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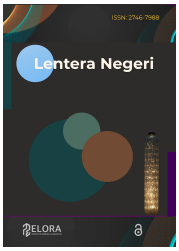

Teaching games for understanding and student learning outcomes in school physical education: a systematic review of experimental and quasi-experimental studies (2020–2025)

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ABSTRACT

Models-based practice has repositioned Teaching Games for Understanding (TGfU) as a leading game-centred alternative to technique-led instruction in school physical education (PE); however, evidence on the learning outcomes it produces remains dispersed and methodologically uneven. This systematic review synthesises experimental and quasi-experimental studies to determine which learning outcomes TGfU has been used to influence and how effective it appears to be in school settings. The review followed the PRISMA 2020 framework. A structured Boolean search of the Scopus database identified 168 records, screened against predefined inclusion and exclusion criteria covering language, document type, publication period (2020–2025), population, study design and topical relevance. Eligibility was restricted to experimental and quasi-experimental interventions measuring student learning outcomes in K–12 school PE. After duplicate removal, title and abstract screening, and full-text assessment, 23 studies were retained for synthesis. Methodological quality was appraised with the FICO framework (Focus, Information, Context, Outcome), and because the included studies used heterogeneous outcomes and instruments, the evidence was combined through thematic synthesis rather than meta-analysis. Two principal findings emerged: first, TGfU and its hybrid configurations consistently improved motivational and psychosocial outcomes, including enjoyment, perceived competence and self-determined motivation; second, effects on physical fitness, motor competence, tactical knowledge and technical skills were generally positive but more variable and dependent on intervention duration and design. The evidence base is geographically concentrated and dominated by short quasi-experimental designs. The review consolidates intervention evidence, informs teacher education and curriculum design, and calls for longitudinal, adequately powered and fidelity-controlled trials.

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Introduction

Physical education occupies a distinctive place within the global education agenda, being widely recognised as the principal institutional vehicle for cultivating movement competence, lifelong physical activity and holistic development among young people. International concern over childhood physical inactivity and

declining motor competence has intensified scrutiny of how PE is taught, prompting a shift from teacher-centred, technique-first instruction toward pedagogical models that foreground meaning, participation and learner agency (Cereda (2023); Elumalai et al. (2022)). Within this reform movement, models-based practice has become an organising principle that encourages teachers to align learning intentions with theoretically grounded designs rather than defaulting to skill-drill routines (Casey & MacPhail, 2018; Zhang et al. (2024)). The quality of pedagogy, more than the activity itself, shapes whether students leave PE motivated, competent and disposed toward an active life.

Teaching Games for Understanding (TGfU), introduced by Bunker and Thorpe (1982), epitomises this game-centred turn. Rather than rehearsing techniques in isolation, TGfU situates learning within modified, tactically representative games so that students first grasp the problems a game poses and then develop the skills required to solve them. The model sequences learning through game form, game appreciation, tactical awareness, decision-making and skill execution, repositioning the learner as an active problem-solver (Ribas et al. (2023); Barquero-Ruiz & Kirk (2024)). Despite decades of advocacy, the empirical case for TGfU has accumulated unevenly, and its theoretical underpinnings continue to be debated and extended (Harvey & Cope (2025); Jones et al. (2023)).

A substantial body of intervention research has examined the consequences of TGfU for diverse learning outcomes. Studies have reported gains in tactical knowledge and decision-making (Harvey et al. (2020); Práxedes et al. (2021)), in motivation, enjoyment and perceived competence (Gil-Arias et al. (2020); Gaspar et al. (2021)), and in technical and motor skills (Wibowo et al. (2024); Rezaee et al. (2025)). Others have addressed physical fitness and physical activity intensity (Cocca et al. (2020); Stojanović et al. (2023)) and psychosocial constructs such as sportsmanship and emotion regulation (Buendía et al. (2021); Nazari et al. (2025)). Collectively, this literature suggests that TGfU can influence cognitive, affective, social and physical domains, yet the breadth of outcomes and instruments complicates direct comparison and cumulative interpretation.

Two pedagogical advances have shaped recent work. First, hybridisation has become commonplace, with TGfU frequently combined with Sport Education or the model of personal and social responsibility to capitalise on complementary strengths (Gil-Arias et al. (2020); Gil-Arias et al. (2021); García-Castejón et al. (2021); Zhang et al. (2024)). Such hybrids appear especially effective for motivational and social outcomes (Pan et al. (2023); Buendía et al. (2021)). Second, digital technologies-particularly tablet-based video tagging and student-led video debates-have been integrated to support tactical reflection within game-based approaches (Greve et al. (2022); Diekhoff (2024); Diekhoff & Greve (2025)). These developments signal a maturing field but also introduce heterogeneity that a contemporary synthesis must accommodate (González-Víllora et al., 2019).

