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Validation of the Tactical Offensive Knowledge Test for Cerebral Palsy Football Players and Its Relationship with Contextual Variables

Juan F. Maggiolo¹, Juan J. García-Hernández^{2,3}, Ismael Castellano-Galvañ^{1*}, Iván Peña-González^{1,4}

¹ Sports Research Centre, Department of Sport Sciences, Miguel Hernández University of Elche, Alicante, Spain.

² Segunda Parte Foundation, Madrid, Spain.

³ Faculty of Health Sciences, Exercise and Sport Sciences, University of Francisco de Vitoria, Pozuelo de Alarcón, Spain

⁴ Spanish Federation of Sports for People with Cerebral Palsy and Acquired Brain Injury (FEDPC), Madrid, Spain.

* Correspondence: (IC) i.castellano@umh.com  ORCID ID n° 0009-0001-5353-3367

Received: 23/10/2025; Accepted: 22/12/2025; Published: 30/06/2026

Abstract: The aim of this study was to adapt and validate the Tactical Offensive Knowledge Test in Football (TCTOF) for athletes in cerebral palsy football (CP football) and examine associations with contextual variables. Ninety-three male players from Spain's CP football First Division (29.1 ± 9.7 years) completed an adapted TCTOF after expert content review by five national-level CP coaches. Two offside-related items were removed to reflect CP football rules, yielding 35 declarative and 15 procedural items. Content validity was high (mean expert agreement = 89.9%; declarative = 87.3%, procedural = 92.6%). Internal consistency was excellent across dimensions and total score (Cronbach's $\alpha = 0.89$ – 0.94 ; McDonald's $\omega = 0.90$ – 0.95). In a random subsample ($n = 17$), test–retest analyses showed good temporal stability (intraclass correlation coefficient (ICC) = 0.73 – 0.82), with acceptable standard error of measurement (SEM) and minimal detectable change benchmarks. ANOVAs revealed no differences by years of experience, playing position, or functional sport class (FT1–FT3). Conversely, post hoc analysis revealed that international experience distinguished performance: players with current or previous national team involvement (U19 or absolute) scored significantly higher than those without such exposure ($p < .001$; Cohen's $d = 1.16$). Overall, findings support the adapted TCTOF as a valid, reliable instrument for assessing offensive tactical knowledge in CP football. Moreover, competitive exposure at the international level—rather than chronological age, accumulated years of play, positional role, or functional class—was the salient contextual factor linked to greater tactical understanding in this population. These results highlight the value of quality competitive environments for developing tactical expertise and provide practitioners with an evidence-based tool for assessment and talent identification.

Keywords: CP football; tactical knowledge; soccer; performance; talent identification.



1. Introduction

The Tactical Offensive Knowledge Test in Football (TCTOF), designed and validated by Serra-Olivares and García-López (2016), is an instrument that assesses football players' level of offensive tactical knowledge from an ecological and comprehensive perspective of the game. Its purpose is to measure both declarative knowledge (knowing what to do and why) and procedural knowledge (knowing how to do it), both of which are linked to the offensive tactical principle's characteristic of invasion sports, with football serving as the model of reference.

The TCTOF is structured into two complementary sections. The first section evaluates declarative knowledge and consists of 36 multiple-choice items addressing aspects related to the rules of the game, player roles and positions, and individual and collective technical-tactical principles. The second section assesses procedural knowledge and includes 16 graphical game situations in a 7-a-side football format, in which players must select the most appropriate action based on the tactical context, allowing for the assessment of anticipation and decision-making abilities.

The design of the TCTOF is grounded in Bayer's (1992) offensive tactical principles—maintaining possession, advancing toward the opponent's goal, and concluding the offensive action. The test takes approximately 15 minutes to administer and can be applied collectively. In its original study, conducted with 465 players aged 8 to 14 years, the instrument demonstrated high internal reliability ($\alpha = 0.87$) and temporal stability (test-retest $r =$

0.75), along with solid evidence of content, construct, and concurrent validity (Serra-Olivares & García-López, 2016). These findings support its use as a valid and reliable tool for diagnosing offensive tactical knowledge and guiding teaching-learning processes and decision-making in youth football.

