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Scientific production on the application of comprehensive models in net sports: a systematic review
Producción científica sobre la aplicación de modelos comprensivos en los deportes de red: una revisión sistemática

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Abstract. The aim of this systematic review was to analyze the scientific production on the effects of the application of comprehensive models on dimensions of Motor Conduct in net sports. Following the PRISMA criteria, this review only considered applied studies on net sports written in English, Spanish or Portuguese in SportDiscuss, Scopus, ERIC and Web of Science databases, published between 2011 and 2021. A total of 12 articles that met the inclusion criteria were included in this analysis. The studies encompassed affective, cognitive, and organic dimensions, but no articles were identified pertaining to the relational dimension. Findings revealed that comprehensive models positively influenced the cognitive dimension, enhancing decision-making and tactical understanding compared to traditional teaching methods. Additionally, in the organic dimension, comprehensive models demonstrated significant improvements in skill execution, while in the affective dimension, they fostered positive outcomes related to motivation and enjoyment. However, the link between affective, organic and relational dimensions with game understanding process and decision-making improvement in net sports remains unexplored.
Keywords: TGfU. Game Sense. Tactical Games Approach. Teaching. Internal Logic. Motor Praxiology. Motor Conduct. Motor Action Theory.

Resumen. El objetivo de esta revisión sistemática fue analizar la producción científica sobre los efectos de la aplicación de modelos comprensivos en las dimensiones de la Conducta Motriz en deportes de red. Siguiendo los criterios PRISMA, esta revisión solo consideró estudios aplicados sobre deportes de red escritos en inglés, español o portugués en las bases de datos de SportDiscuss, Scopus, ERIC y Web of Science, publicados entre 2011 y 2021. Un total de 12 artículos que cumplían con los criterios de inclusión fueron incorporados en este análisis. Los estudios abarcaron las dimensiones afectiva, cognitiva y orgánica, pero no se identificaron artículos sobre la dimensión relacional. Los hallazgos revelaron que los modelos comprensivos influyeron positivamente en la dimensión cognitiva, mejorando la toma de decisiones y la comprensión táctica en comparación con los métodos de enseñanza tradicionales. Además, en la dimensión orgánica, los modelos comprensivos demostraron mejoras significativas en la ejecución de habilidades, mientras que, en la dimensión afectiva, promovieron resultados positivos relacionados con la motivación y la diversión. Sin embargo, la conexión entre las dimensiones afectiva, orgánica y relacional con el proceso de comprensión del juego y la mejora en la toma de decisiones en deportes de red sigue sin explorarse.
Palabras clave: TGfU. Game Sense. Tactical Games Approach. Enseñanza. Lógica Interna. Praxiología Motriz. Conducta Motriz. Teoria de la Acción Motriz.

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Introduction

Research on the effects of the application of different sports teaching models is a topic that continues to be studied in the field of Physical Education (Fernández-Espínola et al., 2020; Kinnerk et al., 2018; Ortiz Gómez et al., 2023). The game-based approaches prove to be effective in sports learning, with notable emphasis on thoroughly researched teaching models such as the Teaching Games for Understanding (TGfU) model and its variations, as well as Constraints-Led Approach (CLA) based on Non-Linear Pedagogy. TGfU is a constructivist-oriented practical model for physical education teachers, while Non-Linear Pedagogy is an ecologically rooted theoretical framework applicable across various domains (Renshaw et al., 2016).

Despite their shared similarities as the use of game shaping in learning tasks, TGfU emphasizes developing cognitive learning and tactical concepts over other elements at the beginning of the process. In contrast, Non-Linear Pedagogy focuses on the quality of the learner-environment relationship and the multiple factors that can derive from the relationship between subject, environment and task (Renshaw et al., 2016). TGfU utilizes cyclical structures, questioning, and skill interjections for holistic development rooted in cognitive aspects, while the CLA employs a three-stage model (Search, Discover, Exploit) encouraging learners to explore, strengthen, and exploit perceptual-motor degrees of freedom in a multifactorial way (Davids et al., 2015).

Both comprehensive models and constraints-led approaches have undergone rigorous investigation across diverse sports, contexts, and populations in scholarly research (Abad-Robles et al., 2020; Clark et al., 2019). Among the different studies and results found, it is possible to affirm that the comprehensive model has gained prominence at the research level, especially guided by the TGfU proposal and its variants: Tactical Games Approach/Model, Play Practice, Tactical-decision Learning Model, Ball-School Concept, Invasion Games Competence Model, Games Concept Approach (Almond, 2015; Hodges et al., 2018; Memmert & Harvey, 2008).

The overall goal of comprehensive models is to develop the ability to understand what is happening in the game and to interact intelligently in problem-solving situations similar to those encountered in internal logic (Kirk & MacPhail, 2002). In addition, the reduction of technical difficulties is

realized in order to match the game structures to the ability of the participants (Thorpe et al., 1986).

