

The Game-Based Method is More Efficient than the Conventional Training Method in Teaching Tennis to Adult Beginners

Tomislav Hublin¹, Petar Barbaros² and Tomislav Rupčić²

¹The Polytechnic of Međimurje in Čakovec

²Faculty of Kinesiology, University of Zagreb

Abstract

Conventional tennis teaching methods which are based on repetitive exercises have their limitations which can lead to demotivation and poor learning outcome. Considering this fact, new game-based teaching methods have been developed. The aim of this research was to assess the efficiency of the game-based method in teaching tennis to adult beginners. Eighty-nine second- and third-year undergraduates at the Faculty of Kinesiology, University of Zagreb were included in the study, none of which had trained tennis ever before. All underwent a four-week tennis training course – one group using the conventional method, other using the game-based method. Following the course, precision and quality of standard tennis stroke techniques were assessed. A significantly higher precision was observed in the game-based group in performing the cross-court forehand and a higher performance quality of “balance” for all types of strokes, apart from the forehand volley, and the “movement orderliness” quality of the forehand. Other differences, although not significant statistically, were consistent in showing superiority of the game-based method. These results call for future research on larger samples, and at the same time justify implementing the game-based method in teaching tennis techniques to adult beginners.

Key words: *efficacy; game-based; precision; quality; tennis.*

Introduction

According to its structure, tennis belongs to the group of polystructured acyclic movements and is considered among the most complex individual sports (Filipic

& Filipčić, 2006). According to published data, tennis is continuously among the most popular sports worldwide, yet a decrease was noticed in the number of people who engage in tennis or show interest in playing tennis (Klinovsky, 1996). There are multiple causes, however, the main reason for the decrease in interest is the complexity of mastering the basic tennis technique which enables playing tennis and a long teaching process before taking part in an actual game (Zetou et al., 2012). This is a consequence of the demanding spatial-temporal game parameters, i.e., the fact that the ball travels at speeds too high for an average person to tackle and control in the field with standard tennis dimensions. As a response to this problem, alternative teaching methods, which are based on specific situations of tennis play and tactics, were devised. In the literature, the methods are summarized under the term “game-based coaching”, which encompasses methods such as “play-and-stay tennis” and “teaching game for understanding” (TGfU). Play and stay tennis is an International Tennis Federation (ITF) program developed primarily for children and later modified for adults (ITF, 2006). The program emphasises the organization of active training with the aim to enable the participants to begin playing rallies as soon as possible. To enable this, slower balls are used, and the court size is adjusted. Such an approach deviates from the conventional training approach, mostly due to the fact that it does not primarily stress learning the tennis technique, rather it focuses on learning skills which enable participants to begin interchanging rallies across the net earlier and consequently master technical elements of tennis strokes. This approach should result in higher satisfaction of the participants and therefore in the popularization of tennis and participation in tennis teaching.

TGfU is a model based on the problem approach to sport games, with the aim of mastering skills used in specific situations of a given sport (Hopper, 2013). This method advocates learning the elements of the technique and skill of a given sport with the aim of solving specific tactical situations encountered during a game. The need to understand the tactical assignment is emphasized in order for a specific technique or skill to be applied purposefully. In general, TGfU is applied across a variety of sport games and is a method used and researched in tennis. Aloui et al. (2018) have reported that in tennis competition, children who were subject to the TGfU method more often used the entire court during matches and approach the net more often than children who underwent training based on the stroke learning technique. Research undertaken to investigate the impact of the method on learning the tennis technique by children has shown that the level of mastering the stroke technique was somewhat lower with this method, yet children’s motivation was significantly higher, which should, in the long term, result in a better overall effect (Nianfeng et al., 2021).

A common problem in teaching tennis is gaining control over performance of tennis strokes with regard to the upcoming ball. Therefore, the methods in teaching tennis used so far were adjusted mostly by simplifying conditions for performing basic tennis

strokes. This results in a longer learning process of basic tennis techniques, before players move to interchanging swings over the net. A novel approach to teaching tennis beginners using modified tennis equipment (spongy balls, softer tennis balls, smaller and lighter racquets, etc.) has enabled learning the tennis technique in reverse order, by interchanging swings. The new approach of mastering the tennis technique is game-based, and the conducted research shows that it has its advantages over the traditional teaching methods (Farrow & Reid, 2010; Harvey & van der Mars, 2010; Zetou et al., 2012).

In the research published thus far, the effects of specific teaching methods and programs have been investigated, mostly on previously trained subjects (Barell, 2012). Research is scarce on the untrained population, in particular in order to answer the question which method, i.e., teaching process has the best effects on individual segments of the tennis technique. The principal aim of teaching the untrained population of different ages is to start participating in active play as soon as possible. To enable this, it is imperative to, first and foremost, master the basic swing techniques, basics of tennis on-field movement and game understanding via specific situations which pertain to basic tennis tactics. The most commonly used teaching method in tennis is based on mastering techniques of basic tennis strokes, while at the same time it neglects the tactical component and the play itself, i.e., interchange of strokes. Novel teaching methods provide learning through play and stroke interchange with the aim of better understanding the game and a balanced development of technique and tactics. With regard to this, there are open questions in the field of teaching tennis technique and the effects of various teaching methods on the learning process. Therefore, the aim of this paper was to assess the efficacy of the game-based method in comparison to the conventional training method in teaching tennis to adult beginners. The secondary aim was to compare the efficacy of both methods with regard to precision in performing tennis strokes.

Methods

This was a case-control study involving second- and third-year undergraduate students at the Faculty of Kinesiology, University of Zagreb. Only students who had not previously trained or played tennis in any form were considered eligible for participating in the research.

Participants were subject to one of the two teaching courses (game-based or conventional) over a four-week period. In each week, two 90-minute practice sessions were held, supervised by licensed coaches and in accordance with a precisely defined program. In the fifth week, an assessment of performance of basic strokes was carried out by five educated coaches, in accordance with detailed instructions, which was followed by specific tests to assess tennis stroke precision.