Subsequently, the TCTOF has been adapted and validated across different contexts and populations, consistently demonstrating robust psychometric properties. In the field of parasport, Muñoz et al. (2020) validated the instrument among football players with intellectual disabilities, showing adequate factorial validity, high internal reliability ($\alpha = 0.84$), and good test-retest stability ($r = 0.78$), as well as the ability to discriminate between players of different competitive levels. These results confirmed the suitability of the TCTOF for populations with cognitive functional diversity, following adaptations to accommodate participants' specific comprehension and response characteristics. Similarly, Serra-Olivares et al. (2022) developed a Brazilian version of the TCTOF, administered to 328 youth players from various competitive categories. This version demonstrated a factorial structure consistent with the original test, internal reliability of $\alpha = 0.84$, and significant convergent validity with players' experience and level of play. These findings confirmed the cross-cultural validity and stability of the instrument's psychometric properties in football contexts beyond the Spanish setting.

Taken together, these findings indicate that the TCTOF is a valid, reliable, and adaptable instrument for use across diverse sporting contexts and populations,

provided that appropriate linguistic and contextual adjustments are made. However, in football for people with cerebral palsy or acquired brain injury (CP football), offensive tactical knowledge has not yet been assessed, despite its particular relevance. In this population, motor and cognitive impairments resulting from neurological damage may affect key processes underlying tactical performance, such as environmental perception, attention, working memory, and decision-making. Assessing this knowledge would allow for a better understanding of players' tactical intelligence, help identify potential cognitive or strategic limitations, and provide valuable insights for training processes and talent identification within this parasport discipline.

CP football is an adapted version of conventional football designed for athletes with cerebral palsy or acquired brain injury, who present impairments in muscle tone, coordination, or motor control. The game is played in a 7-a-side format on a reduced-size pitch (70 × 50 m), with smaller goals, no offside rule, and two 30-minute halves, following the regulations of the International Federation of Cerebral Palsy Football (IFCPF) (IFCPF, 2025 – Game rules). Players are functionally classified into three sport classes (FT1, FT2, and FT3) according to the degree of motor impairment, ensuring competitive fairness (IFCPF, 2025 – Classification rules). Within this context, tactical intelligence plays a crucial role, as motor limitations can be compensated for through greater game understanding, anticipation, and decision-making effectiveness.

Several factors may influence the development of tactical knowledge in football, including age, playing experience,

and competitive level or international exposure, all of which can enhance players' ability to perceive, decide, and act effectively within the game. However, the influence of these variables remains somewhat inconsistent across studies. While some authors have reported that older players demonstrate higher levels of declarative or procedural tactical knowledge (Sánchez-López et al., 2024; Serra-Olivares et al., 2015), others have found only weak or non-significant relationships, suggesting that contextual and experiential factors may play a more prominent role than chronological age itself (Serra-Olivares et al., 2017; Peña-González et al., 2023). Similarly, although playing experience—often quantified as years of structured practice—has been linked to higher tactical knowledge scores (García-Ceberino et al., 2020; Serra-Olivares, Maleki, & Zarei, 2021), this relationship appears to depend more on the quality and context of practice than on its duration. Studies indicate that participation in competitive environments that provide varied decision-making opportunities may be more influential than the mere accumulation of training years (Maleki & Zarei, 2020; Serra-Olivares, García-López, & del Campo, 2017).

Beyond accumulated experience, competitive level—and particularly international experience—seems to be a stronger determinant of tactical understanding. Players competing at national or international levels tend to display superior declarative and procedural tactical knowledge, as well as more advanced cognitive skills such as flexibility and metacognition (Kannekens, Elferink-Gemser, & Visscher, 2009; Huijgen et al., 2015; Montenegro-Bonilla et al., 2024; García-

López et al., 2010). Conversely, other contextual variables such as playing position appear to exert limited influence, with most studies reporting no significant differences in tactical knowledge across roles (Sánchez-López et al., 2023; Matos et al., 2023). Altogether, these findings suggest that the competitive context—rather than chronological age, years of practice, or positional specialization—plays a decisive role in shaping players' tactical knowledge.