The teaching-learning process of comprehensive models is built around modified games that refers to the principles of play relating to the different groups of sports: Invasion, Net/Wall, Fielding/Run Scoring, Target Games (Thorpe et al., 1986). These groups of sports are classified according to the principles of play that are common to them (e.g., in invasion sports: penetration, depth, mobility, amplitude, creativity, delay, balance, concentration, position) (Ouellette, 2004). Considering the didactic bases proposed by the comprehensive models, understanding the structure of the game, i.e., its internal logic, is a key point to develop the game understanding (Martínez-Santos et al., 2020; Menezes-Fagundes et al., 2021).

Parallel to the comprehensive models, there is another current promoted by the Motor Praxiology created by Parlebas (2001). According to this current, each sport or game has an internal logic or pattern of organization that gives it an identity card (Parlebas, 2001). When people take part in a game or sport, they interpret this internal logic and engage in Motor Conduct in response to four groups of internal relations: with others, with space, with the material and with time (Parlebas, 2020). The notion of Motor Conduct corresponds to the motor response performed by a participant with an internal meaning attributed by the player, understanding these two elements in a unitary and assessable way (Parlebas, 2001; Rillo-Albert et al., 2021). Motor Conduct implies considering that participating in a game or sport, the person activates in a systemic way the organic (motor and energetic), cognitive (understanding and decision-making), affective (perceptions and emotions) and relational (interactions and group dynamic) dimensions (Lavega-Burgués, 2007; Parlebas, 2001).

Motor Conduct encompasses a holistic perspective of an individual engaged in a motor situation, integrating both objective and subjective elements. Beyond a mere physical manifestation, it includes the individual's subjective perception across various dimensions of their conduct, culminating in the formation of intrinsic meanings (Lavega-Burgués et al., 2020; Rillo-Albert et al., 2021). These meanings, when expressed in activities such as games, can yield specific effects on one's personality. Various studies aim to comprehend the consequences of engaging in different motor situations on Motor Conduct, shedding light on the intricate relationship between intrinsic meanings and the holistic expression of motor actions (Lavega-Burgués et al., 2020; Martín-Martínez et al., 2021; Muñoz-Arroyave et al., 2021; Serna et al., 2022).

In contextualizing the constructivist perspective of comprehensive models, Butler (1997) emphasizes the need to develop cognitive, affective and psychomotor domains to guide the teaching for understanding process. However, for the effective developing of these Motor Conducts, it becomes imperative to comprehend the internal logic governing the motor practices in question. Moreover, one must exhibit a mastery over the potential avenues for altering this internal logic, whether through representation or exaggeration, with the ultimate aim of nurturing the desired conduct outcomes (Clemente, 2012; Lavega-Burgués, 2007, 2018; Thorpe et al., 1986). The alteration through representation guarantees a direct alignment of the proposed scenarios with the internal logic underpinning the practice, thereby serving as a guiding axis for these scenarios. Conversely, modification through exaggeration seeks to adapt the players' range of actions concerning spatial, material, temporal, and interpersonal aspects. This adaptation is geared towards stimulating specific Motor Conducts that, in turn, facilitate the players' capacity to decipher the proposed situations and cultivate innovative approaches to intervention, thereby enhancing their game comprehension (Clemente, 2012; Fagundes & Ribas, 2020; Thorpe et al., 1986).

Comprehensive models, particularly the TGfU framework, are frequently amalgamated or hybridized with other models. This synthesis aims to distil the core principles and attributes from two distinct models or proposals, thereby optimizing the pedagogical process in sports teaching (Shen & Shao, 2022). There exists scholarly literature that suggests the potential for forging connections between comprehensive models and Motor Praxiology (Martínez-Santos et al., 2020; Menezes-Fagundes et al., 2021). This recognition stems from the observation that both paradigms share similar objects of study and can be viewed through a structural lens.

From this perspective, the understanding of the game gives rise to a singular way of managing the decisional or strategic intervention, but also to identify the meaning that the person has given to its own emotional, relational or organic intervention. The teaching process is based on proposing (and modifying) problem situations that encourage certain Motor Conducts in students, guiding them to construct their own learning and consequently develop a game understanding (Lavega-Burgués, 2018). This aspect is of great interest for current research on comprehensive models (García-González, Abós, Diloy-Peña, Gil-Arias, & Sevil-Serrano, 2020; Gil-Arias, Claver, Práxedes, Villar, & Harvey, 2018; Liu, Wang, Zhang, & Hastie, 2020).

However, such studies on the effects of comprehensive models tend to be conducted in greater numbers with invasion sports, which are already more scientifically ordered and consolidated than other groups of sports (Kinnerk et al., 2018). Thus, we identified a lack of knowledge systematization about the effects of applying comprehensive models on Motor Conduct in net sports. Based on this issue, the aim of this study was to analyze the scientific production on the effects of the application of comprehensive models on dimensions of Motor Conduct in net sports.