The game-based protocol is specific in its synthetic teaching method, i.e., in its integral performance of tennis strokes which are performed in tasks resembling tennis game

settings. To enable this, modified tennis balls, with regard to their rebound height and speed, are used. In the beginning stages of the course, the slowest ball with the lowest rebound is used and, progressively, as the trainees gain experience, balls with higher rebound are introduced. ITF-certified balls were used: red ball, which is 75 % slower and has a rebound height of 85-105 cm; orange ball, which is 50 % slower and has a rebound height of 105-120 cm; green ball, which is 25 % slower and has a rebound height of 120-135 cm; and standard yellow ball with a rebound height of 135-147 cm (ITF, 2006). Also, in the beginning, a smaller play space is used, i.e., smaller tennis court, and the size is slowly enlarged until reaching the size of a proper tennis court. In the game-based protocol, assignments and exercises are conducted predominantly by playing, i.e., exchange of strokes. The protocol is aimed at a balanced development of both the technique and tactics, and game understanding. The conventional training method is conducted by a predominantly analytic method of teaching and the emphasis is on technical correctness of basic stroke segments – shot preparation, swing, contact and follow-through. The exercises are based on a large number of repeating movements which are integral to the tennis technique of basic strokes. In the process of conventional teaching, classic tennis balls are used. All training sessions for both groups were defined in detail and the trainers were educated in conducting all parts of both protocols. Time to teach individual strokes was balanced across the groups.

Subjects

Second- and third-year undergraduate students at the Faculty of Kinesiology of the University of Zagreb were included into the study. The subjects were randomly allocated to each of the groups. Inclusion/exclusion criteria were that the student: i) had never participated in a tennis training course; ii) had never undertaken tennis as a recreational activity; iii) had never been included into a training process; iv) had actively participated in at least 80 % of the study program.

Outcome assessment

In the week preceding the program, an assessment of morphological features and motoric capabilities was carried out in order to estimate heterogeneity and, in case of need, reduce it by balancing the groups. Morphological variables used in the research were measured in accordance with instructions and regulations of the International biological program (Weiner & Lourie, 1969). The measurement program consists of 39 measures, of which, for the purpose of this research, the following were used: body height and weight, upper arm circumference in flexion and extension, and subcutaneous fat percentage.

Motor capacity

Motor capacity was assessed using nine tests for latent motor dimensions in tennis: i) hand coordination – juggling balls; ii) frontal agility – 93639 test; iii) lateral agility –

side steps; iv) repetitive leg power – squats over 30 seconds; v) repetitive core strength – erecting the lower body from a lying position over 60 seconds; vi) explosive jumping power – long jump from a still position; vii) explosive power of the trunk and arms – throwing a medicine ball from a still position by using a forehand and backhand; viii) hand movement frequency – hand tapping; ix) shoulder girdle flexibility – side-turn using a stick (Neljak & Vučetić, 2002).

Assessment of stroke performance

The assessment was done by five tennis professionals certified by the Croatian Tennis Association, based on precisely defined grading instructions. Grading was performed based on six basic tennis technique elements: forehand, backhand, serve, forehand volley, backhand volley, and smash. The referee who assessed stroke performance was blinded as to the groups of subjects, in order to avoid being biased. Each element was assessed over four phases of the stroke: balance during stroke performance, stroke rhythm, timeliness and contact with the ball, and orderliness of movements while performing the stroke, according to a 1-3 Likert-type scale. Therefore, the lowest possible grade for each stroke was four, and the highest twelve. Also, precision was measured for each of the basic elements of the technique. Using a forehand and backhand, the subjects had to target a field whose dimensions were 5.485x4.115 m, which is one half the size of a tennis court, both in parallel and diagonal lines, and the starting position of the subjects was behind the midpoint of the basic tennis line. The serve stroke was to be targeted at a small field whose dimensions were 6.401x4.115 m, diagonally, starting at the basic tennis line.

Data analysis

Normality was assessed using the Kolmogorov-Smirnov test. Continuous and categorical variables were summarized as mean and 95 % confidence interval (CI), nominal variables as absolute (relative) frequency. Means were compared using the t-test, proportions using the χ^2 test. Reliability of the used quality assessment grades was estimated by quantifying their internal consistency using the Cronbach α . All tests were two-sided, and the level of significance was set at 0.05.

Results

Overall, 89 subjects were included in the research, of which 22 (24.7 %) women and 67 (75.3 %) men. There were 44 subjects in the group which underwent conventional training and 45 subjects who underwent game-based training. There were no significant differences between the groups, with regard to the results of motor tests and anthropometric measurements (Table 1).

Table1
Summary of results of motor testing and anthropometric measurements

	overall (n=89)		conventional method (n=44)		game-based method (n=45)		p-value *
	n/ μ	%/95 % CI	n/ μ	%/95 % CI	n/ μ	%/95 % CI	
sex (f/m)	22/67	24,7/75,3	31/13	70,5/29,5	36/9	80,0/20,0	0,213
ball juggling	41.4	39.5-43.2	40.4	37.6-43.2	42.3	39.7-44.9	0.711
“93693” test	9.4	8.4-10.3	8.9	8.7-9.2	9.8	7.9-11.6	0.358
side steps	8.4	8.2-8.6	31.6	30.8-32.5	31.9	30.6-33.2	0.719
squats (over 30 s)	31.6	30.8-32.5	31.3	30.2-32.5	31.9	30.6-33.2	0.526
sit-ups (over 60 s)	54.9	53.6-56.3	54.6	52.9-56.3	55.3	53.0-57.5	0.645
medicinal ball forehand throw	13.2	12.5-13.8	13.1	12.2-14.1	13.2	12.2-14.1	0.953
medicinal ball backhand throw	12.9	12.2-13.5	12.9	12.0-13.8	12.9	11.9-13.8	0.969
long jump (cm)	221.7	215.0- 228.3	220.5	212.1-228.9	222.8	212.3- 233.4	0.731
stick turn (cm)	82.8	79.2-86.4	82.5	77.8-87.2	83.1	77.4-88.7	0.883
hand tapping	48.6	47.6-49.6	47.8	46.4-49.1	49.4	47.9-50.9	0.108
height (cm)	177.7	176.1- 179.2	177.3	174.9-179.6	178.1	175.9- 180.2	0.600
weight (kg)	76.6	74.3-78.8	75.7	72.5-79.0	77.4	74.2-80.6	0.463
subcutaneous fatty tissue (%)	23.4	21.8-25.0	24.2	21.8-26.6	22.6	20.5-24.8	0.322
upper arm cir. in flexion (cm)	33.9	33.2-34.6	34.0	32.9-35.1	33.8	32.9-34.6	0.742
upper arm cir. in extension (cm)	30.8	30.2-31.5	31.1	30.0-32.1	30.6	29.8-31.3	0.478

μ - mean; CI – confidence interval; *t- test for continuous variables, χ^2 for nominal variables

The groups were compared with regard to the precision of performing specific strokes after completing the training course – there were no significant differences, with the exception of a better score on the cross-court forehand for the game-based group (Table 2).