Based on this evidence, adapting and validating the TCTOF for use in CP football represents a necessary step toward providing a valid, reliable, and context-specific instrument to objectively assess tactical understanding among players with cerebral palsy. Such a tool would contribute to advancing scientific knowledge, improving coaching practices, and supporting the development of evidence-based training and talent identification strategies within this sport. Therefore, the primary aim of the present study was to examine the validity and reliability of the TCTOF for its application among football players with cerebral palsy and acquired brain injury, ensuring its relevance and suitability for this specific parasport context. Additionally, the study sought to analyze the influence of contextual variables—including age, years of experience, international experience, playing position, and sport class—on players' tactical knowledge. It was hypothesized that international experience would significantly affect tactical knowledge, whereas the other contextual factors would exert a limited influence on the tactical understanding of CP football players.

2. Materials and Methods

Participants - The sample consisted of 93 male football players with cerebral palsy, all of whom held an active federation license and competed in the First Division of the Spanish National CP Football League during the 2023–2024 season. The players represented eight different teams and had a mean age of 29.1 ± 9.7 years. According to their international competitive experience, 43 players had never been selected for the national team, 20 had participated on at least one occasion, 12 were members of the U19 national team, and 18 were part of the senior national team at the time of the study. Regarding playing position, 13 players were goalkeepers, 35 defenders, 23 midfielders, and 22 forwards.

All participants were informed about the objectives and procedures of the study and provided written informed consent prior to participation, in accordance with the principles of the Declaration of Helsinki (2013 revision). The study protocol was approved by the Ethics Committee of the hosting institution, ensuring confidentiality of all data and compliance with current regulations for research involving individuals with disabilities (ADH.DES.IPG.JFM.24).

Test Review - Before administering the test, the researchers conducted a content review of the TCTOF to ensure the appropriateness of the items for the CP football context. As a result, item 8 from the declarative knowledge section and item 16 from the procedural knowledge section—both related to the offside rule, which does not apply in CP football—were removed. Therefore, the adapted version of the TCTOF

used in this study included 35 items assessing declarative knowledge and 15 items assessing procedural knowledge.

Procedure - To assess content validity, the adapted TCTOF was first administered to five national-level CP football coaches, each with at least five years of experience in CP football. Coaches evaluated the predefined correct answers for each item, and the level of agreement among them was used as an indicator of content validity. Subsequently, the test was administered to the 93 CP football players described above during a scheduled league matchday, at least 2 hours before the match. Testing was conducted by team, in a single session per team, under standardized conditions and the supervision of researchers. Contextual data were collected for each participant, including sport class (FT1, $n = 32$; FT2, $n = 38$; FT3 = 23), date of birth (for age calculation), years of playing experience, international experience, and playing position. Experience was categorized as 0 years for first-year participants, and all values above five years were grouped as “more than five years”. International experience was classified into four categories: (1) Never selected for the national team; (2) Selected for an international tournament at least once; (3) Currently a member of the national U19 team; (4) Currently a member of the senior national team. Participants were also asked to indicate their main playing position (goalkeeper, defender, midfielder, or forward). Prior to administration, researchers provided standardized instructions and ensured players understood how to complete the test. The declarative knowledge section was completed first, followed by the procedural knowledge

section. The time required to complete the test was not recorded.

To examine test–retest reliability, a random subsample of 17 players representing all teams, positions, and levels of international experience completed the TCTOF a second time one week later under identical conditions. This procedure aimed to evaluate the stability of test scores over time.

Statistical Analysis - The percentage of expert agreement was calculated as the mean proportion of coaches who correctly identified the predefined answers for each item. To assess internal consistency, both Cronbach’s alpha (α) and McDonald’s omega (ω) coefficients were computed for the declarative and procedural knowledge dimensions, as well as for the total test. These coefficients were calculated from the dichotomous response matrix (1 = correct, 0 = incorrect). Scores for the declarative, procedural, and total scales were expressed as the percentage of correctly answered items. Cronbach’s α estimated internal consistency based on average inter-item covariance, while McDonald’s ω provided a more robust reliability estimate accounting for unequal factor loadings and potential violations of tau-equivalence. 95% confidence intervals (CI) were computed for both coefficients.

