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DOES VIDEO GAME PRACTICE IMPROVE THE DECLARATIVE TACTICAL KNOWLEDGE OF YOUNG FOOTBALL PLAYERS?

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ABSTRACT

Our main aim was to investigate how video games influenced young football players' declarative tactical knowledge (DTK). Our sample consisted of 70 male football players in the U-13, U-15, and U-17 age categories from the Extension Project 'Futebol UFJF'. For the evaluation of DTK, the test validated by Mangas (1999), whose instrument was adapted by Giacomini et al., (2011) was used, thus considering the best possible response and hierarchy (from the first to the fourth) among the other answers. In relation to video game practice, we used a self-report questionnaire. While the results showed no statistically significant difference in the video game/DTK ratio, the level of DTK was higher in athletes who played video games as compared to those who did not (685 ± 47 versus 637 ± 92, p=0, 26). Hence, we can conclude that although playing video games can stimulate the DTK, it has no significant influence on young football players with a lot of experience in sports.

Key words: Electronic Games. Declarative Tactical Knowledge. Football. Young Athlete.

RESUMO

O uso de videogames melhora o conhecimento tático declarativo de jovens jogadores de futebol?

Nosso principal objetivo foi investigar como os videogames influenciaram o conhecimento tático declarativo (CTD) dos jovens jogadores de futebol. Nossa amostra foi composta por 70 jogadores de futebol masculino nas categorias Sub-13, Sub-15 e Sub-17 do Projeto de Extensão 'Futebol UFJF'. Para a avaliação do CTD, foi utilizado o teste validado por Mangas (1999), cujo instrumento foi adaptado por Giacomini et al., (2011), considerando-se assim a melhor resposta possível e a hierarquia (da primeira à quarta) entre as demais respostas. Em relação à prática de videogame, foi utilizado um questionário de autorrelato. Embora os resultados não tenham mostrado diferença estatisticamente significativa na relação videogame / CTD, o nível de DTK foi maior em atletas que jogaram videogame em comparação com aqueles que não o fizeram (685 ± 47 versus 637 ± 92, p=0,26). Assim, podemos concluir que embora jogar videogame possa estimular o CTD, ele não tem influência significativa em jovens jogadores de futebol com muita experiência na prática esportiva.

Palavras-chave: Jogos Eletrônicos. Conhecimento Tático Declarativo. Futebol. Jovem Atleta.

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INTRODUCTION

Football is a prolonged activity characterized by a combination of intermittent high intensity efforts interspersed with low intensity actions (Bush et al., 2015).

Due to its dynamic characteristics and unpredictable environment (Sarmento et al., 2014), football players need to make quick and accurate decisions (Biemen et al., 2018), that cause them to experience high cognitive demands during the match (Gantois et al., 2019).

When considering the characteristics of team sports like JDC, it is clear that the current approaches have a systemic-complex orientation (Galatti et al., 2014) where in the chronological order of actions and their periodicity of occurrence within the game cannot be determined and anticipated. This gives the JDC a systemic, unpredictable, complex, chaotic, and non-deterministic environment (Gréhaigne, Garganta, 2014).

Since collecting and systematizing information are important to characterize and understand tactical sports behaviour, in recent years, some studies relating to sports training and/or the football game have emerged (Belozo et al., 2016; Bush et al., 2015; Gréhaigne, Garganta, 2014).

Scientific literature too, has highlighted the importance of obtaining accurate references on behaviour and tactical knowledge in sports training of young football players (Mangas, 1999; Giacomini et al., 2011; Pizarro et al., 2017).

Thus, knowledge systematization of the teaching and learning process of team sports becomes essential for the practice of professionals who perform these functions (Galatti et al., 2014; Mesquita et al., 2002).

In relation to the tactical aspects of the game, the declarative tactical knowledge (DTK) and the procedural tactical knowledge (CTP) stand out. Situations that can be declared, which are susceptible to description, and contain organized information from which subjects process and choose decisions are considered declarative knowledge. On the other hand, procedural knowledge is related to motor actions that can be performed (Greco, 2006).

Scientific literature has highlighted the use of the virtual environment as a tool for the training of specific skills in sports (Neumann et al., 2017). In this context, electronic games and sports have always had a strong relationship with sports such as basketball, football, baseball, and hockey, that are most popular in this segment (Murphy, 2009).