Table 2
 Summary of testing results for stroke precision – comparison between groups

	conventional (n= 44)		game-based (n=45)		p - value*
	μ	95 % CI	μ	95 % CI	
forehand cross court	2.23	1.85-2.61	2.82	2.44-3.21	0.030**
forehand down the line	2.84	2.48-3.20	2.82	2.45-3.19	0.942
backhand cross court	2.30	2.00-2.59	2.42	2.13-2.71	0.540
backhand down the line	2.32	1.93-2.71	2.47	2.11-2.83	0.575
forehand volley cross court	3.32	2.96-3.68	3.31	2.93-3.69	0.978
forehand volley down the line	3.86	3.54-4.19	3.76	3.38-4.14	0.665
backhand volley cross court	3.25	2.90-3.60	2.78	2.40-3.16	0.068
backhand volley down the line	3.39	3.04-3.74	3.58	3.23-3.93	0.435
smash cross court	4.23	3.97-4.49	4.36	4.11-4.61	0.476
smash down the line	4.39	4.14-4.63	4.42	4.21-4.64	0.826
serve cross court	2.46	2.12-2.79	2.56	2.21-2.90	0.673
serve down the line	2.48	2.15-2.80	2.84	2.48-3.21	0.135

μ - mean; CI – confidence interval; *- test; ** statistically significant difference

The groups were compared with regard to performance quality of individual strokes. Significant differences, in the sense of a higher quality of performance for the game-based group, were identified for item “balance” for all types of strokes apart from forehand volley, as well as for the item “orderliness of movements” for the forehand (Table 3).

Table 3
Summary of quality assessment of individual strokes: between-group comparison

		conventional (n= 44)		game-based (n=45)		p - value*
		μ	95 % CI	μ	95 % CI	
forehand	balance	2.28	2.20-2.36	2.48	2.38-2.57	0.003**
	rhythm	2.25	2.13-2.36	2.41	2.28-2.54	0.067
	timing and contact	2.08	1.95-2.22	2.23	2.09-2.38	0.128
	orderliness of movement	2.08	1.95-2.20	2.30	2.17-2.44	0.013**
	overall impression	3.28	3.05-3.51	3.52	3.30-3.74	0.129
backhand	balance	2.23	2.15-2.31	2.41	2.31-2.50	0.006**
	rhythm	2.27	2.15-2.39	2.36	2.26-2.46	0.241
	timing and contact	2.01	1.89-2.14	2.14	2.02-2.27	0.134
	orderliness of movement	2.03	1.90-2.17	2.15	2.03-2.28	0.208
	overall impression	3.08	2.85-3.31	3.31	3.11-3.52	0.127
forehand volley	balance	2.21	2.12-2.31	2.32	2.22-2.41	0.137
	rhythm	2.22	2.10-2.34	2.24	2.14-2.35	0.786
	timing and contact	2.05	1.92-2.18	2.16	2.03-2.29	0.243
	orderliness of movement	2.00	1.88-2.13	2.04	1.91-2.17	0.682
	overall impression	3.11	2.88-3.34	3.19	2.99-3.39	0.602
backhand volley	balance	2.17	2.08-2.26	2.35	2.27-2.43	0.004**
	rhythm	2.17	2.07-2.27	2.24	2.12-2.36	0.361
	timing and contact	1.95	1.82-2.08	2.01	1.88-2.14	0.481
	orderliness of movement	1.97	1.84-2.10	1.95	1.82-2.08	0.846
	overall impression	2.93	2.71-3.15	3.08	2.84-3.31	0.363
smash	balance	2.19	2.10-2.28	2.41	2.31-2.52	0.002**
	rhythm	2.21	2.10-2.32	2.26	2.13-2.39	0.544
	timing and contact	2.15	2.03-2.27	2.30	2.18-2.43	0.072
	orderliness of movement	2.19	2.08-2.30	2.29	2.16-2.42	0.211
	overall impression	3.25	3.04-3.47	3.39	3.15-3.62	0.400
serve	balance	2.24	2.16-2.33	2.48	2.40-2.56	<0.001**
	rhythm	2.28	2.16-2.39	2.33	2.25-2.42	0.430
	timing and contact	2.22	2.11-2.34	2.29	2.18-2.41	0.395
	orderliness of movement	2.24	2.14-2.34	2.34	2.23-2.45	0.177
	overall impression	3.41	3.19-3.64	3.52	3.31-3.73	0.485

μ- mean; CI – confidence interval; *t- test; ** statistically significant difference

Internal consistency of the scale used for qualitative assessment was appraised using the Cronbach α for each of the domains. This analysis showed an acceptable internal consistency across all domains (range for Cronbach α = 0.7-0.8, Table 4).

Table 4
Reliability of the scale used to measure performance quality

stroke	Cronbach α
forehand	0,770
backhand	0,710
forehand volley	0,762
backhand volley	0,737
smash	0,766
serve	0,751

Discussion

The results of this research indicate comparative and partially better results of the game-based tennis teaching approach in adult beginners, as compared to the conventional method. This is evident in the significantly higher precision of the cross-court forehand for the game-based group, as opposed to the “conventional” group (2.82, 95 %CI 2.44; 3.21 vs. 2.23, 95 % CI 1.85; 2.61, $P=0.030$). On the contrary, the method was not shown as inferior in terms of precision with regard to any other stroke.