Materials and methods

Research design

This study is a systematic review and was reported according to the Preferred Reporting Items for Systematic

Reviews and Meta-Analyses (PRISMA) (Page et al., 2021). The study design was based on the PICOS strategy, in which the population (P) was not previously defined, intervention (I) must necessarily be developed with some comprehensive model, comparisons (C) were not required, and the outcomes (O) should present the effects of these comprehensive models' application on different aspects of the participants' Motor Conducts, without limitation of the study design (S).

Search method to identify studies

To search for articles in the databases, we used Booleans operators to create the follow search equation, adapting it to each database considered in this study: ("Teaching Games for Understanding" OR "TGFU" OR "Tactical Games Approach" OR "Game Sense" OR "Tactical Games Model" OR "Play Practice" OR "Tactical-decision Learning Model" OR "Ball-School Concept" OR "Invasion Games Competence Model" OR "Games Concept Approach"). Documents that presented some of these keywords in the full-text were included. We decided not to insert the terms referring to net sports in the search equation understanding that this could induce the search for data for certain sports. Instead, a filter was applied to the study eligibility process. The choice to limit the search to comprehensive models is intended to precisely investigate how these models impact various dimensions of Motor Conduct, in addition to the cognitive dimension.

The search using this equation was performed in March 2022 in the following databases: ERIC, Web of Science, Scopus and SportDiscuss. A time frame from 2011 to 2021 was defined in order to identify the most up-to-date studies on the subject and highlight the characteristics of the current academic scenario on comprehensive teaching of net sports and project an overview of the trends in this scientific production.

Inclusion criteria

Based on the established search strategy, studies were identified and duplicates were removed to prepare the database in Microsoft Excel 2019. Based on the articles found, a database was organized to perform the screening process. Two authors independently carried out the screening process by doble-blind peer review following the criteria: contain the comprehensive models' names in the title of the articles (consider that articles that include comprehension models as a studied variable would cite them in the title), articles published in journals, studies that employed interventions with net sports (even if mixed with sports from another category) and original and full-text studies written in English, Spanish or Portuguese. These selection criteria were established before the data collection process.

For the eligibility phase, two authors independently read the articles and selected the empirical studies that applied comprehensive models to net sports and presented data from the subjects who underwent this teaching program to be included in this systematic review. Differences between the authors in the double-blind peer review process were settled by subsequent consensus. The number of articles analyzed in each phase and the reason for their exclusion can be seen in Figure 1.

Methodological quality

According to requirements of the PRISMA protocol and to guarantee the quality of the data obtained, the methodological quality of the studies was assessed (Page et al., 2021). Two authors independently assessed the methodological quality of the studies using PEDro Scale for Randomized Controlled Trial (Maher et al., 2003), JBI Critical Appraisal Checklist for Quasi-experimental studies (Tufanaru C, Munn Z, Aromataris E, Campbell J, Hopp L., 2020) and JBI Critical Appraisal Checklist for Qualitative Studies (Lockwood et al., 2015).

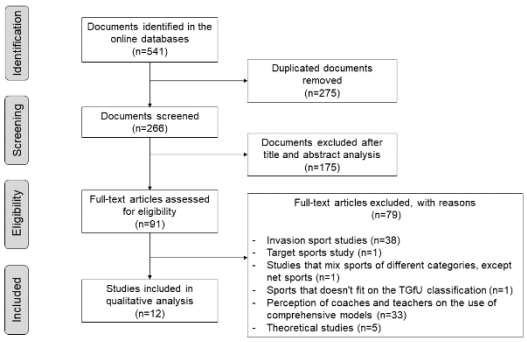

Figure 1. PRISMA flowchart to studies' filtering process. Source: Elaborated by the authors.

Results

The search generated a total of 541 documents (SportDiscuss: 243, Scopus: 175, ERIC: 62, Web of Science: 61), and 275 were excluded as duplicates. Then, the titles and abstracts of the 266 remaining articles were read and 175 were excluded, totalizing 91 studies for the eligibility process. After analysis, 79 were excluded because they did not meet the inclusion criteria. Thus, 12 studies composed the material for analysis of this systematic review based on the inclusion criteria (Batez et al., 2021; Chatzipanteli et al., 2014; García-Castejón et al., 2021; García-González et al., 2020; Gil-Arias et al., 2018, 2021; Liu et al., 2020b, 2020a; Nathan, 2016; Sarruge et al., 2020; Sgrò et al., 2021; Zhang et al., 2012). All selection process is described in Figure 1.