The simulation of JDC characteristics in a virtual environment have been well documented (Silberman, 2007; Bideau et al., 2010; Alves e Morais, 2014; Tirp et al., 2015; Mousavi et al., 2018) Some authors claim that training of cognitive and motor skills using video games positively affect performance in real-life situations by improving understanding, confidence, motivation, and performance in several activities as well as different groups (Sobczyk, 2015; Pallavicini et al., 2018).

Some studies have found that using the virtual environment can contribute to the acquisition of specific and psychomotor skills by athletes in individual sports such as bowling (Wegener et al., 2009) Paralympic shooting (Alves e Morais, 2014) and javelin throw (Tirp et al., 2015; Mousavi et al., 2018) besides team sports such as rugby and handball (Bideau et al., 2010).

Specifically, in relation to football, Samuel et al., (2019) observed the importance of using a virtual simulator in sequential decision making in referees. The influence of electronic games on the acquisition of sports skills has been well studied in games that use virtual reality (Bideau et al., 2010; Tirp et al., 2015; Neumann et al., 2017; Mousavi et al., 2018) while a limited number of studies have focused on investigating these improvements using traditional video games that are commercialized and more accessible to the general population (Wegener et al., 2009).

Therefore, considering that football presents an unpredictable environment and demands high cognition, it is possible that the practice of video games can improve aspects related to this sport, by helping in the decision making during the real game environment.

Thus, this study aimed at comparing DTK with video game practice in young football players in the U-13, U-15 and U-17 age categories.

MATERIALS AND METHODS

Seventy male football players from the U-13, U-15, and U-17 categories belonging to the extension project of the School of Physical Education and Sports of the Federal University of Juiz de Fora participated in the study.

Their training frequency spanned 5 to 7 times a week with training duration of 120 minutes, and competitions usually being held

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over the weekends. Those who had experienced bone, joint, or muscle injuries in the previous 3 months and/or used supplements were excluded. Similarly, participants with less than 85% attendance during training and games were debarred.

The study was previously approved by the Research Ethics Committee of the Federal University of Juiz de Fora, through Opinion No. 009/11.

The football players and their guardians signed an informed consent form (TCLE) in accordance with the Declaration of Helsinki. The athletes and the institution were guaranteed anonymity and data confidentiality

Table 1 - Sample's general characteristics (n=70).

Variables	Mean ± standard deviation (Min - max)
Age (years)	14,7 ± 1,4 (12,1 - 17,3)
Practice time (years)	6,9 ± 2,2 (1,0 - 12,0)
	Percentages
Categories:	
Under-13	20%
Under-15	50%
Under-17	30%
Training frequency:	
2 to 4x/week	41,4%
5 to 7x/ week	58.6%
Training duration:	
90 minutes	14.3%
120 minutes	77.1%
150 to 180 minutes	8.6%
Competitive level:	
Municipal	49.3%
State	29.0%
National/International	21.7%

Procedures

The athletes were invited to randomly assign themselves to a classroom of the School of Physical Education and Sports of the Federal University of Juiz de Fora.

Upon entering the room, they received a form containing a questionnaire with questions that corroborated the purpose of the study and a form to record the answers/solutions regarding the content of the CTD test. After the researchers presented the information intended for the CTD test and answered relevant questions, the test began.

The CTD test was set up by offensive play scenes that were shown and thereafter the motion was frozen until the ball carrier decided 'what to do'. Subsequently, four pictures appeared on the screen with four possible solutions for each play, with each image having a description of the possible action of the player possessing the ball. The pictures were numbered from one to four for better understanding of the participants, who were allotted as much time as they thought necessary to decide on what their answers would be. Shortly thereafter, participants recorded their answer/solution relating to the play which they thought was most appropriate. Thus, it was possible to analyse the level of DTK.

After completing the CTD test, participants were asked to respond to the video game questionnaire. The following questions were asked: 1) 'Does the athlete play video games?'; 2) If yes, 'How many hours per week?' Then, the participants were divided into two groups, those who played video games and those who did not.