Apart from the objective advantage (precision), an advantage was established for performance quality of individual stroke elements. More precisely, balance was shown to be better for the game-based group, as compared to the conventional method for all strokes apart from the forehand volley (Table 3). Additionally, a higher perceived forehand performance quality was established for the item “orderliness of movements” for the game-based method, as compared to the conventional method (2.30, 95 %CI 2.17; 2.44 vs. 2.08, 95 % CI 1.95; 2.20, $P = 0.013$).

Performance quality was assessed using the Likert-type scale, devised for the needs of the research. As a novel instrument was applied, a validation process was required. The validation process was in part done by assessing internal consistency. The obtained Cronbach α values indicate an acceptable internal consistency across all domains (range of values 0.710 to 0.770, Table 4). Other psychometric properties of the instrument were not appraised, which poses a limitation to this research. Considering the fact that the applied instrument was simple and with proven acceptable consistency, we hold that other properties are likely to be acceptable, thereby making the results reliable.

It is worth noting that superior quality of the game-based method was shown across all of the researched categories (6 strokes, each 5 items – 30 categories in total), with the exception of “orderliness of movements” for backhand volley. The differences in question are not statistically significant, yet they are consistent in the same direction and can be interpreted as being, in general, in favour of higher quality of performance

of strokes after undergoing the game-based learning process. A similar advantage of the game-based method was shown for stroke precision appraisal. Although it is not statistically significant, higher precision was established for seven strokes for the game-based method: backhand cross-court and down the line, backhand down the line volley, smash cross court, smash down the line, serve cross court and serve down the line (Table 2). On the other hand, only four strokes were more precise for the conventional method (statistically not significant): forehand down the line, forehand cross court volley, forehand volley down the line, and backhand volley cross court (Table 2).

The first game-based teaching models in kinesiology were introduced in the early 1980s, and have since grown in the number of variants, popularity, and the amount of empirical evidence supporting their application (Bunker & Thorpe, 1982; Launder, 2001). Research results supporting the implementation of game-based methods come from various domains and include fields such as sports psychology, motor learning, and sports pedagogy (Harvey & van der Mars, 2010). Contrary to the traditional learning models, which rest on repetitive exercises, game-based learning emphasizes the tactical dimension of the game by modifying the playing conditions, in order to make the game either easier or more demanding (for example, a game of tennis in which a third player takes part, whose role is to help the student continue the rally or changing the technical conditions of the game – equipment, court size and shape) (Harvey & van der Mars, 2010).

The traditional model of teaching presupposes mastering certain skills prior to taking part in an actual game. Some of the more prominent critiques of this approach regard the fact that repetitive exercises, without taking part in a game, negatively impact motivation and desire to play. Moreover, exclusively repeating certain sequences can have a negative impact on their application in a real-life setting (Thorpe, 1992). Early research in the field of game-based teaching dealt with describing the features of the new approach and delineating the differences with respect to the existing methods. It was only later that the first empirical evidence appeared on the efficacy and comparative advantages of the approach (Griffin et al., n.d.). Koronas (2018) researched the effect of the training method based on the Play and Stay program, as compared to the traditional teaching method, with regard to the backhand stroke in children of average age of 11.13 years. The results showed that the Play and Stay method achieved better training effects. The conclusion was that there are no differences in training effects between girls and boys. No difference across gender in learning the tennis technique even at the adolescent age was also shown by other research (Pangrazi, 1997; Zetou et al, 2012). In their research, Sahan et al. (2018) investigated the difference between two methods of teaching basic line strokes and the effect of the methods on the precision of performing the forehand and backhand. They found that the method which employed varying ways of performing the basic line strokes achieved better results than the method which employed the same performance of strokes.

Our results are in accordance with previously published research and speak in favour of the efficacy of the non-conventional approach in teaching tennis techniques, with an important emphasis on the targeted population – adult beginners. The majority of previous research was conducted on the population which previously took part in a training process, therefore their example is a case of mastering motor skills, whereas this research was undertaken on a population of beginners, with no previous knowledge of tennis. Based on the results, a conclusion can be drawn that even among untrained adults both methods yield positive results; however, in certain settings the game-based method was shown to be more efficient.

Lack of statistical significance is a possible consequence of a small sample size, which is one of the most important limitations of this study. Namely, study power was not formally assessed before the research, therefore it is possible that a larger sample might have led to an observation of significant differences across other domains. The second limitation concerns the lack of testing of psychometric properties of the instrument applied – questionnaire to assess stroke performance. Thirdly, the training process was performed over a short period of time and therefore it is possible that more realistic conditions (longer training process) would result in a different outcome. We hope our results serve exactly this purpose, as an impetus for further research of higher quality and a larger sample.

Conclusion

Our results indicate efficacy and a comparative advantage of the game-based method in teaching tennis technique, in comparison to the conventional teaching method. In favour of this notion are results of stroke precision measurement, as well as the appraisal of quality of performance of separate phases of tennis strokes. Apart from the limitations, we hold that the results merit further research on a larger sample, and at the same time justify the implementation of the game-based method in teaching tennis techniques to adult beginners.

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Tomislav Hublin

The Polytechnic of Međimurje in Čakovec
Ulica bana Josipa Jelačića 22a, 40000, Čakovec, Croatia
thublin@mev.hr

Petar Barbaros

Faculty of Kinesiology
University of Zagreb
Horvaćanski zavoj 15, 10000 Zagreb, Croatia
petar.barbaros@kif.unizg.hr

Tomislav Rupčić

Faculty of Kinesiology
University of Zagreb
Horvaćanski zavoj 15, 10000 Zagreb, Croatia
petar.barbaros@kif.unizg.hr

Metoda poučavanja temeljena na igri efikasnija je od konvencionalne metode poučavanja teniske tehnike odraslih početnika

Sažetak

Konvencionalne metode poučavanja tehnike tenisa utemeljene na repetitivnim vježbama imaju svojih nedostataka koji mogu rezultirati demotivacijom i slabim ishodom poučavanja. S obzirom na navedeno razvijene su nove, na igri utemeljene, metode poučavanja teniske tehnike. Cilj je bio istražiti učinkovitost metode temeljene na igri u poučavanju tehnike tenisa kod odraslih početnika. U istraživanje je uključeno 89 studenata druge i treće godine studija kineziologije koji prethodno nisu trenirali tenis. Kroz četiri tjedna studenti su poučavani tenisu – jedna grupa konvencionalnom metodom, druga metodom temeljenoj na igri. Nakon provedenoga protokola, procijenjena je preciznost izvođenja, kao i kvaliteta pojedinih faza standardnih udaraca u tenisu. Pokazana je statistički značajno bolja preciznost forhend dijagonale i viša kvaliteta izvedbe kod skupine koja je sudjelovala u poduci metodom temeljenoj na igri. Statistički značajna razlika identificirana je za segment „ravnoteža“ za sve udarce osim forhend voleja, kao i za „pravilnost izvedbe“ za forhend. Ostale razlike, iako statistički neznačajne, konzistentne su u smjeru superiornosti metode poučavanja temeljene na igri. Rezultati opravdavaju daljnja istraživanja na većem uzorku, a istovremeno opravdavaju provođenje metode temeljene na igri u poučavanju odraslih početnika tehnikama u tenisu.

