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Original Article

DOES THE TYPE OF SET AND FINAL SCORE CHANGE TIME INDICATORS IN BEACH VOLLEYBALL? A STUDY DURING BRAZILIAN SCHOOL CHAMPIONSHIP

O TIPO DE SET E A PONTUAÇÃO FINAL ALTERAM OS INDICADORES DE TEMPO NO VOLEIBOL DE PRAIA? UM ESTUDO DURANTE O CAMPEONATO BRASILEIRO ESCOLAR

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RESUMO

Esse estudo objetivou comparar indicadores temporais de acordo com o tipo de set e a diferença da pontuação final. Participaram do estudo 25 times masculinos de voleibol de praia (15 – 17 anos), que competiram nos Jogos Escolares Brasileiro, fase nacional. Foram observados 21 jogos, 42 sets e 1374 rallies. As variáveis analisadas foram a duração do rally, tempo de descanso entre os rallies, tempo total de trabalho, tempo total de descanso, duração do set, razão tempo de descanso : tempo de trabalho e quantidade de rallies. Comparou-se os indicadores de tempo entre o tipo de set (1ºset Vs. 2ºset) e categorias de equilíbrio de acordo com a diferença da pontuação final (desequilibrado, moderado equilíbrio e equilibrado), utilizando teste t e Anova de uma via, respectivamente. Não foi encontrada diferença significativa entre o 1º e 2º set, no entanto, efeito moderado foi observado no tempo total de trabalho. A diferença da pontuação final afetou a duração do set, o tempo total de trabalho e o trabalho total de descanso, mostrando uma tendência linear entre os níveis de equilíbrio. Os indicadores temporais parecem não se alterar em relação ao tipo de set, porém, há uma tendência de aumento do tempo de trabalho do 1º para o 2º set. Finalmente, a pontuação influencia a duração do set, tempo total de trabalho e tempo total de descanso, sem modificar a relação esforço : pausa.

Palavras-chave: Tempo-movimento. Jovens atletas. Esporte de areia. Análise de jogo. Demanda do jogo.

ABSTRACT

This study aimed to compare temporal indicators according to the type of set and final score difference. Twenty-five teams of male beach volleyball players (15 – 17 years old) competed in Brazilian School Championship, national stage. 21 matches, 42 sets, and 1374 rallies were observed. The variables analyzed were rally duration, rest time between rallies, total work time, total rest time, duration of the set, rest time : work time ratio, and the number of rallies. Time indicators were compared between the type of set (1st set Vs. 2nd set) and balance categories according to the difference in the final score (unbalanced, moderate balance, and balanced), using t-test and one-way ANOVA, respectively. No significant difference was found between the 1st and 2nd set, although a moderate effect was observed in total work time between sets. Moreover, the final score difference influences the duration of set, total work time, and total work-rest show a linear tendency between balanced levels. The temporal indicators do not seem to change concerning the type of set. However, there is a tendency for an increase in working time from the 1st to the 2nd set. Finally, the score influences the duration of the set, total work time, and total rest time, without modifying the effort : rest ratio.

Keywords: Time-movement. Young athletes. Sand sport. Match analysis. Match demands.

Introduction

Temporal or time-movement analysis has been widely used in sports with intermittent characteristics (i.e., frequent variation in intensity throughout the event). It allows studying the physical demands of the sport and monitoring training loads[1]. Besides, this knowledge can be applied to increase the specificity of prescriptions, optimizing performance[2]. In general, the observations investigate the effort : rest relationship[3], and there is a set of indicators specific to the characteristics of each modality.

Sports with a net (e.g., volleyball and tennis) feature the match based on rallies[4,5], which consists of the time the ball remains in play between serve at any athlete or team make a point.

Specifically, in beach volleyball, matches had at least two sets, won by the team that reached 21 points, following are used as temporal indicators: duration of rallies, rest time between rallies, total work time (sum of rallies), total rest time (sum of rest time between rallies), duration of the set, duration of match and number of rallies[6,7]. In addition, the first set has the same characteristic as the second set.

In previous research, an average game duration of 42 ± 14 minutes in males, regardless of the number of sets, for females 39 ± 18 minutes and 40 ± 17 minutes, when there were two or three sets, respectively[8]. Subsequently, an effort : rest ratio of 1:5 was observed in women, with rallies lasting ~6.46 seconds and a rest time corresponding to ~22.69 seconds[9]. Finally, Medeiros et al.[10], show results in male U-19, U-21, and senior categories, which demonstrated a 1:3 effort : rest ratio, with the duration of the rally ~07 seconds and rest time ~21 seconds. However, there are no investigations related to any kind of residual effect from the first set to the second or in balanced matches (e.g., sets won by a slight difference in points) in temporal indicators.