Despite this activity, the evidence base remains fragmented. Primary studies are dominated by short interventions, modest samples and single-sport contexts, which constrains generalisability and obscures whether reported gains endure (Arias-Estero et al. (2020); Gaspar et al. (2021)). Existing reviews have tended to focus on the implementation of game-centred approaches in general (Silva et al. (2021)) or on hybrid models anchored in Sport Education (Zhang et al. (2024)), rather than on the spectrum of learning outcomes attributable to TGfU interventions specifically in school PE. Consequently, practitioners and teacher educators lack a consolidated, outcome-oriented account of what TGfU reliably achieves under controlled conditions.

A second gap is methodological. Conceptual contributions have questioned whether TGfU is adequately theorised, proposing classification criteria, cognitive-load perspectives and character-education extensions (Ribas et al. (2023); Harvey & Cope (2025); Dudley (2025)), while empirical work relies heavily on quasi-experimental designs with limited control of fidelity (Tangkudung & Mahyudi (2022); García-Castejón et al. (2021)). Teacher-facing evidence indicates that, although practitioners value TGfU, they encounter persistent difficulties enacting it faithfully (Papagiannopoulos et al. (2023); Sanz-Remacha et al. (2025)). These limitations raise the question of whether optimism surrounding TGfU is matched by methodologically robust intervention evidence.

Given the rapid growth of publications between 2020 and 2025 and the absence of a recent synthesis dedicated to TGfU intervention outcomes, a systematic review is timely. Synthesising controlled studies can establish which outcome domains are well supported, where evidence is thin or contradictory, and which methodological practices warrant strengthening. Such a synthesis offers value to curriculum designers, teacher educators and policymakers seeking evidence-informed justification for adopting game-centred

pedagogy in schools (Pritchard & Dockerty (2025); Elumalai et al. (2022)). To this end, the review pursues three questions.

RQ1. What types of learning outcomes have been examined in experimental and quasi-experimental studies implementing TGfU in school physical education?. RQ2. What evidence do these studies provide regarding the effectiveness of TGfU in improving students' learning outcomes?. RQ3. What are the methodological and contextual characteristics-research designs, intervention configurations, and geographic and temporal patterns-of this evidence base, and what gaps and future directions follow? Together, the three questions yield a focused, outcome-centred synthesis of controlled TGfU research that integrates effectiveness with design and field-level trends-an integration not offered by prior reviews. In addressing these questions, the review evaluates intervention effectiveness-rather than measurement validity or implementation fidelity per se-by synthesising the direction, consistency, and, where reported, the magnitude of effects across studies, together with the validated instruments used to capture them (for example, the Game Performance Assessment Instrument for tactical performance and validated self-determination scales for motivational outcomes).

Method

Research Design and Framework

A systematic literature review (SLR) was adopted because it provides a transparent, replicable and rigorous procedure for locating, appraising and synthesising evidence on a defined question, thereby reducing selection bias relative to narrative reviews (Tranfield et al., 2003; Liberati et al., 2009). The review was designed and reported in accordance with the PRISMA 2020 statement (Page et al., 2021; Moher et al., 2009). Because the review targets the effectiveness of an intervention, eligibility was deliberately restricted to experimental and quasi-experimental studies; given the heterogeneity of outcomes and instruments, a qualitative thematic synthesis was selected over meta-analysis.

Search Strategy

The search combined controlled and free-text terms across three conceptual blocks-the pedagogical model, the educational setting and the outcome focus-joined with Boolean operators and applied to the title, abstract and keyword fields (TITLE-ABS-KEY). Truncation (asterisk) captured morphological variants. The string executed was:

> ("Teaching Games for Understanding" OR TGfU) AND ("physical education" OR "school physical education" OR "physical education and sport" OR "physical education lesson*" OR "physical education class*" OR "physical education teaching") AND (student* OR pupil* OR child* OR adolescent* OR youth)

Field codes restricted matches to substantive bibliographic fields, while truncation broadened recall for plural and spelling variants. Limiters were subsequently applied for publication year, language, document type and subject area, as detailed in eligibility criteria.