Ključne riječi: kvaliteta; preciznost; tenis; učinkovitost; učenje temeljeno na igri

Uvod

Tenis po svojoj strukturi pripada skupini polistrukturalnih acikličkih gibanja i smatra se jednim od najkompleksnijih individualnih sportova (Filipčić i Filipčić, 2006). Prema analizama kontinuirano je jedan od najpopularnijih sportova na svijetu. Ipak, u nekim zemljama analize pokazuju pad broja osoba koje se bave tenisom ili su zainteresirane za igranje tenisa (Klinovsky, 1996). Uzroka je više, ali kao glavni razlog smanjenja interesa

za igranje tenisa navodi se kompleksnost savladavanja osnovne teniske tehnike koja omogućuje igranje tenisa te dugotrajan proces poduke prije sudjelovanja u realnoj igri (Zetou, Koronas, Athanailidis i Koussis, 2012). Do toga dolazi zbog zahtjevnosti savladavanja prostorno-vremenskih parametara igre, odnosno zbog toga što je brzina leta lopte uglavnom prevelika da bi je prosječna osoba mogla savladati i kontrolirati na terenu klasičnih teniskih dimenzija. Kao odgovor na detektirani problem u teniskoj su struci osmišljene alternativne metode poduke u tenisu bazirane na specifičnim situacijama teniske igre i taktici. U literaturi su najčešće obrađene kroz pojam *game-base coaching* koji obuhvaća metode poput *Play and stay tennis* i *Teaching game for understanding* (TGfU). *Play and stay tennis* je program koji popularizira Međunarodna teniska federacija (ITF) ponajprije za djecu, a potom je prilagođen i za odrasle osobe (ITF, 2006). Naglasak programa je na organizaciji aktivnoga teniskog treninga s ciljem da sudionici što brže počnu igrati na poene. Da bi to bilo ostvarivo, koriste se sporije lopte i prostor za igru prilagođenih dimenzija. Ovakav pristup teniskoj poduci odstupa od konvencionalnoga pristupa treningu najviše zbog toga što u prvom planu nije učenje teniske tehnike, nego učenje vještina koje omogućavaju sudionicima da što ranije počnu razmjenjivati udarce preko mreže na što se postupno nadovezuje savladavanje elemenata tehnike teniskih udaraca. Ovakav pristup trebao bi rezultirati većim zadovoljstvom sudionika, a samim time i popularizacijom tenisa i sudjelovanja u teniskoj poduci.

TGfU se definira kao model koji zagovara problemski pristup poučavanju sportskih igara s ciljem savladavanja vještina koje se koriste u određenim situacijama nekog sporta (Hopper, 2013). Ova metoda zagovara učenje elemenata tehnike i vještine nekog sporta, ali u svrhu rješavanja konkretnih taktičkih situacija u igri. Naglašava se potreba shvaćanja taktičkoga zadatka kako bi se određena tehnika ili vještina mogla svrsishodno primijeniti. TGfU se generalno primjenjuje u raznim sportskim igrama te je korištena i proučavana i u tenisu. Alaoui, Kpazaï, Portmann, i Comtois (2018) utvrdili su da u teniskim natjecanjima mlađih dobnih kategorija djeca koja su sudjelovala u poduci TGfU metodom više koriste cijeli teniski teren za vrijeme mečeva te se mnogo češće odlučuju na izlazak na mrežu od djece koja su sudjelovala u poduci temeljenoj na učenju tehnike izvođenja udaraca. Istraživanja koja su proučavala utjecaj ove metode na učenje teniske tehnike kod djece utvrdila su da je razina savladavanja tehnike udaraca bila nešto niža kod korištenja ove metode, no motivacija djece je bila znatno viša što bi dugoročno trebalo rezultirati boljim ukupnim efektima (Nianfeng, Feng i Yi, 2021).

Česti problem prilikom poučavanja tenisa je stjecanje kontrole nad izvođenjem teniskih udaraca s obzirom na nadolazeću lopticu. Zbog toga se dosadašnja metodika poučavanja tenisa prilagođavala uglavnom stvaranjem jednostavnijih uvjeta za odigravanje osnovnih teniskih udaraca. Navedeno rezultira nešto dužim procesom usvajanja osnova teniske tehnike prije nego bi igrači krenuli u izmjenu udaraca preko mreže. Novi pristup poučavanju početnika u tenisu prilagođenim teniskim rekvizitima (spužvastim lopticama, mekšim teniskim lopticama, manjim i lakšim reketima i sl.)

omogućio je usvajanje teniske tehnike obrnutim slijedom, kroz izmjenu udaraca. Ovaj pristup usvajanja teniske tehnike svoje polazište pronalazi u igri, a provedena istraživanja ukazuju na njegove prednosti u odnosu na tradicionalni način poučavanja (Farrow i Reid, 2010, Harvey i van der Mars, 2010, Zetou i sur., 2012).