A post hoc power analysis was performed using G*Power 3.1 (Exact test: Correlation) to determine the achieved statistical power for the test–retest reliability analysis. Based on an expected correlation under H_1 of 0.70—consistent with the ICC values observed across the different dimensions of the test—and a sample size of 17 participants, the analysis indicated an achieved statistical power greater than 0.90

($\alpha = 0.05$, one-tailed). For this test-retest analysis, paired-sample t-tests were used to determine whether significant differences existed between the first and second administrations. The intraclass correlation coefficient (ICC) was calculated as an estimate of relative reliability following a two-way mixed-effects model for single measures and consistency agreement, ICC(3,1), as the measurement occasions were treated as fixed effects and participants as random effects. The standard error of measurement (SEM) and minimal detectable change (MDC) were calculated to quantify within-subject variability and the threshold required to consider a real change between test administrations. ICC values were interpreted according to Koo and Li (2016): <0.50 = poor, 0.50 – 0.75 = moderate, 0.75 – 0.90 = good, and >0.90 = excellent. The SEM was computed from the standard deviation (SD) and ICC using the formula $SEM = SD \times \sqrt{1 - ICC}$. The MDC was then derived using $MDC = SEM \times 1.96 \times \sqrt{2}$, representing the minimum detectable difference to indicate a real change. These analyses were performed for declarative, procedural, and total knowledge scores.

The relationship between tactical knowledge and age was examined using Pearson's correlation coefficient (r), interpreted following Hopkins et al. (2009): trivial (<0.09), small (0.10 – 0.29), moderate (0.30 – 0.49), large (0.50 – 0.69), very large (0.70 – 0.89), and nearly perfect (>0.90). Differences in tactical knowledge according to contextual variables were analyzed using one-way analyses of variance (ANOVA), with post-hoc Bonferroni corrections for pairwise comparisons. Factors included years of

experience (categorized as: [1] 0–1, 2–3, 4–5, >5 years; [2] 0–2, 3–5, >5 years; [3] <5 vs. ≥ 5 years), sport class (FT), playing position, and international experience. Effect sizes (Cohen's d) were calculated and interpreted as: trivial (<0.25), small (0.25 – 0.50), moderate (0.50 – 1.0), and large (>1.0) (Rhea, 2004).

All statistical analyses were conducted using Microsoft Excel® and JASP® (version 0.95.4). Statistical significance was set at $p < 0.05$.

3. Results

The mean percentage of expert agreement for the TCTOF items was 89.9%, derived from partial agreement values of 87.3% for the declarative knowledge dimension and 92.6% for the procedural knowledge dimension.

Table 1 presents the internal consistency values (Cronbach's α) and homogeneity coefficients (McDonald's ω) for the declarative and procedural knowledge dimensions, as well as for the overall tactical knowledge score.

Table 1. Internal consistency of the TCTOF dimensions for CP football players.

Dimension	McDonald's ω (95% CI)	Cronbach's α (95% CI)
Declarative knowledge	0.90 (0.87; 0.93)	0.89 (0.86; 0.92)
Procedural knowledge	0.94 (0.92; 0.96)	0.94 (0.92; 0.95)
Overall	0.95 (0.93; 0.96)	0.94 (0.92; 0.96)

¹CI: confidence interval

The test-retest reliability analysis indicated no significant differences between the first and second administrations of the TCTOF, either for declarative knowledge (69.2 ± 11.7 vs. 70.1 ± 12.9 ; $t = 0.41$, $p = 0.69$),

procedural knowledge (79.8 ± 11.1 vs. 80.6 ± 11.9 ; $t = 0.45$, $p = 0.66$), or total tactical knowledge (74.5 ± 8.5 vs. 75.3 ± 7.9 ; $t = 0.55$, $p = 0.59$). The corresponding reliability indices showed an ICC of 0.74 (95% CI: 0.49, 0.88), SEM of 9.52, and MDC of 26.4 points for declarative knowledge; an ICC of 0.82 (95% CI: 0.63, 0.92), SEM of 6.40, and MDC of 17.7 points for procedural knowledge; and an ICC of 0.73 (95% CI: 0.47, 0.87), SEM of 5.98, and MDC of 16.6 points for the overall score.