In brief, these studies point to variability between the genders, performance levels, and scarcity of information, especially with young athletes. Also, the players had an elevated technical-tactical level (i.e., matches in International Competitions). Thus, these dates may not be accurate to prescribe physical and technical-tactical training in younger categories and different levels. Proper reference values may help coaches and trainers prepare athletes in a coherent way regarding the competition context. Besides, it was not investigated whether there is a difference between sets in the same match (1st set vs. 2nd set) and how the score difference changes the temporal parameters. Therefore, this research aimed to compare temporal indicators according to the type of set and the final score differences. The initial hypothesis formulated is that the duration of the working parameters decreases from the 1st to the 2nd set and a balanced match has longer rallies than unbalanced.

Methods

Subjects

The study included 50 male school athletes representing 25 teams (24 state champions and 1 local guest) from Brazil. They competed in the national phase of the Brazilian School Championship (Youth School Games = "Jogos Escolares da Juventude"). The players were between 15 and 17 years old. In total, 21 group stage matches were observed (42 sets and 1374 rallies), which corresponded to 77% of the total matches in that stage. The third set was not included due to its different structure. Thus, there was not enough frequency to be included in the study. Following the Declaration of Helsinki principles, the procedures were previously approved by the Human Research Ethics Committee (protocol 0441/14). Legal guardians and athletes were informed about the study's aims, and an informed consent form was signed to participate in the research.

Data collection

Two camcorders (Sony® DSC-SX21. Manaus, Brazil), positioned behind the court in an elevated plan, supported on conventional tripods, were used to record the matches. Then, the recordings were transferred to a portable HD (Samsung, Manaus, Brazil). The duration of rallies was measured using the digital chronometer of the VLC Media Play software. Times were noted using the Microsoft Excel 2016 software, as suggested by Palao and Manzanares[7], and the other variables were mathematically calculated in automatic.

The reliability is verified by Intra and Inter observers. Two researchers with experience in beach volleyball observed 11.9% of the sets. After 15 days, they performed the same procedure in the same games. The mean difference was less than 5%, and intraclass correlation coefficients are ≥ 0.90 (excellent reliability) Intra and Inter researchers[11], allowing to continue with the measurements.

Variables

Many temporal indicators were analyzed[6,10]: (a) rally duration (time between the start -server's ball hit- and the end of a rally -referee's whistle signal-), (b) rest time between rallies (time between the end -referee's whistle signal- and the beginning -server's ball hit- of a rally), (c) total work time (sum of the duration of all rallies in a set), (d) total rest time (sum of the duration of all rest time between rallies in a set), (e) duration of the set (time between the first serve and the end of the last rally in a set), (f) rest time : work time ratio (TRT : TWT Ratio) and (g) number of rallies (points played per set). Interruptions (technical timeouts and timeouts) were not excluded from the analysis.

The sets were classified in the type of set (1^{St} or 2^{nd}); and final score difference: (a) unbalanced [UNBAL (points doing by loser team ≤ 8)], (b) moderate balanced [MODBAL (points doing by loser team between 9-14)], and (c) balanced [BAL (point doing by loser team ≥ 15)].

Statistical analysis

A descriptive analysis (mean ± standard deviation) was performed. Then, the distribution of the data was analyzed by the Shapiro-Wilk normality test. The dependent Student T-test was used to compare the temporal indicators between sets. Moreover, one-way ANOVA with Tukey post hoc (for significant cases) is used to compare the temporal indicators between balance levels.

The effect size was calculated by Cohen's *d*[12], interpreting through the magnitude suggested by Hopkins et al.[13]: <0.2 (trivial), >0.2 to 0.6 (small), >0.6 to 1.2 (moderate), >1.2 to 2.0 (large), >2.0 to 4.0 (very large), >4.0 (extremely large). In addition, partial eta squared (η_p^2) is presented for Anova analysis, and r and r^2 are calculated by point–biserial correlations coefficient between temporal indicators and final score difference. The analyzes were performed using IBM Corp. Released 2011 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp), with a significance level of $p \leq 0.05$.