U dosadašnjim istraživanjima istraživani su učinci određenih programa i metoda treninga, većim dijelom na već treniranoj populaciji (Barell, 2012). Nedostaju istraživanja provedena na netreniranoj populaciji koja će odgovoriti na pitanje koje metode, odnosno načini poučavanja u tenisu imaju najbolje efekte na pojedine segmente teniske igre. Osnovni cilj teniske poduke kod netrenirane populacije različite dobi je što brže sudjelovanje u aktivnoj igri. Da bi to bilo moguće, potrebno je prije svega savladati osnove tehnike udaraca, osnove teniskoga kretanja na terenu te samo razumijevanje igre kroz specifične situacije koje se odnose na osnove taktike u tenisu. Najčešće korištena metoda poučavanja u tenisu bazirana je na savladavanju tehnike osnovnih teniskih udaraca te zanemaruje taktičku komponentu i samu igru, odnosno izmjenu udaraca. Novije metode provode učenje kroz igru i izmjenu udaraca s ciljem što boljegaa razumijevanja igre te podjednakog razvoja tehnike i taktike. S obzirom na navedeno, usvajanje teniske tehnike te učinci različitih metoda treninga još uvijek su nedovoljno istražena područja. Stoga je osnovni cilj ovoga istraživanja utvrditi učinkovitost metode temeljene na igri u odnosu na konvencionalnu metodu poučavanja teniske tehnike odraslih početnika. Sekundarni cilj istraživanja je usporediti učinkovitost obje metode s obzirom na preciznost izvođenja teniskih udaraca.

Metode

Istraživanje je studija tipa „slučajevi-kontrole“ (engl. *case-control study*), na studentima druge i treće godine Kineziološkog fakulteta Sveučilišta u Zagrebu, u sklopu kolegija „Tenis“. U istraživanju su sudjelovali samo studenti koji do početka istraživanja nisu trenirali tenis niti su se redovito rekreativno bavili tenisom.

Istraživanje se sastoji od provedbe dva različita programa poučavanja tijekom četiri tjedna nastave. U svakom tjednu održana su dva treninga u trajanju od devedeset minuta s educiranim trenerima po precizno definiranom programu. U petom tjednu provedeno je ocjenjivanje izvedbe osnovnih udaraca od strane pet educiranih trenera prema detaljnim uputama, nakon čega su provedeni i specifični teniski testovi za utvrđivanje preciznosti izvođenja teniskih udaraca.

Specifičnost protokola temeljenoga na igri jest u tome što se provodi sintetičkom metodom poučavanja, odnosno što se teniski udarci izvode u cijelosti i to kroz zadatke koji su slični situacijama u teniskoj igri. Da bi to bilo moguće, koriste se teniske loptice koje su prilagođene visinom odskoka i brzinom. U programu se u početku koristi najsporija lopta s najnižim odskokom te se progresivno, s unapređenjem znanja ispitanika, uvode brže lopte s višim odskokom. Korištene su certificirane teniske loptice od strane ITF-a i to crvena lopta koja je 75 % sporija te je njezina visina odskoka između 85 i 105 cm, narančasta lopta koja je 50 % sporija s visinom odskoka

od 105 do 120 centimetara, zelena lopta koja je 25 % sporija s visinom odskoka od 120 do 135 centimetara te standardna žuta lopta s visinom odskoka od 135 do 147 centimetara (ITF, 2006). Također, u početku programa koristi se manji prostor za igru, tj. manji teniski teren te se s unapređenjem znanja ispitanika povećava prostor za igru sve do veličine klasičnoga teniskog igrališta. U protokolu koji se temelji na igri zadatci i vježbe provode se dominantno kroz igru odnosno razmjenu udaraca. Ovim protokolom želi se podjednako utjecati na razvoj tehnike te taktike i razumijevanja igre. Konvencionalna metoda provodi se dominantno analitičkom metodom poučavanja te je naglasak na tehnički ispravnom izvođenju segmenata osnovnih teniskih udaraca – zamah, predmah, zgođaj i izmah. Vježbe su bazirane na velikom broju ponavljanja pokreta koji su sastavni dio tehnike osnovnih teniskih udaraca. U procesu poučavanja konvencionalnom metodom koriste se klasične teniske loptice. Svi treninzi za obje skupine ispitanika su detaljno razrađeni te su treneri educirani za provođenje svih dijelova oba protokola. U oba protokola izjednačeno je vrijeme koje se koristi za poučavanje svakog pojedinog udarca.

Ispitanici

U istraživanje su uključeni studenti oba spola druge i treće godine preddiplomskoga studija na Kineziološkom fakultetu Sveučilišta u Zagrebu. Ispitanici su nasumičnim odabirom alocirani u jednu od dvije trenažnih skupina. Kriteriji uključivanja/isključivanja bili su da student: i) nikad nije sudjelovao u poučavanja tenisa, ii) nije se rekreativno bavio tenisom; iii) nije sudjelovao u trenažnom procesu tenisa, iv) aktivno sudjelovao u najmanje 80 % predviđenoga programa.

Mjerenje ishoda

U tjednu prije početka provedbe programa provedeno je mjerenje morfoloških karakteristika i motoričkih sposobnosti ispitanika kako bi se procijenila heterogenost i, u slučaju potrebe, ista smanjila ujednačavanjem grupa. Morfološke varijable korištene u ovom istraživanju mjerene su prema uputama i propisima Međunarodnog biološkog programa (Weiner i Lourie, 1969). Navedeni program mjerenja sastoji se od 39 mjera, od kojih su za potrebe ovoga istraživanja korištene sljedeće: visina tijela, težina tijela, opseg nadlaktice u fleksiji, opseg nadlaktice u ekstenziji i postotak potkožnoga masnog tkiva.

Motoričke sposobnosti

Motoričke sposobnosti ispitanika ispitivane su koristeći deset testova za procjenu devet latentnih motoričkih dimenzija u tenisu: i) procjena koordinacije ruku - žongliranje lopticama, ii) procjena frontalne agilnosti - test 93639, iii) procjena lateralne agilnosti - koraci u stranu, iv) procjena repetitivne snage nogu - čučnjevi u 30 sekundi, v) procjena repetitivne snage trupa - podizanje trupa iz ležanja u 60 sekundi, vi) procjena eksplozivne snage tipa skočnosti- skok udalj s mjesta, vii) procjena eksplozivne snage trupa i ruku - bacanje medicine iz mjesta forhendom i bacanje medicine iz mjesta

bekendom, viii) procjena brzine frekvencije pokreta ruku - taping rukom, ix) procjena fleksibilnosti ramenog pojasa - iskret palicom (Neljak i Vučetić, 2002).