Pearson's correlation analysis revealed a weak, non-significant negative relationship between age and declarative knowledge ($r = -0.15$, $p = 0.159$), as well as between age and total score ($r = -0.17$, $p = 0.106$). However, a significant negative correlation was found between age and procedural knowledge ($r = -0.26$, $p = 0.018$).

No significant differences were observed in tactical knowledge (either declarative or procedural) across different groupings based on players' years of experience ($F = 0.39$ – 1.24 , $p = 0.293$ – 0.761). In contrast, significant differences were found according to international experience (Table 2). Post hoc analyses indicated that players with current or previous participation in the national team (U19 or senior) scored

significantly higher in tactical knowledge compared to players without international experience.

Neither playing position (Table 3) nor sport class (Table 4) had a significant effect on TCTOF scores (Declarative knowledge: $F = 0.51$ and 1.95 , $p = 0.678$ and 0.145 , respectively; Procedural knowledge: $F = 1.23$ and 1.31 , $p = 0.307$ and 0.277 , respectively; Total: $F = 0.72$ and 1.64 , $p = 0.541$ and 0.200 , respectively). Post hoc analyses revealed no pairwise differences among playing positions or sport classes.

For international experience, large effect sizes (Cohen's d) were observed when comparing players without international exposure to those with occasional participation ($d = 0.98$ – 1.20), U19 national team members ($d = 0.28$ – 0.98), and senior national team players ($d = 1.16$ – 1.48). In contrast, comparisons across playing positions yielded small effect sizes ($d = 0.03$ – 0.66), consistent with the absence of statistically significant differences. Similarly, comparisons between functional classes showed small to moderate effect sizes ($d = 0.12$ – 0.61), reinforcing that tactical knowledge did not differ meaningfully according to motor impairment level.

Table 2. Differences in TCTOF scores (%) according to international experience.

Dimension	Without international experience	Ocasional international participation	U-19 National Team	Absolute National Team	F	p	Cohen's d (95% CI) ¹
Declarative knowledge	54.22 ± 17.16	72.87 ± 12.35^a	69.40 ± 16.29^a	77.11 ± 13.63^a	11.17	< 0.001	1.48 (0.85, 2.10)
Procedural knowledge	52.14 ± 17.38	68.80 ± 11.45^a	60.64 ± 15.78^a	73.56 ± 12.48^a	10.73	< 0.001	1.41 (0.80, 2.02)
Overall	51.49 ± 18.64	67.05 ± 11.86^a	55.91 ± 14.15	69.94 ± 13.29^a	7.88	< 0.001	1.16 (0.56, 1.76)

¹CI: confidence Interval; ^a Statistically different from "Without international experience"

Table 3. Differences in TCTOF scores (%) according to playing position

Dimension	Goalkeepers	Defenders	Midfielders	Forwards	F	p	Cohen's d (95% CI) ¹
Declarative knowledge	62.50 ± 14.10	60.59 ± 17.03	60.05 ± 21.54	55.57 ± 16.21	0.51	0.678	0.39 (-1.37, 0.59)
Procedural knowledge	75.70 ± 13.33	63.77 ± 17.78	63.77 ± 21.54	64.60 ± 15.82	1.23	0.307	0.66 (-1.73, 0.50)
Overall	67.00 ± 14.62	61.62 ± 16.52	61.91 ± 20.61	57.71 ± 17.16	0.72	0.541	0.53 (-1.26, 0.83)

¹CI: confidence interval.**Table 4.** Differences in TCTOF scores (%) according to functional sport class (FT).