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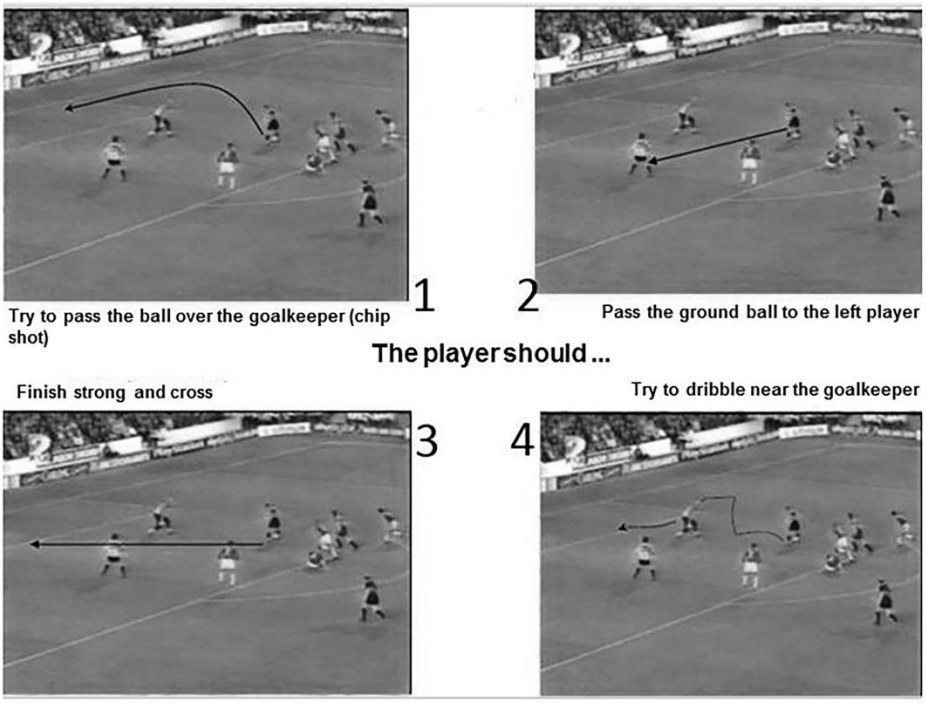
Instruments

We used the test built by Mangas, (1999) and adapted by Giacomini et al., (2011) to assess the CTD of young football players. In this adapted test, the eight scenes, that obtained a statistically satisfactory agreement by all Mangas test experts, were used. For choosing the best solution, we used the hierarchy of three subsequent answers.

We verified that the player who chose the second best solution for the play cannot be assessed (based on points) in the same way as the player who chose the third or worst solution, as well as those choosing the best or worst decision alternative. Thus, a new answer key was built.

- Best solution: 100% accuracy = 100 points in the final score;
- Second best solution: 75% accuracy = 75 points in the final score;
- Third best solution: 50% accuracy = 50 points in the final score;
- Worst solution: 25% accuracy = 25 points in the final score.

We intended to obtain a more objective and reliable assessment of athletes' CTD with these adaptations of the instrument. The maximum and minimum test scores were 800 and 200 points, respectively. Example of a test scene situation (Mangas, 1999).



1 - Try to pass the ball over the goalkeeper (chip shot)
2 - Pass the ground ball to the left player
3 - Finish strong and cross
4 - Try to dribble near the goalkeeper

Statistical Analysis

The results were presented as mean ± standard deviation and percentages for the quantitative and qualitative variables, respectively.

The assumption of data normality was assessed by Komolgorov-Smirnov's test and by the asymmetry and kurtosis values. Students' t test value was used to test the difference in DTK among video game practitioners and non-practitioners.

The effect size was assessed by Cohen's d. All analyses were performed using the SPSS statistical software version 20.0 (IBM Corp., Armonk, NY), with a significance level of 5%.

Revista Brasileira de Futsal e Futebol
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RESULTS

Our results showed that the level of DTK was higher in football players who played video games as compared to those who did not, although the difference was not statistically significant (685 ± 47 versus 637 ± 92, respectively; p= 0.260; d= 0.690). From a practical point of view, the effect size indicated a moderate difference in terms of magnitude.

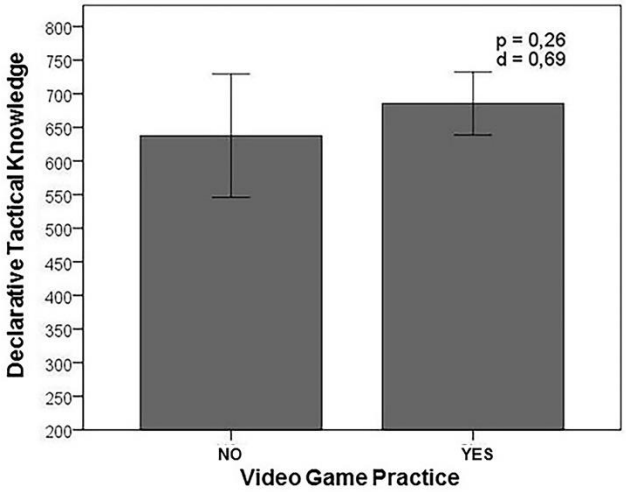

Figure 2 - Mean and standard deviation of DTK of football players aged between 12 to 17 years, who played and did not play video games

