

## THE ROLE OF SPECIFIC GOALKEEPER TRAINING ON THE TACTICAL KNOWLEDGE OF YOUNG FOOTBALL GOALKEEPERS

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### ABSTRACT

In recent years, significant tactical and technical modifications in the performance of goalkeepers have been observed, which calls for the adoption of specific training to meet such demands. Based on this assumption, this study aimed to evaluate the offensive tactical knowledge of young goalkeepers with and without specific training. The sample consisted of 42 goalkeepers aged 13 to 17 who participated in regional championships. Two groups were created: a trained group (TG) and a non-trained group (NTG). To evaluate offensive tactical knowledge, the TCTOF-BR protocol was applied, which includes the dimensions "tactical knowledge," "operational tactical principles," "collective tactical-technical elements," "knowledge of rules," and "decision-making" ( $p>0.05$ ). Trained goalkeepers had a better score in tactical knowledge ( $ES=1.18$ ;  $p=0.01$ ), operational tactical principles ( $ES=1.00$ ;  $p=0.02$ ), collective tactical-technical elements ( $ES = 1.27$ ;  $p=0.01$ ), knowledge of rules ( $ES = 1.06$ ;  $p=0.01$ ), and decision-making ( $ES = 1.08$ ;  $p<0.01$ ). It was concluded that specific goalkeeper training has contributed to developing competencies and increasing knowledge related to football.

**Key words:** Football. Goalkeeper. Tactical knowledge.

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### RESUMO

Papel do treinamento específico de goleiros sobre o conhecimento tático de jovens goleiros de futebol

Ao longo dos últimos anos, significativas modificações tático-técnicas na atuação dos goleiros foram observadas, o que reclama a adoção de treinamentos específicos para suportar tais demandas. A partir desta assunção, o objetivo deste estudo foi avaliar o conhecimento tático ofensivo de jovens goleiros com e sem treinamento específico. A amostra foi composta por 42 goleiros de 13 a 17 anos que participaram de campeonatos regionais. Houve a criação de dois grupos: grupo treinado (GT) e grupo não-treinado (GNT). Para a avaliação do conhecimento tático ofensivo, foi aplicado o protocolo TCTOF-BR, que possui as dimensões "conhecimento tático", "princípios táticos operacionais", "elementos táticos-técnicos coletivos", "conhecimento de regras" e "tomada de decisão" ( $p>0,05$ ). Os goleiros treinados apresentaram uma melhor pontuação no conhecimento tático ( $ES=1,18$ ;  $p=0,01$ ), princípios táticos operacionais ( $ES=1,00$ ;  $p=0,02$ ), elementos táticos-técnicos coletivos ( $ES=1,27$ ;  $p=0,01$ ), conhecimento de regras ( $ES=1,06$ ;  $p=0,01$ ) e tomada de decisão ( $ES=1,08$ ;  $p<0,01$ ). Conclui-se que os treinamentos específicos de goleiros contribuíram para o desenvolvimento de competências e a elevação de conhecimentos ligados ao futebol.

**Palavras-chave:** Futebol. Goleiro. Conhecimento tático.

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## INTRODUCTION

Football is a team invasion sport played by 22 players who share a defined playing space and have as their basic premise the conservation of ball possession, progression in the playing space, and scoring goals against opponents (Jaime et al., 2020).

In this antagonistic relationship (attack vs defense), goalkeepers play a central role, as they are responsible for preventing goals and performing different tactical-technical actions with other team players, such as coverages and control of the depth of the last line in the defensive phase, or even creating numerical superiority and passing lines in the offensive phase (Marques Filho et al., 2018).

All the demands of goalkeeper performance in modern football require a highly demanding decision-making component (Berto, Magalhães, 2017).

However, regarding tactical-technical evaluation, studies such as Coelho e Silva et al. (2010) and Silva et al. (2018) exclude the goalkeeper position from research participants, which has been justified by the low sample size compared to other position groups and reflects a trend in this research segment.

Over the years, significant modifications in the structure and functionality of football have been observed.

Barreira et al., (2014) highlighted the advancement of the collective nature of the game when compared to what was observed in the 20th century.

This assertion is supported by the author by pointing out the increase in the number of passes, whether short or long, whereas previously, football had a predominance of dribbling and ball possession.

Barreira et al., (2014) further adds that due to the greater number of players in the central zones, the number of shots on the goal has decreased, and consequently, the goalkeeper has become less involved in the defensive phase.

These pieces of information align with Marques Filho et al., (2018) and Berto, Magalhães (2017), who found a greater participation of goalkeepers in the offensive phase compared to the defensive phase of the game.