General characteristics of the studies selected for this systematic review

The totality of intervention studies considered in this systematic review evaluated an amount of 634 participants, with a sample size per study ranging from 24 to 99 participants. The average age of the participants is between 8,9 and 21,0 years old. Regarding the context in which these participants are inserted, 476 school students and 158

university students were evaluated. Of all nine comprehensive models considered in the search equation, only studies with TGfU, Play Practice and Tactical Games Model applied in net sports were found (Tables 1 and 5).

Table 1.
Characteristics of the studies included (n=12)

Study/ Country (First Author)	Objective	Research Design/ Sport	Participants	Model Length	Main results	MCD
Zhang et al. (2012) USA	To investigate the effects of Play Practice (PP) on the performance of four table tennis skills (i.e., forehand drive, forehand attack, serving, and creating space) among college students when compared with skill-focused instruction (SI).	Quasi-experimental (Intervention-control group comparison) Table Tennis	56 university students	Play Practice 18 lessons (14,4 hours)	Participants in both PP and SI conditions significantly improved their forehand attack skills from pre to post. However, participants in PP condition had better significant improvements in the forehand attack skills as compared with those in SI condition. The results indicated that participants in both PP and SI conditions significantly improved their serving skills. However, participants in PP condition had better improvements in serving skills as compared with those in SI condition. Because of their low reliability, the creating space test scores were not included.	Organic
Chatzipanteli et al. (2014) Greece	To examine the effectiveness of a tactical-game model in promoting metacognitive behavior in elementary-school students.	Randomized Controlled Trial Volleyball	77 school students	Tactical-game model 8 lessons (6 hours)	The tactical problem assessment revealed that in the first phase before the intervention program 5.63% of students were categorized at a high level in the experimental group. Yet, after the intervention program, 22.53% were categorized as possessing a high level of metacognition. The results of the study show that a game-centered approach could enhance students' metacognitive behavior.	Cognitive
Nathan (2016) Malaysia	To examine the effects that a revised model of TGfU compared to SDT had on learning movement skills in Badminton.	Quasi-experimental (Intervention-control group comparison) Badminton	32 school students	TGfU 10 lessons (6,7 hours)	There was no significant difference between TGfU and SDT models on none of the variables evaluated. Movement to base: showed that the TGfU outperformed the SDT. Skill execution: indicated no significant difference between TGfU and SDT models. Decision making: indicated no significant difference between TGfU and SDT models.	Cognitive and Organic
García-González et al. (2020) Spain	To examine whether the effects of a hybrid SE/TGfU volleyball teaching unit was equally effective on a set of Skill Drill Technical (SDT) related variables according to students' initial motivations.	Quasi-experimental (Pre-post without control group) Volleyball	49 school students	SE/TGfU 10 lessons (8,3 hours)	A significant increase in the students' perceptions of support to BPNs from the PE teacher can be observed in the three identified motivational profiles, with the exception of relatedness support in the group with "high Relative Autonomy Index (RAI)". The same was observed in the students' perceptions of satisfaction of the three BPNs in the three identified profiles, except for competence satisfaction in the group with "high RAI", and of relatedness satisfaction in the groups with "moderate and high RAI". Regarding novelty and variety satisfaction, students belonging to the three identified motivational profiles obtained a significant increase in these two study variables.	Affective and Cognitive
Gil-Arias et al. (2018) Spain	To investigate the impact of a hybrid TGfU and sport education (SE) physical education unit on autonomy support, perceived motivational climate, enjoyment and perceived competence, in comparison to a unit delivered via a traditional direct instruction model.	Quasi-experimental (Counter-balanced cross-over design) Volleyball and Ultimate Frisbee	55 school students	TGfU/SE 16 lessons (more than 8 hours)	Students in both groups had significantly higher scores on the two autonomy support factors when they were taught by the teacher using a hybrid TGfU/SE unit. Neither of the two groups showed a significant increase in their perceptions of a task-oriented motivational climate after completing the hybrid TGfU/SE unit. Results showed that students reported greater enjoyment and perceived competence when participating in lessons in the hybrid TGfU/SE unit.	Affective and Cognitive