Results

Table 1 shows the results of the temporal indicators used. In general, there were no statistically significant differences between the 1^{st} and 2^{nd} sets. However, there is a tendency to increase the rally duration, rest time between rallies, total rest time, and the duration of the set (small effect) and an increase in the total work time (moderate effect) from the 1^{st} to the 2^{nd} set. Furthermore, the TRT : TWT ratio seems to decrease as well as the number of rallies, but the effect was trivial.

Table 1. Comparison between the 1st and 2nd set of temporal indicators.

	1st set	2nd set		ES
	Mean (ST)	Mean (ST)	*p*	Cohen's *d*
Rally duration (sec)	07:19 (± 0:99)	07:61 (± 01:14)	0.205	0.393 (small)
Rest time between (sec)	18:55 (± 1:74)	19:10 (± 01:99)	0.354	0.294 (small)
Total work time (min:sec)	03:56 (± 0:52)	04:08 (± 0:56)	0.477	0.962 (moderate)
Total rest time (min:sec)	09:45 (± 01:10)	10:01 (± 01:47)	0.580	0.431 (small)
Duration of set (min:sec)	13:42 (± 1:56)	14:10 (± 2:34)	0.515	0.342 (small)
TRT : TWT Ratio	2.54 (± 0.360)	2.47 (± 0.366)	0.535	-0.193 (trivial)
Number of rallies (points)	32.76 (± 4.34)	32:67 (± 4.86)	0.947	-0.019 (trivial)

Note. ES= effect size; TRT : TWT Ratio= ratio between total rest time : total work time.
Source: Authors

Moreover, Table 2 shows the comparison of temporal indicators between final score differences. Rally duration and rest time between rallies there were no statistically significant differences between balance levels, [F(2.00 39.00)= 2.186; p= 0.126; η_p^2 = 0.101] and [F(2.00 39.00)= 1.111; p= 0.339; η_p^2 = 0.054], respectively. The total work time [F(2.00 39.00)= 28.016; p< 0.001; η_p^2 = 0.590], and duration of set [F(2.00 39.00)= 29.298; p< 0.001; η_p^2 = 0.600], showed a significant difference between all levels established. Total rest time show significant differences only when compared UNBAL with subsequent levels [F(2.00 39.00)= 19.619; p< 0,001; η_p^2 = 0.502]. Finally, the ration TRT : TWT was significantly different when compared UNBAL with BAL [F(2.00 39.00)= 5.246; p= 0.010; η_p^2 = 0.600]. The significance and effect size in pairs (post hoc) is presented in the Supplement files 1.

Also, duration of set [F(1.00 39.00)= 57.922; p< 0.001], total work time [F(1.00 39.00)= 56.006; p< 0.001] and total rest time [F(1.00 39.00)= 38.200; p< 0.001] demonstrated a significant tendency linearity (Figure 1).

Table 2. Comparison between time indicators according to final score differences.

(n)	Rally duration (sec)	Rest time between (sec)	Total work time (min:sec)	Total rest time (min:sec)	Duration of set (min:sec)	TRT : TWT Ratio
UNBAL (16)	07 (± 01)	19 (± 01)	03:16 (± 00:36)	08:38 (± 00:59)	11:54 (± 01:32)	2.672 (± 0.268)
MODBAL (15)	07 (± 01)	18 (± 02)	04:10 (± 00:39)^{a}	10:16 (± 01:12)^{a}	14:26 (± 01:33)^{a}.	2.510 (± 0.409)
BAL (11)	07 (± 01)	18 (± 01)	04:59 (00:27)$^{a.b}$	11:12 (01:02)^{a}	16:12 (01:11)$^{a.b}$	2.255 (0.279)^{a}
r	0.317*	0.215	0.768**	0.699**	0.770**	0.456**
r^2	0.10	0.04	0.58	0.48	0.59	0.20
η_p^2	0.101	0.054	0.590	0.502	0.600	0.212

Note. Unbalanced [UNBAL (points doing by loser team ≤ 8)]; Moderate balanced [MODBAL (points doing by loser team between 9-14)]; Balanced [BAL (point doing by loser team ≥15)]. [a] Significantly different from UNBAL; [b] The significantly different from MODBAL. *p ≤ 0.05; **p ≤ 0.01
Source: Authors