Thus, profound transformations can be observed in the goalkeeper position, as the

current game demands that these players perform defensive and offensive tasks (Santos et al., 2022).

To do so, goalkeepers have taken on new roles aimed at adhering to the principles related to the team game model (Hewitt et al., 2016).

To support these new tactical-technical requirements, specialized goalkeeper training has become increasingly widespread, with its importance being recognized as crucial for the manifestation of good performance in the sport. In Brazil, this practice originated in the mid-1970s by way of specialized and systematized training carried out by former players of the position, but with a focus on techniques (Thiengo et al., 2012).

Keeping up with all the advances in the sport, this type of training has also gone through an evolutionary process, in which attention has ceased to be restricted only to coordinative, technical, and physical tasks and has started to consider psychological and, mainly, tactical aspects for the development of training (Gonçalves, Nogueira, 2006).

In the tactical dimension, cognitive processes gain prominence since to play tactically, the player needs to perceive and analyze situations, find a mental solution that addresses the presented problems (tactical scenarios), and then select a motor response (technique) that best fits the decision made (Barcellos et al., 2022).

Regarding the possibilities of assessing the cognitive processes that precede technical execution, declarative tactical knowledge (DTK) is widely studied in different contexts (Costa et al., 2016), genres (Rodrigues et al., 2020), competitive levels (Caríssimo et al., 2021), age ranges (Sousa et al., 2015), and playing positions (Giacomini et al., 2011). Additionally, Souza et al., (2013) argue that tactical knowledge of the game can be improved through training.

Despite recent efforts by the scientific community to investigate tactical-technical actions in football, there appears to be a gap regarding the presence of goalkeepers in studies, as the literature often ends up disregarding this position when forming a group of research participants (Ajamil et al., 2018).

Thus, this study aimed to compare tactical knowledge between goalkeepers who received specific goalkeeper training and those

who did not receive such stimuli. Considering previous information in the literature that reinforces the importance of deliberate practice for the consolidation of tactical-technical learning (Greco et al., 2010; Aquino et al., 2016), as long as the stages of sampling and specialization are respected (Côté et al., 2009), the initial hypothesis of the study is that specific goalkeeper training is capable of positively modifying the tactical knowledge of young football goalkeepers.

## MATERIALS AND METHODS

### Participants

A total of 66 goalkeepers belonging to youth teams in the city of Maringá, Brazil were pre-selected to participate in the study. The following exclusion criteria were adopted: (a) failure to complete the test for tactical knowledge assessment; (b) refusal to participate in the study; (c) failure to provide the signed consent and assent form by parents and/or guardians. The final sample consisted of 42 football goalkeepers, comprising 8

goalkeepers from the under-13 category ( $12.47 \pm 0.57$  years), 16 goalkeepers from the under-15 category ( $14.66 \pm 0.72$  years), and 18 goalkeepers from the under-17 category ( $16.56 \pm 0.55$  years). This investigation was approved by the local ethics committee (Statement N°. 4,442,566).

### Sample division and analysis procedures

Considering that the development of motor skills occurs through a combination of deliberate practice activities and deliberate play (Côté et al., 2014; Broadbent et al., 2014), as well as the fact that tactical knowledge is directly related to training time (Lima et al., 2012), the participants were divided into two expertise groups.

Goalkeepers who reported practicing specific training for 12 months or more were classified as trained goalkeepers (TG). In turn, footballers who did not engage in specific training or did so less than a year ago were classified within the non-trained group (NTG). The distribution of goalkeepers by category and expertise group is shown in Table 1.

**Table 1** - Number of trained and non-trained players divided by U-13, U-15, and U-17 categories.

	TG	NTG	Total
U-13	1	7	8
U-15	9	7	16
U-17	10	8	18
Total	20	22	42

Note: TG = trained group; GNT = non-trained group.

The summary of the main activities performed by trained goalkeepers during specific training sessions is described in Frame 1. All categories performed coordination work in

their daily training routine, but the incidence of tactical-situational work was higher in the U-17 category.

**Frame 1** - Abilities worked on in each game category.

	U-13	U-15	U-17
Coordination	30%	20%	10%
Technical	50%	40%	30%
Tactical-situational	20%	40%	60%

The questionnaire used to evaluate the tactical knowledge of young football players (TCTOF-BRA) was individually administered due to the COVID-19 pandemic, at the scheduled locations and times. An informed consent form (ICF) and an informed assent form (IAF) were provided to the participant and their guardian. To administer the test, the researcher

read all the instructions contained in the questionnaire.