Liu et al. (2020a) USA	To investigate the development of skill and tactical competence, as well as game performance, in college-level badminton, through the incorporation of the key elements of the PP model.	Quasi-experimental (Intervention-control group comparison) Badminton	66 university students	Play Practice U.S.: 16 lessons (24 hours) China: 48 lessons (40 hours)	Students in both the skill-focused instructional approach (SI) and PP interventions improved in their ability to execute discrete sport skills, with some of these skills being explicitly advantaged under the conditions of PP. While significant main effects per time were present in both the United States (US) and Chinese cohorts, the main effect per conditions was evident only for US students. In both countries, students from SI and PP conditions improved tactical understanding significantly from preintervention to postintervention, with the students experiencing PP showing superior gains.	Cognitive and Organic
Liu et al. (2020b) USA	To examine the development of Chinese pre-service physical education teachers' technical skill, tactical understanding, game performance (common content knowledge - CCK), and specialized content knowledge (SCK) during a badminton course incorporating PP instruction.	Quasi-experimental (Pre-post without control group) Badminton	36 university students	Play Practice 24 lessons (36 hours, but 10 hours of PP)	Significant differences were found on all measures from pre- to post-test, with all showing large effect sizes. In particular, over 75% of students achieved the benchmark depth of SCK following the course. The inclusion of Play Practice within a sport instruction course can contribute to various elements that are needed to promote the CCK and SCK of pre-service physical education students.	Cognitive and Organic
Sarruge et al. (2020) Brazil	To analyze the use TGfU and Information and Communication Technologies (ICT) as didactic resources in the volleyball sport initiation process.	Qualitative Study Volleyball	24 school students	TGfU 5 lessons (10 hours)	ICT, especially the filming aspect, together with the TGfU model contributed to achieve the teaching goals, especially to understand the tactical elements of the game. The study found that even with difficulties experienced during the lessons, many students acquired the ability to play intentionally according to the tactical principles taught. All students who participated in the focus group reported that it was quite fruitful.	Cognitive
Batez et al. (2021) Serbia	To determine if the TGfU approach is better than skill-oriented teaching to improve volleyball skills and increase enjoyment in secondary school students	Randomized Controlled Trial Volleyball	55 school students	TGfU 12 lessons (9 hours)	The six-week PE intervention significantly improved volleyball overhead and forearm passing compared to the control group. There was a significant main effect for time with both groups improving their result after the six-weeks intervention. There were no significant effects for passing considering time or group per time cohorts. Perceived sport enjoyment was significantly higher after the TGfU model.	Affective and Organic
Gil-Arias et al. (2021) Spain	To analyze the effects of a hybrid teaching games for understanding/sport education (TGfU/SE) volleyball teaching unit on students' motivational outcomes, using a mixed-method approach.	Quasi-experimental (Pre-post without control group) Volleyball	53 school students	TGfU/SE 10 lessons (8,3 hours)	Students showed a significant increase in their perceptions of support of the three basic psychological needs (BPNs) from the Physical Education teacher, the satisfaction of the three BPNs. In addition, boys reported a significant increase in introjected regulation whereas girls showed a significant increase in intrinsic motivation. Finally, only boys reported a significant decrease in intention to participate in volleyball after the intervention.	Affective and Cognitive
Sgrò et al. (2021) Italy	To assess the effect of a longitudinal Tactical-Game Model based instructional plan on game-play volleyball performances of elementary school students, when they were grouped by their skill levels (i.e. as a subsequent aim).	Quasi-experimental (Pre-post with no control group) Volleyball	39 school students	Tactical-Game Model 26 lessons (16 hours)	All participants had an overall moderate to large improvement in volume of play, efficiency index, and performance score, and this global improvement seems to have remained at least until the end of the summer vacation re-test. Lower-skilled students attained a larger and more established improvement than high-skilled students did. However, some detrimental effects on in-game students' performance existed at the end of the instructional period. The students' performances comparison between higher and lower-skill-level students resulted in large to medium differences, respectively.	Cognitive and Organic

García-Castejón et al. (2021) Spain	To know the effects of applying hybridization between the Model of Personal and Social Responsibility and TGfU model in first- and second-year Secondary Education students on the improvement of health measured through the intention to be physically active and the psychological variables of the students.	Quasi-experimental (Intervention-control group comparison) Volleyball, Futsal and Basketball	4 teachers 99 students	TGfU/Model of Personal and Social Responsibility 11 lessons (18,3 hours)	The results of the questionnaires indicate significant improvements in the experimental group over time in terms of the intention to be physically active, as well as in autonomous motivation, the self-determination index, the index of psychological mediators, personal and social responsibility, and enjoyment of the students.	Affective and Cognitive

MCD: Motor Conduct Dimensions Source: Elaborated by the authors.

Methodological quality of studies on comprehensive models and net sports

To access the methodological rigor of the investigations considered in this study, different analysis tools were used. Tables 2, 3 and 4 shows the methodology quality of the 12 articles considered in this systematic review, dividing them according to the studies design.

Table 2.
Methodological quality of the included randomized controlled trials, measured by the PEDro scale

Study	1	2	3	4	5	6	7	8	9	10	11
Chatzipanteli et al. (2014)	1	1	0	1	0	0	0	1	1	0	1
Batez et al. (2021)	1	1	0	1	0	0	0	1	1	1	1

1: yes; 0: no. Source: Elaborated by the authors.