Dimension	FT1	FT2	FT3	F	p	Cohen's d (95% CI)
Declarative knowledge	59.03 ± 16.10	62.17 ± 16.48	51.50 ± 23.01	1.95	0.149	0.61 (-0.15, 1.38)
Procedural knowledge	64.86 ± 17.41	67.06 ± 16.79	57.46 ± 23.97	1.31	0.277	0.52 (-0.28, 1.32)
Overall	59.79 ± 17.29	64.17 ± 15.80	54.79 ± 22.29	1.64	0.200	0.54 (-0.23, 1.30)

FT1: severe functional limitation; FT2: moderate functional limitation; FT3: mild functional limitation; CI: confidence interval.

4. Discussion

The primary aim of this study was to assess the validity and reliability of the Tactical Offensive Knowledge Test in Football (TCTOF) for its application as an instrument to evaluate tactical knowledge among national and international CP football players. A secondary aim was to examine the relationship between various contextual variables and players' test performance, in order to identify factors that may influence tactical understanding in CP football. The main findings indicate that the TCTOF can be applied as a valid and reliable tool within this parasport context. Furthermore, results suggest that tactical knowledge among CP football players is influenced by international competitive experience, whereas other contextual factors—such as age, years of experience, playing position, or sport class—do not appear to exert a significant effect.

The TCTOF demonstrated strong content validity, as evidenced by a high level of agreement (89.9%) among five national-level CP football coaches who evaluated the accuracy of the predefined test responses. The agreement rate was slightly lower for the declarative knowledge dimension (87.3%) compared with the procedural dimension (92.6%). This difference may be attributed to several factors. On the one hand, some declarative knowledge items may include multiple correct options, requiring participants to select all of them to be scored as correct, which increases item difficulty. On the other hand, factors related to the target population may also contribute, as players with cerebral palsy or acquired brain injury may present cognitive impairments associated with their neurological condition that affect their ability to comprehend or express declarative knowledge more than procedural understanding. Overall, these expert

agreement results support the content validity of the TCTOF as an appropriate and accurate instrument for assessing tactical knowledge in CP football player.

The reliability analysis of the TCTOF for CP football players revealed excellent internal consistency across both evaluated dimensions. Cronbach's alpha coefficients were 0.93 for the declarative knowledge subscale and 0.94 for the procedural knowledge subscale, while the overall value for the instrument was 0.89. Similarly, McDonald's omega coefficients confirmed the high homogeneity of the items ($\omega = 0.93, 0.94$, and 0.89 , respectively). All coefficients exceeded the threshold of 0.85, indicating strong internal consistency and supporting the reliability of the TCTOF as a robust measure of tactical knowledge in CP football players.

The test-retest analyses also demonstrated high reliability, as no significant differences were found between the first and second administrations of the test, either for the overall score or for any of its dimensions. The obtained ICC values indicated strong temporal stability, accompanied by acceptable levels of measurement error (below 10%) and reasonable minimum detectable change (MDC) values. These results provide practical benchmarks for players and coaches to interpret the smallest meaningful change in tactical understanding that can be considered beyond random variation. Overall, the findings support the temporal stability of the TCTOF, confirming its suitability as a reliable instrument for assessing tactical knowledge in football players with cerebral palsy.

Tactical knowledge in football is shaped by a variety of contextual and experiential factors that can influence how players perceive, interpret, and respond to game situations. Among these, age, years of experience, and competitive level (i.e. national vs international competitive exposure) have been discussed in the literature as potential determinants of tactical understanding and decision-making ability. In contrast, other variables such as playing position or functional sport class (FT) may exert a more limited influence, as offensive tactical knowledge tends to depend primarily on a player's overall comprehension of the game and accumulated experience rather than on their specific role or motor capabilities.

The influence of age on tactical knowledge has been widely examined in mainstream youth football, though the evidence remains inconclusive. Some studies have reported age-related differences, indicating that older players tend to exhibit higher levels of declarative or procedural tactical knowledge. For example, Sánchez-López et al. (2023) found significant differences in declarative tactical knowledge across age categories (U14, U16, U19, and U23) in a sample of 163 players, while Serra-Olivares et al. (2015) also reported greater tactical understanding among older children aged 8–12 years. However, these findings have not been consistent across all studies. Serra-Olivares et al. (2017) observed only weak correlations between age, experience, and tactical knowledge in players aged 7–13 years ($r < 0.70$), suggesting that the learning environment and type of sport participation may have a stronger

influence than chronological age. Similarly, Peña-González et al. (2023) found no significant association between tactical knowledge, chronological age, or maturity status in players aged 12–14 years, reinforcing the idea that contextual and experiential factors may outweigh biological or developmental influences.