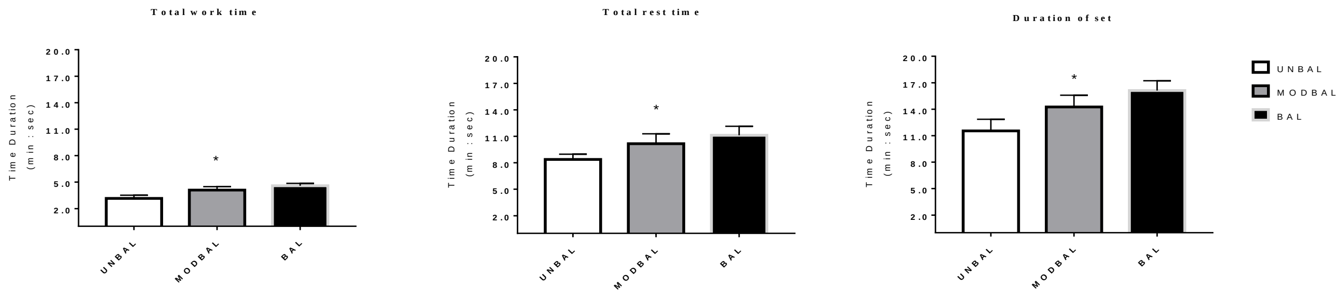

Figure 1. Mean time duration of total work time, total rest time, and duration of the set according to final score differences.
Note: *significative tendency linearity. Unbalanced (UNBAL [points doing by loser team ≤ 8]); Moderate balanced (MODBAL [points doing by loser team between 9-14]); Balanced (BAL [point doing by loser team ≥15]).
Source: Authors

Discussion

This study aimed to compare temporal indicators according to the type of set and the final score differences. No significant difference was identified for any of the indicators used. However, there is a moderate effect, indicating a slight increase in total work time from the 1^{st} to the 2^{nd} set. The balanced sets influenced the duration of the set, total work time, and total rest time, increasing length when the set score was closer (i.e., win by a small difference), so the initial hypotheses were discarded.

It was expected that the second set would have a shorter total work time, but the moderate to increase effect is explained by better adaptation of the athletes to the competition atmosphere (e.g., wind speed, temperature). Moreover, TRT : TWT Ratio, a 2.54 - 2.47 ratio was observed (1^{st} set and 2^{nd} set, respectively), is very similar to the adult and U-21 female[9,14], adult[15] and U-19/21 male categories[10]. In this way, the rally time does not seem to differentiate strongly between categories (~7 sec), but it is noteworthy that slightly shorter rest time between rallies (~19 sec). Compared to subsequent categories was relative with less ability to manage the time between the rallies of young athletes, making the match more intense. Medeiros et al.[10], suggested practices such as cleaning sunglasses or moving the sand adopted by more experienced athletes, little used in this category.

Regarding the duration of the set, in UNBAL or MODBAL sets, a shorter duration was observed. The number of rallies per set can explain this. Medeiros et al.[10], identified a mean duration of ~ 16 minutes for U-19 and ~ 18 minutes for U-21 and professional. Professional athletes play ~ 40 rallies per set[8] and U-19, ~ 35 rallies per set[10]. Although BAL sets to increase the duration of the set, rally duration was not affected. We hypothesize that when the sets are balanced there could be longer rallies, given the technical-tactical balance. Moreover, as the attack skill is lower in young categories, this could also contribute to keeping the ball in play, this is not because the skill in continuation actions (e.g., serve reception, dig) is also lower.

Previously, an insignificant increase in lactate was identified in beach volleyball matches[16]. Therefore, training should focus on the development of aerobic and alactic anaerobic systems. Besides, beach volleyball can contribute to the physical development of young indoor volleyball athletes, due to the greater physical demand of the sand, without losing the similarity in the effort : rest relation[6,17,18]. Finally, this paper was limited to school national level male athletes, so caution is advised to extrapolate this data to older age categories (e.g., under 21 or 23) or gender. So, future research should investigate these issues at different levels of competition and in females.

Practical applications

In practice, the data from this study are essential for training prescriptions, especially using interval approaches. The balance of the game explains 59% of the duration of the set. So, coaches can use the time parameters to prescribe interval training progressing according to the data of each final score difference. Additionally, it is suggested that training blocks should have at least 32 repetitions (mean number of rallies per set).

Conclusion

The temporal parameters do not seem to change with the set type. However, there is a tendency to increase the working time from the 1st to the 2nd set. The score influences the duration of the set, total work time, and total work rest. These data provide temporal information for coaches for prescribing more specific training with intermittent characteristics, favoring physical development, and designing proper periodization programs.

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