Table 3.
Methodological quality of the included quasi-experimental studies, measured by the JBI critical appraisal checklist for Quasi-experimental studies

Study	1	2	3	4	5	6	7	8	9
Zhang et al. (2012)	Y	Y	U	N	Y	U	Y	Y	Y
Nathan (2016)	Y	Y	U	N	Y	U	N	Y	Y
García-González et al. (2020)	Y	N	U	N	Y	U	Y	Y	Y
Gil-Arias et al. (2018)	Y	U	U	N	Y	U	Y	Y	Y
Liu et al. (2020a)	Y	U	U	N	N	U	N	Y	Y
Liu et al. (2020b)	Y	U	U	N	Y	U	N	Y	Y
Gil-Arias et al. (2021)	Y	Y	U	N	Y	U	Y	Y	Y
Sgro et al. (2021)	Y	Y	U	N	Y	U	Y	Y	Y
García-Castejón et al. (2021)	Y	Y	U	Y	N	U	N	Y	Y

Y: yes; N; no; U: unclear. Source: Elaborated by the authors.

Table 4.
Methodological quality of the included qualitative study, measured by the JBI critical appraisal checklist for Qualitative Studies

Study	1	2	3	4	5	6	7	8	9	10
Sarruge, Ginciene, Impolcetto (2020)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y

Y: yes; N; no. Source: Elaborated by the authors.

Table 5.
Synthesis of the characteristics of the articles about the comprehensive models per net sport

Categories	Volleyball	Badminton	Table Tennis
Studies Designs	Randomized controlled trial (2) Counter-balanced crossover design (1) Qualitative Study (1) Pre-post study with no control group (4)	Non-equivalent control/comparison group experimental design (2) Pre-post study with no control group (1)	Non-equivalent control/comparison group experimental design (1)
Comprehensive Models Used	TGfU (6) Tactical Games Approach/Model (2)	Play Practice (2) TGfU (1)	Play Practice (1)
Motor Conduct' Dimensions Assessed	Affective (5) Cognitive (7) Organic (2)	Cognitive (3) Organic (3)	Organic (1)
Internal Logic Variables Manipulated	Relation with: Space (3) Time/Score (1) Material (4) Interaction with: Others (7)	Relation with: Space (0) Time/Score (0) Material (0) Interaction with: Others (1)	Relation with: Space (0) Time/Score (0) Material (0) Interaction with: Others (0)

Source: Elaborated by the authors.

Following the summarize data on table 5, volleyball is the most studied sport, especially regarding variables of the cognitive dimension of Motor Conduct developed from the TGfU model, followed by affective and organic dimensions. On the other hand, studies on badminton focused on Cognitive and Organic dimensions, from the Tactical Games Approach and TGfU were found. Looking at the group of net sports, we found that the greatest scientific production occurs in sports with direct offensive cooperation through the material (volleyball), while other sports that present versions in which there is indirect offensive cooperation (pair versions of badminton or table tennis) or without offensive cooperation (single version of the same sports) are less studied. Regarding the populations under investigation, eight studies were conducted with schoolchildren, while four focused on undergraduate students.

Few articles report which internal logic elements were manipulated in the proposed game situations. The data

obtained shows that the relationships between players is the most cited element, followed by interaction with material and space. Nevertheless, none of the studies included in this review sought to explicitly study the net sports principles of play (continuity, initiative, and finalization) pointed out by Contreras-Jordán et al. (2007) and their effects on the Motor Conduct dimensions.

Discussion

The aim of this study was to analyze the scientific production on the effects of the application of comprehensive models on dimension of Motor Conduct in net sports. Subsequently, we will present the findings from articles that examine variables associated with each of these dimensions. Our investigation encompasses elements connected to affective, cognitive, and organic dimensions. Regrettably, we were unable to locate any articles pertaining to the relational dimension (e.g., interpersonal relationships, group cohesion, etc.). It is noteworthy that several studies have integrated multiple dimensions into their analyses. Nevertheless, for the sake of clarity in our discussion, we will interpret the outcomes in accordance with each distinct dimension of Motor Conduct.

Cognitive dimension

Six studies have undertaken an examination of the cognitive dimension, specifically focusing on game situations and decision-making within the context of net sports. In terms of the impact of comprehensive models over time, these studies have yielded favorable outcomes across some variables, including decision-making, tactical comprehension, and subject content knowledge (Liu et al., 2020b; Sarruge et al., 2020; Sgrò et al., 2021). Sgrò et al. (2021) found that students who were taught using the Tactical Games model showed improved performance in volleyball, particularly among those who initially had lower skill scores in the pre-test compared to their medium and high-skilled counterparts. Liu et al (2020b) discovered positive outcomes for the Play Practice (PP) and skill-focused instructional approach in the development of badminton across two countries. The results were more favorable for PP. Regarding game understanding, both groups improved in the American context, but there was no noticeable difference in the Chinese groups. Sarruge et al. (2020) incorporated Information and Communication Technologies (ICT) in the TGfU teaching-learning process with schoolchildren. Results showed that ICT facilitated students in interpreting opponents' actions, making decisions, and reflecting on their actions.