DISCUSSION

This study aimed at comparing CTD with video game practice in the U-13, U-15, and U-17 categories. While our results did not indicate a statistically significant difference between the time of video game practice and the level of DTK in football players whose ages ranged from 12 to 17 years, they did indicate a moderate effect size showing that CTD was higher in players who played video games as compared to those who did not. Some studies in literature have verified the influence of electronic games on specific and cognitive skills tests in different populations (Toril et al., 2014; Bamidis, et al., 2015; Pallavicini et al., 2018) as well as athletes of several sports (Wegener et al., 2009; Alves; Morais, 2014; Tirp et al., 2015; Mousavi et al., 2018).

However, this is the first time a study has compared video game practice with a specific CTD test related to football.

Some research has shown consistent results indicating that video practice can improve cognitive aspects both in the adult and elderly population (Toril et al., 2014; Bamidis et al., 2015; Pallavicini et al., 2018).

On the other hand, scientific studies that sought to investigate the practice of video games and the improvement of cognitive aspects in athletes are still limited (Alves, Morais, 2014).

Wegener, (2009) observed that the electronic game demonstrated a significantly positive effect on bowling average scores.

Similarly, Alves e Morais, (2014) showed that the electronic game has led to improvements in the training process for Paralympic athletes of shooting sport and target archery. Although the present study did not show statistically significant improvements, the moderate effect size found in our results show that these findings corroborate scientific literature.

Recent studies have shown that virtual reality can be applied as an effective tool for discrete learning of motor skills (Mousavi et al., 2018), and these can be transferred to real tasks in the sports environment (Tirp et al., 2015) improving anticipation and decision making skills.

However, games that present this reality are more complex and require sophisticated equipment, generating high costs when compared to traditional electronic games that are widely commercialized (Miles et al., 2012).

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Price et al., (2018) emphasizes the potential of video games and its use in the context of sports training and physical education in developing the experience and learning in athletes' performance during games.

In fact, video games can be an attractive tool in the learning process, making it easier for practitioners to detect feedback mechanisms during sports reality (Price et al., 2018) allowing players to be able to 'solve problems' by adapting to the numerous game situations (Price et al., 2017).

Therefore, it seems that the use of electronic games may contribute to a tactical skill-centred approach (Hopper, Hpper, 2013) where players through a greater tactical understanding can make better decisions in the game context (Price et al., 2018).

Although our study did not assess procedural tactical knowledge, the improvement of CTD in participants who played video games may support this theory.

Any interpretation of the results regarding video game practice and CTD should be done taking into account the number of hours per week video games were played by the participants (Assis et al; 2016).

Literature points out that to obtain significant results with the practice of video games, it is necessary to practice for 1 to 6 weeks, with 3 weekly sessions of at least 30 minutes and not more than one hour.

The weekly practice time of video games was not controlled in this study and may be the reason why we did not find significant differences. Another limiting factor may have been the game design. Serious game is a category of games developed with a scientific objective to improve a specific activity (Peretz et al., 2011; Anguera et al., 2013; Sobczyk, 2015).

In this study, not using a serious game but traditional games could have been a factor that may have influenced the results. Also, another aspect that should be considered is the mode of electronic football game.

There are two types of electronic football games: one where the player controls the whole team, and the other, where the player controls only one component of the team, namely the so-called first-person game. In our opinion, the second mode in which the player controls only one component of the team seems to be the one that requires most knowledge about the football game (Sobczyk, 2015).

Besides, factors such as practice time, sports experience, specific training methodology applied by the coach, maturational processes, and competitive level may also have influenced better decision making during the CTD test.

However, many of these are difficult to control, and each has its relevance in the context of general sports training, influenced by the acquisition of several skills that culminated in better decision-making during game reality.

CONCLUSION

Although differences between video game practice and CTD levels in 12 to 17 year old football players were not statistically significant, the results suggest that players who played video games had higher CTD scores than those who did not play.

DECLARATION OF CONFLICTING INTEREST

The Author(s) declare(s) that there is no conflict of interest.

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