In the present study, no significant correlation was found between age and overall tactical knowledge among CP football players, although a small but significant negative relationship was observed with procedural knowledge ($r = -0.26$, $p = 0.018$), indicating that younger players achieved slightly higher scores in this dimension. These results are consistent with the competitive nature of the sample, composed of adult athletes competing in the top national division rather than developing youth players. In such a context, age-related differences are expected to be minimal, as all participants have already been selected to perform at a high competitive level. Therefore, variations in tactical knowledge are more likely to reflect differences in the quality of experience and exposure to high-level competition, as well as potential contextual factors such as cohort effects (younger players having been trained under more contemporary methodologies), recent changes in coaching curricula, and selection bias favouring younger athletes who already demonstrate higher tactical proficiency, rather than the influence of chronological age or maturation.

Similarly, analyses conducted to examine possible differences in declarative and procedural tactical knowledge

according to players' years of football experience revealed no significant effects. Different grouping criteria were tested based on accumulated experience, yet no statistically significant differences were observed in any of the TCTOF dimensions. These findings suggest that the amount of playing experience—measured as years of participation—does not necessarily translate into higher levels of offensive tactical knowledge among players with cerebral palsy. This outcome is consistent with the broader literature in mainstream football, which highlights that the influence of experience on tactical knowledge depends largely on how it is conceptualized. While several studies have reported that greater football experience—typically measured as years of structured practice or competition—is associated with higher levels of declarative and procedural tactical knowledge (García-Ceberino et al., 2020; Serra-Olivares, Maleki, & Zarei, 2021), others have emphasized that this relationship is not always consistent. For instance, Maleki and Zarei (2020) demonstrated that experience mediates the relationship between verbal tactical knowledge and tactical behavior, underscoring its functional rather than temporal significance. Conversely, Serra-Olivares, García-López, and del Campo (2017) found only weak correlations between years of experience and tactical knowledge, reinforcing that the quality and context of practice—such as the type of training, competition, and decision-making opportunities provided—are more decisive than the sheer duration of sport

participation. In this regard, the present results support the notion that tactical understanding in CP football is shaped primarily by meaningful game experiences and competition level rather than by the number of years spent in the sport.

In contrast, international experience emerged as a significant factor influencing both declarative and procedural tactical knowledge. Post hoc analyses revealed that players with international experience—either current or former members of the national team—achieved significantly higher TCTOF scores than those without such experience. These findings suggest that participation in international contexts, typically characterized by higher tactical complexity, competitive intensity, and exposure to diverse styles of play, may substantially enhance players' tactical understanding. This interpretation aligns with previous studies in conventional football, where athletes competing at higher competitive levels have demonstrated superior tactical and cognitive performance (Kannekens *et al.*, 2009; Huijgen *et al.*, 2015; García-López *et al.*, 2010). Collectively, these results indicate that it is not the quantity of experience, but rather the quality and competitive demands of the environment, that play a decisive role in shaping tactical knowledge and game intelligence. However, it is also plausible that this relationship is bidirectional. Players who already possess higher levels of tactical knowledge and game intelligence are more likely to be identified and selected for national or international teams, where tactical understanding constitutes a key selection criterion. Therefore, greater tactical

knowledge may not only be a product of international exposure but also a prerequisite for achieving it. This interpretation is consistent with research on talent identification and development in football, which underscores tactical awareness, decision-making, and game understanding as critical predictors of selection into elite pathways (Williams *et al.*, 2020; O'Connor *et al.*, 2016). Within the context of CP football, these findings highlight that higher tactical knowledge could both facilitate and result from participation at the international level, reinforcing its dual role as both a determinant and an outcome of high-performance sport participation.