Additionally, some investigations have sought to compare the effects of comprehensive models with those of traditional teaching models, such as technical instruction and Skill Drill Technical. Notably, these comparative studies have revealed positive results in favor of comprehensive models, particularly in terms of metacognitive levels and decision-making (Chatzipanteli et al., 2014; Liu et al., 2020a; Nathan, 2016).

For example, in an experimental study with schoolchildren, Chatzipanteli et al. (2014) observed a substantial enhancement in the metacognition of the experimental group, exposed to eight Tactical Game Approach classes, compared to the control group. Liu et al. (2020a) analyzed tactical understanding, game performance and subject content knowledge of trainee teachers following a PP badminton unit. Over time, the group showed significant improvements in all variables assessed. Nathan (2016) compared the effectiveness of TGfU and Skill Drill Technical approaches in badminton game performance. The study indicated substantial improvements favoring TGfU in movement to the base (i.e. return to the center of the court after the hit). However, no significant differences were found between the two models regarding skill execution and another decision-making variables.

It is worth highlighting that groups exposed to the traditional teaching model also demonstrated improvement in certain cognitive aspects; however, these improvements were less pronounced compared to the comprehensive models. Taken together, these studies provide compelling evidence supporting the capacity of comprehensive models to enhance the cognitive dimension among students. These findings are in harmony with research conducted in diverse sports and educational settings, consistently demonstrating substantial improvements in decision-making within game scenarios (Abad-Robles et al., 2020; Ortiz et al., 2023).

Studies on ecologic perspective, such as those by Rocha et al. (2020a) and Rocha et al. (2020b), have identified disparities in the technical-tactical development of novice players on courts of varying dimensions (3×3 m, 4×4 m, 4.6×4.6 m and 5.2×5.2 m). Notably, these studies have revealed that players tend to make better-adapted decisions on larger courts, while demonstrating superior adjustment and efficiency on smaller courts. The results of Lacasa Claver et al. (2021) study on paddle training reveal significant impacts when modifying Motor Conduct through the manipulation of task constraints. In a game adapted for young players, there was observed an increase in opportunities and variety of actions compared to the standard game.

However, it is worth mentioning that no studies have been found within the framework of comprehensive models that systematically compare different manipulations of internal logic and their resultant impacts on Motor Conduct, as well as their implications for principles of play and decision-making. Nonetheless, it is crucial to delve into aspects related to the potential interactions with space, time, materials, teammates, and opponents. This becomes particularly relevant when considering that comprehensive models are rooted in the concept of teaching through the subject's interaction with the environment (Martínez-Santos et al., 2020; Menezes-Fagundes et al., 2021; Parlebas, 2020). These modifications to internal logic represent essential pedagogical tools for fostering understanding. Indeed, it is through adjustments involving representation and exaggeration that educators can effectively guide the teaching

process (Almond, 2015; Clemente, 2012; Thorpe et al., 1986). Consequently, there exists a pressing need for additional research aimed at scrutinizing the effects of alterations to the components of internal logic on the process of game comprehension.

Organic dimension

The Organic dimension has been the subject of investigation in five articles that sought to assess the impact of comprehensive models on the development of specific skill execution in net sports. Among these, four conducted pre-post studies with control groups to discern differences in the effects of comprehensive models as compared to traditional models on skill execution. The results consistently demonstrated significant improvements favoring comprehensive models in the development of skills relevant to badminton (base movement), table tennis (forehand attack), and volleyball (overhead and forearm pass) (Batez et al., 2021; Liu et al., 2020a; Nathan, 2016; Zhang et al., 2012). It is worth emphasizing the study conducted by Liu et al. (2020b), which delved into the effects of comprehensive models over time through a pre-post study without a control group. The study revealed notable enhancements in the values of the French clear test in badminton when compared to baseline results. Zhang et al (2012) also observed skill execution improvements with technical models compared to baseline results, albeit to a lesser extent than with comprehensive model.

Since the 1990s, when comprehensive models proposed a departure from the centralized focus on technique in sports teaching, there has been considerable academic interest in the development of skill execution within comprehensive approaches (Graça & Mesquita, 2007). Numerous studies across various sports have compared tactical and technical approaches across multiple variables in order to determine their relative effectiveness (Miller, 2015). A systematic review with meta-analyses on this topic found that, of the six studies analyzed, none of them demonstrated an advantage for technical models. Conversely, two studies employing tactical models showed significant positive effects on skill execution when compared to technical models (Abad-Robles et al., 2020). These findings align with the outcomes of this review and support the premise that comprehensive models possess the potential to enhance the Organic dimension in net sports among students.

Affective dimension

Five studies have conducted assessments of the affective dimension among players (Batez et al., 2021; García-Castejón et al., 2021; García-González et al., 2020; Gil-Arias et al., 2018, 2021), and their findings have consistently revealed positive outcomes related to various aspects of this dimension. These include autonomous motivation, psychological mediators, perceived competence, enjoyment, intrinsic motivation, and self-determination motivation.