### Instrument of measurement

The declarative and procedural tactical knowledge was assessed using the Test of Offensive Tactical Knowledge in Football

(TCTOF-BRA), adapted and validated for the Brazilian context by Rechenchosky et al. (2022). This instrument allows for obtaining valid and reliable measures of tactical knowledge (TK) and dimensions of operational tactical principles (OTPs), collective tactical-technical elements (CTTEs), rules, and decision-making (DM) of young football players aged 12 to 17.9 years old.

The test comprises 15 multiple-choice questions involving statements and game contexts depicted through figures. The OTPs dimension consists of three questions regarding maintaining ball possession, progressing towards the opponent's goal, and attempting to score a goal. The CTTEs dimension involves four questions about width, depth, creating numeric superiority, and creating free spaces; the rules dimension has two questions about the offside position. The DM dimension comprises six figure-based questions about decision-making in situations of keeping/maintaining the ball, advancing/progressing, and attacking/attempting to score a goal. Each of the evaluated dimensions has a specific equation in which the maximum score to be obtained is 10 points.

### Data analysis

For data treatment, descriptive statistics (measures of central tendency and dispersion) were used. The Shapiro-Wilk test and graphical analysis of data distribution skewness and kurtosis were employed to test normality.

The independent samples t-test was used to compare the tactical knowledge of trained and untrained goalkeepers ( $p < 0.05$ ). Cohen's  $d$  was adopted to estimate the magnitude of differences and was classified as follows (Hopkins et al., 2009):  $< 0.20$  (trivial),  $0.20$  to  $0.59$  (small),  $0.60$  to  $1.19$  (moderate),  $1.20$  to  $1.99$  (large),  $2.0$  to  $3.9$  (very large), and  $> 4.0$  (nearly perfect). The IBM SPSS Statistics package (Version 23.0) was used for the analysis.

### RESULTS

Table 2 presents a characterization of the sample and the tactical knowledge manifested by young goalkeepers from the under-13, under-15, and under-17 categories belonging to the study sample.

**Table 2** - Description of age, football experience, and tactical knowledge of young football goalkeepers from the U-13, U-15, and U-17 categories of the Maringá Sports League in 2020, ( $n=42$ ).

Variables	Mean	SD	Minimum	Maximum
Age (years)	15.06	1.65	11.30	17.30
Football experience (years)	5.83	2.97	1.00	10.00
Tactical Knowledge (points)	6.15	2.56	2.50	10.00
Operational tactical principles (points)	7.70	3.24	0.80	10.00
Tactical-technical elements (points)	6.14	3.07	1.50	10.00
Knowledge of Rules (points)	6.22	2.73	1.70	10.00
Decision-making (points)	5.98	2.71	1.70	10.00

Note: DP = standard deviation.

**Table 3** - Comparison of tactical knowledge between trained and untrained goalkeepers.

Variables	TG ( $n=20$ )	NTG ( $n=22$ )	t	p	Effect Size
	Mean (SD)	Mean (SD)			
Age (years)	15.68 (1.41)	14.50 (1.68)	2.45	0.01*	Moderate
Football experience (years)	6.30 (2.47)	5.40 (3.36)	0.98	0.33	Small
Tactical Knowledge (points)	7.49 (2.17)	4.94 (2.30)	3.69	0.01*	Large
OTPs (points)	8.89 (2.27)	6.62 (3.65)	2.39	0.02*	Average
Tactical-technical elements (points)	7.91 (2.66)	4.53 (2.52)	4.23	0.01*	Large
Knowledge of Rules (points)	7.46 (2.23)	5.09 (2.69)	3.13	0.01*	Large
Decision-making (points)	7.31 (2.36)	4.77 (2.47)	3.40	0.01*	Large

Caption: TG = trained group; GNT = non-trained group; OTPs = operational tactical principles; \*significant difference.

Table 3 compares the variables of tactical knowledge between trained goalkeepers (TG) and non-trained goalkeepers (NTG). There was a significant difference in favor of the trained group in all variables related to tactical knowledge (mean  $p=0.02$ ), suggesting the importance of specific training to improve perceptual abilities related to tactical knowledge in football games.

## DISCUSSION

The study aimed to compare the tactical knowledge of goalkeepers who had received specific goalkeeper training for over 12 months and those who had not received such training.

The main results confirmed the initial hypothesis of the study by showing that goalkeepers who had received specific goalkeeper training presented higher values for the dimensions of tactical knowledge, tactical-technical elements, rules, and decision-making when compared to non-trained goalkeepers.

The position of goalkeeper in field football assumes a great responsibility, as the tactical-technical actions of the goalkeeper can achieve moments of great success or failure. The goalkeeper also assumes important participation in the offensive structure of his team, using both his hands and feet (Santos et al., 2022).