Procjena izvedbe udaraca

Procjenu izvedbe udaraca provodilo je petero educiranih teniskih stručnjaka s najvišom trenerskom licencom Hrvatskog teniskog saveza na temelju precizno definiranih uputa za ocjenjivanje. Stručnjaci koji su provodili ocjenjivanje izvedbe udaraca zaslijepljeni su s obzirom na skupinu u koju pripada ispitanik, kako bi se osigurala objektivnost. Ocjenjivanje je provedeno na šest osnovnih elemenata teniske tehnike: forhend, bekend, servis, forhend volej, bekend volej i smeš. Svaki od navedenih tehničkih elemenata procjenjivan je kroz četiri faze udarca: ravnoteža prilikom izvođenja udarca, ritam izvođenja udarca, pravovremenost i kontakt s lopticom i pravilnost pokreta kod izvođenja udarca i to prema skali Likertova tipa (od 1 do 3). Tako je za svaki udarac najmanja ocjena četiri, a najveća dvanaest. Također, za svaki od osnovnih elemenata tehnike provedena su specifična mjerenja preciznosti. Forhendom i bekendom gađana su polja dimenzija 5,485 m x 4,115 m, što odgovara veličini polovice velikoga teniskog polja, po paraleli i dijagonali, a početna pozicija ispitanika je iza sredine osnovne teniske linije. Forhend volejom, bekend volejom i smešom gađana su polja dimenzija 5,485 m x 4,115 m, što odgovara veličini polovice velikoga teniskog polja, po paraleli i dijagonali, a početna pozicija ispitanika je na sredini maloga polja na teniskom terenu. Servisom su gađana mala polja, dimenzije 6,401 m x 4,115 m, dijagonalno s osnovne teniske linije.

Obrada podataka

Distribucija varijabli testirana je Kolmogorov-Smirnovljevim testom i grafički. Kontinuirane i kategorijske varijable pregledno su prikazane aritmetičkom sredinom i 95 postotnim intervalom pouzdanosti, nominalne varijable kao apsolutna (relativna) frekvencija. Aritmetičke sredine uspoređivane su *t*-testom, proporcije hi-kvadrat testom. Pouzdanost testova motoričkih sposobnosti i specifičnih teniskih testova preciznosti procijenjena je kvantifikacijom unutarnje konzistentnosti, koristeći Cronbachov alpha koeficijent. Korišteni statistički testovi bili su dvostrani, a razina značajnosti definirana je kao 0,05.

Rezultati

U istraživanje je uključeno ukupno 89 ispitanika, od čega 22 žene (24,7 %) i 67 (75,3 %) muškaraca. U skupini koja je poučavana tenisu konvencionalnom metodom bilo je 44 ispitanika, u skupini poučavanoj metodom temeljenoj na igri 45 ispitanika. Nije bilo značajnih razlika između skupina, s obzirom na rezultate motoričkoga testiranja i antropometrijskih mjera (Tablica 1).

Tablica 1.

Objekte skupine uspoređivane su s obzirom na preciznost izvođenja pojedinih udaraca nakon provedene škole tenisa – nije bilo značajnih razlika, s izuzetkom značajnoga boljeg skora forhend dijagonale kod skupine poučavane metodom temeljenoj na igri, u odnosu na konvencionalnu skupnu (Tablica 2).

Tablica 2.

Skupine su uspoređivane i s obzirom na kvalitetu izvedbe pojedinih udaraca. Značajne razlike, u smislu više kvalitete izvedbe kod skupine poučavane metodom temeljenoj na igri, identificirane su za element „ravnoteža prilikom izvođenja udarca“ za sve udarce osim forhend voleja, kao i za element „pravilnost pokreta kod izvođenja udarca“ za forhend (Tablica 3).

Tablica 3.

Unutarnja konzistentnost korištene ljestvice kvalitativnoga vrednovanja procijenjena je koristeći Cronbachov alpha koeficijent za svaku pojedinu domenu. Ova analiza pokazala je prihvatljivu unutarnju konzistentnost za sve domene (Cronbach $\alpha = 0,7 - 0,8$, Tablica 4).

Tablica 4.

Rasprava

Rezultati ovoga istraživanja pokazuju usporedive, a dijelom i bolje rezultate metode poučavanja teniske tehnike temeljene na igri u usporedbi s konvencionalnom metodom, kod odraslih početnika. To je pokazano kroz značajno veću preciznost izvođenja forhend dijagonale kod skupine poučavane metodom temeljenoj na igri, u odnosu na „konvencionalnu“ skupinu (2,82, 95 % CI 2,44; 3,21 nasuprot 2,23, 95 % CI 1,85; 2,61, $P = 0,030$). S druge strane, metoda se nije pokazala inferiornom u preciznosti izvođenja bilo kojeg drugog udarca.

Osim objektivne prednosti (preciznosti), pokazana je i veća procijenjena kvaliteta izvedbe pojedinih elemenata udaraca. Točnije, ravnoteža kod izvođenja udaraca procijenjena je boljom kod skupine poučavane metodom temeljenoj na igri u odnosu na konvencionalnu metodu za sve udarce osim forhend voleja (Tablica 3). Dodatno, pokazana je viša procijenjena kvaliteta pravilnosti pokreta kod forhenda za skupinu poučavanu metodom temeljenoj na igri, u usporedbi s konvencionalnom metodom (2,30, 95 % CI 2,17; 2,44 nasuprot 2,08, 95 % CI 1,95; 2,20, $P = 0,013$).

Kvaliteta izvođenja udaraca procjenjivana je pomoću ljestvice Likertova tipa, razvijenu za potrebe ovog istraživanja. Kako je riječ o novom instrumentu, potrebno je bilo provesti validaciju. Ista je učinjena procjenom unutarnje konzistentnosti. Dobivene vrijednosti Cronbachova alpha koeficijenta ukazuju na prihvatljivu unutarnju konzistentnost za sve domene (raspon vrijednosti 0,710 do 0,770, Tablica 4). Druga psihometrijska svojstva instrumenta nisu testirana, što predstavlja jedno od ograničenja ovoga istraživanja.