Database and Information Sources

Scopus served as the primary and authoritative information source, selected for its broad coverage of peer-reviewed sport pedagogy, education and health journals and its rigorous indexing. The search was executed in a single session to ensure a stable record set, and all retrieved metadata were exported for screening. No supplementary databases were used, a boundary acknowledged as a limitation in Section 5.5; this decision prioritised indexing consistency and reproducibility of the record count underpinning the PRISMA flow. No supplementary databases were searched. We acknowledge that multi-database searching is standard practice for systematic reviews and that confining identification to Scopus may introduce retrieval bias by omitting studies indexed only in Web of Science, ERIC, SPORTDiscus, or PubMed. Scopus was nevertheless selected as a single, high-coverage index to maximise metadata consistency and the exact reproducibility of the record count underpinning the PRISMA flow; this boundary is registered among the limitations, and the conclusions are framed accordingly.

Eligibility Criteria

Eligibility was governed by predefined inclusion and exclusion criteria operationalised through a PICOS logic (Population: K–12 school students; Intervention: a TGfU-based game-centred approach; Comparison: a control or alternative-pedagogy condition, or pre–post change; Outcomes: quantitatively measured student learning outcomes; Study design: experimental or quasi-experimental). Reviews, conceptual and position

papers, purely qualitative studies, research-and-development or model-validation studies, action research, single-group pre-experimental designs, and studies on non-school populations were excluded. Table 1 summarises the criteria.

Table 1. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Language	English-language publications	Non-English publications
Document type	Peer-reviewed empirical journal articles	Conference papers, book chapters, editorials, theses
Publication period	2020–2025	Published before 2020
Subject area	Education; social sciences; health professions; sport pedagogy	Unrelated disciplines
Population	K–12 school students	University/college students, pre-service teachers, elite athletes, non-school settings
Intervention	A TGfU-based game-centred approach	Pure technique-centred or non-TGfU pedagogies
Study design	Experimental or quasi-experimental (with control/comparison or pre–post measurement)	Reviews, conceptual/position papers, qualitative-only, R&D/model-validation, action research, single-group pre-experimental
Outcome	At least one quantitatively measured student learning outcome	No assessable learning outcome reported
Relevance	Directly evaluates TGfU in school PE	Tangential or incidental mention only

Study Selection Process

Selection proceeded in sequential stages consistent with PRISMA 2020. Following export, 12 duplicate records were removed, leaving 156 records for title and abstract screening; 71 clearly off-topic records were excluded. Of 85 reports sought for retrieval, 9 could not be obtained, leaving 76 reports assessed in full text against the eligibility criteria. Screening was conducted systematically, with uncertain cases re-examined and ambiguous records retained to the next stage to minimise premature exclusion. The resulting flow is depicted in Figure 1. Title–abstract and full-text screening were conducted independently by two reviewers; inter-rater agreement was substantial (Cohen's $\kappa = 0.75$ at title-abstract and 0.76 at full text), with disagreements resolved by discussion until consensus.

Quality Assessment (FICO Framework)

Methodological quality and topical fit were appraised using a four-dimensional FICO framework-Focus (clarity of aims and alignment with TGfU), Information (adequacy of methodological reporting, sampling and instruments), Context (appropriateness of the school PE setting and population) and Outcome (clarity and assessability of reported learning outcomes). Each dimension was rated on a three-point scale (0 = not met, 1 = partially met, 2 = fully met), yielding a maximum of eight points; studies scoring at least four points, with no dimension scored zero, met the threshold for inclusion.

Data Extraction Procedure

A standardised template captured, for each included study, the author(s), year, country, research design, sample characteristics, sport context, intervention configuration (including hybridisation or digital components), outcome measures and principal findings. Extracted data populated the descriptive tables (Tables 2 and 3) and underpinned the synthesis, drawn directly from the source records to preserve fidelity to authors' reported titles, terminology and findings.

Network and Bibliometric Analysis Methodology

Descriptive bibliometric procedures characterised the corpus: the annual distribution of included studies revealed publication trends (Figure 2); geographic provenance, coded from author affiliations and reported

settings, mapped contributing countries (Figure 3); and thematic clustering grouped studies by primary outcome focus to visualise the conceptual structure of the evidence (Figure 4).

Data Analysis and Synthesis

Findings were integrated using thematic synthesis (Thomas & Harden, 2008), proceeding from line-by-line coding of study findings, through descriptive themes, to analytical themes addressing the review questions. Codes were derived inductively from reported outcomes and intervention features and organised into outcome-domain themes; contradictory and null findings were deliberately retained to avoid confirmation bias.