With regard to playing position, no statistically significant differences were observed in any of the TCTOF dimensions. All *p*-values exceeded 0.05, and the effect sizes were small, indicating that differences between goalkeepers, defenders, midfielders, and forwards were minimal and lacked practical relevance. These results suggest that the playing position does not significantly influence the level of offensive tactical knowledge among football players with cerebral palsy. This finding aligns with previous evidence from mainstream football, where positional role has been shown to exert little influence on players' overall tactical understanding. For instance, Sánchez-López *et al.* (2023) examined 163 academy players from four age categories (U14–U23) and found no significant differences in declarative tactical knowledge across positions, suggesting that tactical understanding develops as a general and transferable competence rather than one

specific to positional specialization. Similarly, Matos et al. (2023), in a study involving young players participating in three-a-side small-sided games, reported no meaningful differences in tactical decision-making or motor efficiency between positions, reinforcing the notion that tactical knowledge represents a transversal component of football performance.

Likewise, analyses based on functional sport class (FT1, FT2, and FT3) also revealed no significant differences in declarative or procedural tactical knowledge. Effect sizes were small, and the wide confidence intervals confirmed the absence of meaningful differences between functional profiles. Collectively, these findings indicate that the degree of motor impairment does not condition the development of offensive tactical knowledge in CP football. Rather, this competence appears to evolve similarly regardless of the player's functional class or tactical role on the field, underscoring the cognitive and experiential nature of tactical understanding over physical or motor constraints. These findings also suggest that the current classification system in CP Football, which is based exclusively on motor impairment, effectively isolates physical function without constraining players' tactical or cognitive potential. In other words, tactical knowledge appears to develop independently of functional class, supporting the notion that classification procedures successfully prevent cognitive or perceptual abilities from influencing sport class allocation.

Although the present study provides strong evidence for the validity and reliability of the adapted TCTOF in CP football, several limitations should be acknowledged. The sample, although representative of the national competitive level, was limited to Spanish players competing in a single league season, which may restrict the generalizability of the findings to other countries or competitive contexts, where tactical culture may also differ and potentially influence the results. In addition, while the TCTOF assesses both declarative and procedural tactical knowledge, it does not capture players' in-situ tactical behavior or decision-making during actual game performance. Future studies should consider combining knowledge-based assessments with observational or notational analyses of match behavior to provide a more comprehensive understanding of tactical expertise in CP football. Additionally, the cross-sectional design limits the ability to infer causal relationships between contextual variables and tactical knowledge. Longitudinal research examining the development of tactical understanding across competitive seasons and training interventions would help clarify the mechanisms underlying these associations.

5. Practical Applications

From an applied perspective, the adapted TCTOF represents a valuable tool for coaches, classifiers, and practitioners in CP football. Its use allows for the objective assessment of players' offensive tactical knowledge, supporting individualized training programs focused on improving

tactical awareness and decision-making skills. Moreover, the TCTOF can help identify cognitive or perceptual strengths and weaknesses that may influence players' tactical performance, facilitating the design of tailored learning tasks that align with their functional and cognitive profiles. At the talent identification level, the test may also assist in recognizing athletes with high tactical potential who could benefit from exposure to higher-level competitive environments, such as national or international programs. Integrating tactical knowledge assessment into regular evaluation processes may therefore contribute to evidence-based decision-making in player development and selection within CP football.

6. Conclusions

The findings of this study demonstrate that the adapted version of the Tactical Offensive Knowledge Test in Football (TCTOF) is a valid and reliable instrument for assessing offensive tactical knowledge among football players with cerebral palsy and acquired brain injury. The test exhibited excellent internal consistency, high temporal stability, and strong content validity, confirming its suitability for use in this parasport context. Among the contextual variables examined, international experience emerged as the only factor significantly associated with higher tactical knowledge, highlighting the importance of competitive exposure at advanced levels in fostering tactical understanding. Conversely, age, years of experience, playing position, and functional sport class did not significantly influence

test performance. These results suggest that tactical knowledge in CP football is primarily shaped by the quality of competition and learning environments rather than by chronological, experiential, or physical factors. The TCTOF thus provides a robust foundation for both scientific inquiry and applied practice in the assessment and development of tactical expertise in CP football.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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