It's possible to highlight García-González et al. (2020) study that focused on the effects of the intervention on students with different levels of Relative Autonomy Index (RAI). Results show a significant improvement in the following variables: perception of the physical education teacher's support for Basic Psychological Need (BNPs), satisfaction with BPNs, satisfaction with novelty and variety, especially in students with medium and low RAI. These results are similar to those found by Gil-Arias et al. (2021), who found positive values after the intervention of a hybrid TGfU and Sports Education unit in the variables perceptions of need-support from the physical education teacher, Basic Psychological Needs satisfaction, novelty, variety satisfaction and intrinsic motivation when compared to the pre-intervention values.

It is noteworthy that previous research has established a strong link between enjoyment in game situations and motivation levels in physical education classes, emphasizing the importance of fostering enjoyment among students (Huhtiniemi et al., 2019). When comparing comprehensive models with traditional teaching approaches, the evidence from studies suggests that comprehensive models are more effective in developing different facets of the affective dimension (Graça & Mesquita, 2007; Kirk et al., 2000; Ortiz et al., 2023). Additionally, studies focusing on the use of comprehensive models in other group of sports and their impact on the development of Basic Psychological Needs have also demonstrated positive results in terms of affective variables, further supporting the potential of this type of intervention to enhance the affective dimension (Chu & Zhang, 2018). However, it's worth noting that these articles do not delve into potential relationships between these affective variables and the processes of game understanding and decision-making, which are central aspects of comprehensive models.

Furthermore, another avenue for future research regarding the affective dimension in net sports could involve the study of emotions. Existing research has already established that different types of emotions arise based on the interactions between players in games, such as psychomotor interactions (without interaction) or sociomotor interactions (cooperation, opposition, or a combination of both) (Dyson & Grineski, 2001; Lavega et al., 2013). Therefore, gaining insight into the emotions elicited by various possibilities of interaction with elements of internal logic could contribute to a deeper understanding of the process of developing the affective dimension and its relationship with game comprehension.

Conclusion

In light of this systematic review, it is evident that comprehensive models applied to net sports hold the potential to foster development across various dimensions of Motor Conduct. Recognizing the uniqueness of sports teaching processes, there are discernible points of convergence across different studies, particularly in the Affective, Cognitive, and Organic dimensions. Consequently, this

systematic review affirms that the utilization of comprehensive models for teaching net sports consistently yields significant improvements in several facets of Motor Conduct. Moreover, there is a pressing need to delve deeper into the development of game comprehension. Almond (2015) astutely propose that literature should explore how teachers organize this process or provide informed guidance on achieving understanding, especially given its fundamental importance.

Motor Praxiology enables the systematic structuring of game situations and the discernment of inherent interconnections within their internal logic. Subsequently, it facilitates the identification of interrelationships forged between the participants (actors) and the game (system), facilitating the elucidation of the influence of these interactions on their Motor Conduct across various dimensions, with particular emphasis on game comprehension. Hence, we advocate that the hybridization of comprehensive models with Motor Praxiology holds the potential to elucidate the intricate interactions between the structural design of game situations and the comprehension development, accentuating pivotal parameters that could serve as guiding benchmarks for educators in the educational process guiding.

Notably, there remains a scarcity of research that combines comprehensive models, net sports, Motor Conduct, principles of play, and game understanding. It is imperative to test whether proposed changes in internal logic (modification through representation and exaggeration) effectively encourage specific Motor Conduct in students and, more importantly, facilitate the development of principles of play and game understanding. Given the horizontal nature of comprehensive models, it is essential to seek commonalities between practices within the same category to enable the transfer of skills and knowledge between different sports.

Through synthesizing the findings of applied studies, our objective is to discern trends, emerging patterns, and knowledge gaps that are pertinent to the discourse surrounding the instruction of these sports. The review encompasses a critical evaluation of the teaching methodologies employed in the analyzed studies, providing valuable insights into the effectiveness of current approaches. Drawing from these conclusions, we put forth practical recommendations tailored for researchers, educators and coaches. From a research perspective, potential practical applications include analyzing how alterations in the internal logic of net sports may impact the assimilation of principles of play, in addition to presenting a critical view of scientific production on the topic. Furthermore, there is an opportunity to enhance the didactic knowledge of educators and coaches who aspire to incorporate comprehensive models into their approach to net sports. The findings, illustrating the efficacy of these models across various dimensions of Motor Conduct, lend support to their applicability in diverse educational settings.

As a limitation of this study, it should be noted that only studies explicitly naming the models in the article title were considered for this research. This decision may have excluded some publications from the sample. We believe that future studies should not only identify the effects of understanding models but also delve deeper into the process of comprehending the game and its intricate relationships with various game-related variables.

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