Reporting and Documentation

The review was documented in compliance with the PRISMA 2020 checklist and flow diagram (Page et al., 2021). Record counts reported in the abstract, methods and results are mutually consistent and correspond to Figure 1.

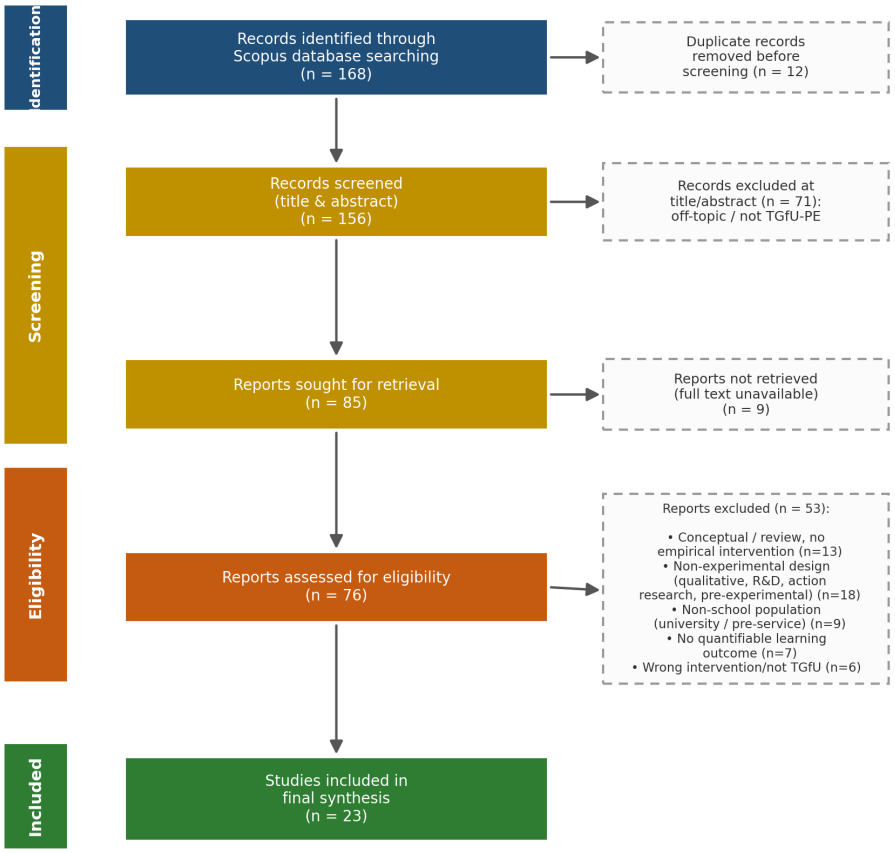

Figure 1. PRISMA 2020 flow diagram of the study identification, screening, eligibility and inclusion process.

Results and Discussions

Study Selection Results

The Scopus search identified 168 records. After removing 12 duplicates, 156 records were screened by title and abstract, of which 71 were excluded as off-topic or as not addressing TGfU within school physical education. Of the 85 reports sought for retrieval, 9 could not be obtained, leaving 76 reports assessed in full text. A further 53 reports were excluded for being conceptual or review papers without an empirical intervention (n = 13), employing a non-experimental design such as qualitative, research-and-development, action-research or single-group pre-experimental approaches (n = 18), involving a non-school population

such as university or pre-service samples (n = 9), reporting no quantifiable learning outcome (n = 7), or lacking a genuine TGfU intervention (n = 6). Consequently, 23 experimental and quasi-experimental studies met all criteria and were included in the synthesis, corresponding exactly to the PRISMA flow in Figure 1.

Descriptive Characteristics

The 23 included studies were published between 2020 and 2025 and span a range of countries, sports and outcome foci. Table 2 summarises each study, reporting authorship, year, country, design, full title and a concise statement of key findings. Table 3 classifies the studies by design, thematic focus, intervention configuration and outcome direction. The annual distribution (Figure 2), geographic provenance (Figure 3) and thematic clustering (Figure 4) follow.