Kako je riječ o jednostavnom instrumentu s dokazanom prihvatljivom konzistentnosti, vjerujemo da bi i druga testirana svojstva bila prihvatljiva, stoga se rezultati prikupljeni ovom ljestvicom mogu smatrati pouzdanima.

Vrijedi napomenuti kako je viša kvaliteta izvedbe kod metode temeljene na igri pokazana kroz sve vrednovane kategorije (6 udaraca, svaki 5 elemenata – ukupno 30 kategorija), s jednim izuzetkom „pravilnosti pokreta“ kod bekend voleja. Spomenute razlike ne dosežu statističku značajnost, ali su konzistentne, u istom smjeru i mogu se interpretirati u prilog načelno veće kvalitete izvedbe udaraca nakon protokola poučavanja temeljenoga na igri. Slična prednost metode temeljene na igri pokazana je i kod mjerenja preciznosti udarca. Iako statistički neznčajna, veća preciznost pokazana je za čak sedam udaraca kod metode poučavanja temeljene na igri: bekend dijagonala, bekend paralela, bekend volej paralela, smeš dijagonala, smeš paralela, servis dijagonala i servis paralela (Tablica 2). S druge strane, četiri su udarca preciznija kod konvencionalne metode (statistički neznčajno): forhend paralela, forhend volej dijagonala, forhend volej paralela i bekend volej dijagonala (Tablica 2).

Prvi modeli poučavanja temeljeni na igri u kineziologiji su predstavljeni u ranim 1980-im godinama, a od tada rastu u broju inačica, popularnosti i količini znanstvenih dokaza u korist njihove primjene (Bunker i Thorpe, 1982, Launder, 2001). Istraživanja čiji rezultati podupiru primjenu metoda poučavanja temeljenih na igri dolaze iz više domena, a uključuju područja kao što su sportska psihologija, motoričko učenje i sportska pedagogija (Harvey i van der Mars, 2010). Za razliku od tradicionalnih metoda poučavanja, koje su utemeljene na ponavljajućim vježbama, učenje temeljeno na igri naglašava taktičku dimenziju igre putem modificiranja uvjeta igre, kako bi ona postala ili lakša ili zahtjevnija (primjerice igra tenisa u kojoj sudjeluje treći igrač, čija je uloga pomagati učeniku da poen traje što duže ili promjena tehničkih uvjeta igre – opreme, veličine i oblika terena) (Harvey i van der Mars, 2010). Tradicionalni model poučavanja pretpostavlja da je potrebno usvojiti određene vještine prije same igre. Neke od važnijih kritika ovoga pristupa odnose se na činjenicu da ponavljajuće vježbe, bez sudjelovanja u igri, negativno utječu na motivaciju i želju za igrom. Drugo, isključivo ponavljanje određenih sekvenci mogu negativno utjecati na primjenu istih u uvjetima stvarne igre (Thorpe, 1992). Rana istraživanja iz područja poučavanja temeljenog na igri bavila su se definiranjem značajki tada novog pristupa, kao i opisivanjem razlika u odnosu na postojeće metode, a tek kasnije objavljeni su prvi empirijski dokazi o učinkovitosti i komparativnoj prednosti ovoga pristupa (Griffin, Mitchell i Oslin, 1997). Koronas (2018) u svojem istraživanju utvrđuje učinak metode treninga bazirane na *Play & stay* programu u usporedbi s tradicionalnom metodom poučavanja na tehniku bekend udarca kod djece prosječne starosti 11,13 godina. Ovim je istraživanjem utvrđeno da se *Play & stay* metodom postižu bolji efekti treninga. Zaključuje i da ne postoji razlika u efektima treninga učenja između djevojčica i dječaka. Da ne postoje značajne razlike u učenju teniske tehnike između djevojaka i dječaka ni u adolescentskoj dobi, pokazala su i druga istraživanja (Pangrazi, 1997, Zetou i sur., 2012). U svojem istraživanju Sahan,

Erman i Ertekin (2018) utvrđuju razliku između dva načina poučavanja udaraca s osnovne crte i utjecaj tih metoda na preciznost izvođenja forhenda i bekenda. Utvrdili su da se metodom koja se provodila varijabilnim načinima izvođenja osnovnih udaraca s osnovne crte postižu bolji rezultati od metode kojom se udarci odigravaju uvijek istim načinom izvedbe.

Dobiveni rezultati u skladu su s rezultatima ranijih istraživanja i govore u prilog učinkovitosti nekonvencionalnoga pristupa u poučavanju tehnike tenisa. Većina dosadašnjih istraživanja provedena je na populaciji koja je već sudjelovala u procesu treninga te se u njima zapravo radi o usavršavanju motoričkih znanja dok je ovo istraživanje provedeno na populaciji početnika bez teniskih predznanja. Na temelju rezultata može se zaključiti da i kod netrenirane odrasle populacije obje metode daju pozitivne rezultate s tim da se u određenim parametrima metoda bazirana na igri pokazala efikasnijom.

Izostanak statističke značajnosti moguća je posljedica premalenog broja ispitanika, što je ujedno jedno od važnijih ograničenja ove studije. Naime, snaga studije nije formalno ocijenjena prije početka istraživanja, stoga je moguće da bi istraživanje na većem uzorku pokazalo značajne razlike u ostalim domenama. Drugo ograničenje leži u spomenutom nedostatku testiranja psihometrijskih svojstava korištenoga instrumenta – upitnika za procjenu izvedbe udaraca. Treće, sam trenažni proces kratko je trajao – moguće je da bi realniji uvjeti (duži trenažni proces) rezultirao drugačijim ishodom. Nadamo se da će ovi rezultati upravo i tome poslužiti, kao poticaj za daljnja istraživanja veće kvalitete i brojnijega uzorka.

Zaključak

Rezultati ukazuju na učinkovitost i komparativnu prednost metode poučavanja tehnike tenisa temeljene na igri u odnosu na konvencionalnu metodu poučavanja. O tome govore rezultati mjerenja preciznosti udaraca kao i ocjena kvalitete izvedbe pojedinih faza standardnih udaraca u tenisu. Poštujući ograničenja, smatramo da rezultati opravdavaju daljnja istraživanja na većem uzorku, a istovremeno opravdavaju provođenje metode temeljene na igri u poučavanju odraslih početnika tehnikama u tenisu.