high importance (AM 0,114), QSS quality of second serve and QOB the quality of offensive backhand have medium importance (AM 0,097; AM 0,096), QPMS playing multiple styles have very low importance and QTA quality of transition attack have low importance (AM 0,070; AM 0,066), QNS quality of net shots and QNM quality of net game movement have very low importance (AM 0,043; AM 0,036).

Table 1. Arithmetic means (AM), standard deviations (SD) the relative importance coefficients of the grades given by experts for the relative importance of eighteen performance evaluation criteria, as well as the correlation means of experts (RMS) & Cronbach's alpha (α) per offensive baseliner tennis player on offence and defence

OFFENCE	AM	SD	DEFENCE	AM	SD
QTIR	0,171	0,033	QSSR	0,192	0,023
QFS	0,167	0,012	QDF	0,159	0,019
QOF	0,140	0,036	QBM-DT	0,149	0,029
QBM-OT	0,114	0,010	QDB	0,147	0,020
QSS	0,097	0,012	QFSR	0,136	0,021
QOB	0,096	0,021	QPLR	0,098	0,010
QPMS	0,070	0,010	QPS	0,071	0,008
QTA	0,066	0,007	QUSS	0,047	0,003
QNS	0,043	0,002			
QNM	0,036	0,002			
RMS	0,901		RMS	0,874	
α	0,974		α	0,976	

Legend: QTIR - quality of taking initiative in rallies; QFS - quality of first serve; QOF - quality of offensive forehand; QBM-OT - quality of baseline movement - offensive tasks; QSS - quality of second serve; QOB - quality of offensive backhand; QPMS - quality of playing multiple styles; QTA - quality of transition attack; QNS - quality of netgame shots; QNM - quality of netgame movement; QSSR - quality of second serve return; QDF - quality of defensive forehand; QBM-DT - quality of baseline movement - defensive tasks; QDB - quality of defensive backhand; QFSR - quality of first serve return; QPLR - quality of performance in long rallies; QPS - quality of passing shots; QUSS - quality of uncommonly situation shots

Discussion

Based on the results obtained, it can be concluded that the primary task of the offensive baseliner player in offence is to try to finish the point in the shortest possible time by putting pressure on the opponent through service and forehand (Fernandez et al., 2006). Such constant pressure involves a high level of movement on the baseline that would enable a quality performance forehand. Due to their offensive characteristics, these players, on average, have the highest number of direct points but also unforced errors compared to other types of players (Djurovic et al., 2009). Due to their movement close to the baseline and the frequent hit of the ball in the climb to reduce the reaction time in the recovery phase, they achieve their best results on fast surfaces (ATP, 2020). Practice shows that, of all types, their play is, however, the most dependent on the current sense of stroke of the ball, which can be disturbed by internal and external conditions. Therefore, there are frequent defeats in matches of much lower ranked tennis players as well as victories over much better ranked tennis players (ATP, 2020). In women's tennis, this type of player usually presses on both sides of the opponent, while in men's competition the quality level of the offensive forehand is the most powerful weapon of the game from the baseline. Accordingly, the author's assumption is that the results of the most important weighted predictors of an individual's technical and tactical quality would differ significantly between men's and women's tennis (O'Donoghue, 2002). Based on the results obtained, it can be concluded that the primary task of offence baseliner player on defence is to respond to return requests in order to neutralize the opponents' initial initiative and to balance the points below. Given that the second service is much slower than the first service (Djurovic et al., 2009), it is easy to conclude that for these players, the quality of the second service return is the most important criterion in the game of defence. Namely, players with high levels of this criterion have excellent anticipation of kick and slice service and consequently use their strongest strike (forehand) in order to take their own initiatives at the points. In order to disable quality forehand solutions of offence baseliner player, opponents most often use tactical solutions on their backhand side. Given that their movement due to the offensive style during rallies takes place on the baseline, these players have a large number of unforced errors (Djurovic et al., 2009). Namely, during the movement outside the base line (up to 1m) in defensive tasks it is extremely difficult to establish a balance in the points if at the same time the aim is to reduce the reaction time of opponents on the future impact (Liu, 2014). This is the reason these players hold the high (significant) importance of all defensive shots from the baseline. Comparing the primary tasks of defensive baseliner (Djurovic et al., 2015) and offensive baseliner player, it can be concluded that these are two completely different types of players. Previous studies also show satisfactory values of objectivity coefficients for all positions in the game (Trninic et al., 2000; Hraste et al., 2010). Also, the conventional methods of explaining the success in the sports games ignore dynamic interactions of which the sports games are composed (Lames and McGarry, 2007). The authors claim that the present assumptions ignore the interaction between the player and the opponents, as important sources of variability within the sports games. Therefore, future research may investigate non-linear, hybrid systems, detection of neurotransmitter and hormonal factors, and factors of diversity of motor programs that determine individual quality differences in elite players (Trninic et al., 2010). A limitation of this research is that only seven tennis experts were included in the research, which should be considered in future research.

It is very important to design the training process in a way to merge the most important offence criteria with the most important defence criteria, while simultaneously working on specific psychosocial criteria (Djurovic et al., 2014). The presented training system which connects physiology, psychology, biomechanics and tennis criteria allows new neural programs development and training progress measurement. The fitness program must be shaped according to the characteristics of the game of offensive baseliner players.

Conclusion

Measuring the overall performance of a player in a tennis match is a challenge that scientists and coaches face. The hierarchical AHP model to solve multi-criteria decision helps to choose the best solution among several alternatives across multiple criteria. The current investigation has found offensive baseliner player's priorities for offence and defence. Also, it is important to find priorities for other styles of play and make a comparative analysis. The proposed model is not final but should be regarded as a starting point for empirical investigations, based on which the model could be changed and upgraded.

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