Regarding the greater tactical knowledge presented by trained goalkeepers compared to untrained ones, it should be considered that experiences obtained during training contribute to the development of skills and elevate the knowledge of the players who undergo it. In this sense, Moreira et al., (2013), when investigating the U-09 category, observed that systematic training using the global method raised the scores of procedural tactical knowledge in young football players, in line with Magalhães et al., (2018), who observed that U-12 players from youth categories had a higher score in tactical knowledge compared to players from football schools, where training time is longer. Therefore, it is observed that the practice of systematic exercises in training contributes to the improvement of tactical knowledge.

Upon analyzing the OTPs, we observed a moderate modification in favor of TG over NTG. In the study by (Scopel et al., 2006), which analyzed professional and amateur

goalkeepers, differing in terms of practice time and predominant profession, they reported that both groups have a common personality characteristic of extroverted orientation. This supports the tactical function performed by goalkeepers, as this orientation predominates in greater sociability and ease in dealing with people, which favors the goalkeeper's task on the field in guiding his teammates, as his position allows him to obtain an overall view of the positioning of the opposing team.

The technical-tactical elements showed a significant result in favor of trained goalkeepers over untrained ones. This aspect is becoming increasingly necessary in the football of today, as actions such as controlling defensive depth and the ability to receive and make passes while seeking an offensive composition of the team are becoming important functions to be developed by goalkeepers (Sousa et al., 2022).

In the literature review conducted by Perez-Arroniz et al., (2022) on specific game-related technical development, a study was found that compared elite and non-elite goalkeepers. The results showed that elite goalkeepers demonstrated significantly higher technical ability, which was attributed to their high level of training.

Although specific training for goalkeepers has been shown to be relevant to their performance, the study by Jara et al., (2019) found that the use of training in different small-sided games is a fundamental aspect of the development of the goalkeeper's spatial exploration, improving their tactical perceptions of the game.

The "knowledge of rules" and "decision-making" variables showed favorable results for the trained goalkeeper group when compared to the untrained group. Decision-making is "typically based on a continuous and active process of exploration and selection of relevant information to support choices" (Lopes et al., 2008).

This ability becomes essential in football, particularly for goalkeepers. For example, in a penalty kick situation, a goalkeeper's decision-making can change every second and still determine the outcome of a match (Lopes et al., 2008).

According to Sousa et al., (2022), a survey conducted with 15 goalkeeper coaches showed that decision-making was identified as



a central and important factor in training. However, upon analyzing the aspects present in a 60-minute goalkeeper training session, only 25-30% was found to be dedicated to decision-making.

With this assessment, these authors also support the reflection made by Scopel et al., (2006), who observe that specific goalkeeper training is necessary, but sometimes limited to mechanized, isolated, and technical exercises.

These types of training are far from simulating game-like situations that can be developed through small-sided games that involve contact with other players on the team, assisting in the improvement of tactical and decision-making abilities.

Players should be involved in a teaching and learning environment that materializes through practice, providing repertoire and resources that favor the team autonomously, without the need for sequential interventions by the coach (Gonçalves et al., 2020).

In the present study, the dimensions related to operational principles, tactical-technical elements, rules, and decision-making were different between football players who did and did not undergo specific training, but the football practice time between groups was similar. In this regard, the study by Macedo (2015), which evaluated the U-9, U-11, and U-13 categories, did not identify strong correlations between practice time and declarative tactical knowledge, indicating that practice time is not necessarily related to athletes' decision-making.

This result adds to our research because the analyzed goalkeepers showed no significant difference in years of practice in the sport, leading to the conclusion that only the age factor, in isolation, is not capable of contributing to better decision-making.

## STUDY LIMITATIONS

Our study has limitations, such as the number of goalkeepers undergoing specific training and the lack of control over the contents developed in all training sessions.

However, this investigation reinforces the importance of specific training for goalkeepers in order for them understand the tactical-technical structure and functionality of

the sport and thus assume a more autonomous role that goes beyond protecting the goal, fulfilling various tactical and technical actions important to the game (Gonçalves et al., 2021). It is suggested that future studies expand and invest more in research focused on goalkeepers.

## CONCLUSION

It can be concluded that specific goalkeeper training leads to improvements in offensive tactical knowledge of the game of football and can promote an improved understanding of tactical elements of the game, such as operational principles, collective tactical-technical elements, rules, and decision-making.

## ACKNOWLEDGEMENTS

We acknowledge the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the grants conceded to L.S.C.U., G.S.G.M and C.Z.M.

## DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## FUNDING

We acknowledge the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the grants conceded.

## DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors affirm that no artificial intelligence was utilized in the creation of this article.

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Recebido para publicação em 30/10/2023  
Aceito em 07/02/2024