Table 2. Summary of included studies (n = 23)

Author(s) & Year	Country	Design	Title	Key findings
Arias-Estero et al. 2020	Spain	Mixed-methods (quasi-experimental)	Effects of two TGFU lessons period on game performance, knowledge and psychosocial variables in elementary physical education	Both 8- and 14-lesson TGfU periods improved game performance, knowledge and psychosocial variables; practice volume alone did not differentiate outcomes.
Cocca et al. 2020	Mexico	Quasi-experimental (cluster)	Does a multiple-sport intervention based on the TGFU pedagogical model for physical education increase physical fitness in primary school children?	A six-month multi-sport TGfU programme significantly improved primary children's flexibility, abdominal strength, speed and handgrip versus controls.
Gil-Arias et al. 2020	Spain	Quasi-experimental (crossover)	Autonomy support, motivational climate, enjoyment and perceived competence in physical education: Impact of a hybrid teaching games for understanding/sport education unit	A hybrid TGfU/SE unit increased autonomy support, enjoyment and perceived competence relative to direct instruction.
Santoso et al. 2024	Indonesia	Quasi-experimental	How do the Learning Models of Teaching Game for Understanding and Problem-Based Learning Influence Fundamental Football Skills in Physical Education? Conducting an Analysis in the Elementary School Context	Both TGfU and problem-based learning significantly improved elementary students' fundamental football skills, with TGfU producing the larger effect.
Harvey et al. 2020	Spain	Quasi-experimental	Effects of teaching games for understanding on tactical knowledge development in middle school physical education	A TGfU soccer unit significantly developed middle-school students' tactical knowledge.
Ferraz et al. 2024	Portugal	Quasi-experimental	Effects of implementating a hybrid teaching model in a basketball didactic unit	A hybrid SEM/TGfU basketball unit enhanced adolescents' performance and motivation.

Author(s) & Year	Country	Design	Title	Key findings
Sholehudin et al. 2025	Indonesia	Quasi-experimental	Enhancing motor educability in young learners: challenging the 'schools without brains' stigma through teaching games for understanding	TGfU enhanced young learners' motor educability, challenging assumptions that sport schooling neglects cognition.
Gaspar et al. 2021	Spain	Quasi-experimental	How tgfu influence on students' motivational outcomes in physical education? A study in elementary school context	A TGfU-plus-questioning programme improved primary students' basic psychological need satisfaction, motivation and intention to be active.
Wibowo et al. 2024	Indonesia	Experimental	Effectiveness of a modified TGfU program in enhancing volleyball skills among elementary school students	A modified TGfU volleyball model significantly improved elementary boys' serving and passing technical skills versus traditional classes.
Neira-Navarrete et al. 2024	Chile	Quasi-experimental	Effects of Modified Invasion Games on Motor Competence and Self-Assessed Physical Condition in Elementary School Students in the Physical Education Classroom	A 12-week modified-invasion-games programme improved fifth-graders' real and perceived motor competence.
Tangkudung & Mahyudi 2022	Indonesia	Quasi-experimental (mixed-methods)	Teaching Game for Understanding (TGfU) Learning Design for Basketball Games in Physical Education	A TGfU basketball design significantly improved decision-making, technical execution, game performance and enjoyment.
López-Lemus et al. 2023	Spain	Quasi-experimental	Could the Hybridization of the SE/TGfU Pedagogical Models Be an Alternative for Learning Sports and Promoting Health? School Context Study	An SE/TGfU hybrid unit improved enjoyment, perceived competence, decision-making and game performance versus a technical approach.
Pan et al. 2023	Taiwan	Quasi-experimental	A comparison of the learning effects between TGfU-SE and TGfU on learning motivation, sport enjoyment, responsibility, and game performance in physical education	TGfU-SE produced better learning motivation, enjoyment, responsibility and game performance than TGfU alone.
Arantes et al. 2025	Brazil	Quasi-experimental	Life Skills and Volleyball Teaching: Comparison Between TGfU and Direct Instruction Model	TGfU and direct instruction were comparable for tactical-technical learning, but TGfU yielded higher teamwork (life-skill) scores.

Author(s) & Year	Country	Design	Title	Key findings
Gouveia et al. 2022	Portugal	Quasi-experimental	The Impact of Different Pedagogical Models on Moderate-to-Vigorous Physical Activity in Physical Education Classes	Lesson length and pedagogical model influenced moderate-to-vigorous physical activity in PE invasion-game classes.
Stojanović et al. 2023	Serbia	Cluster-randomized trial	School-Based TGfU Volleyball Intervention Improves Physical Fitness and Body Composition in Primary School Students: A Cluster-Randomized Trial	A 16-week TGfU volleyball intervention improved primary students' physical fitness and body composition.
Práxedes et al. 2021	Spain	Quasi-experimental	Combining Physical Education and unstructured practice during school recess to improve the students' decision-making and execution	Adding unstructured recess practice to a TGfU basketball unit further improved decision-making and execution.
Batez et al. 2021	Slovenia	Randomized controlled trial	Effects of teaching program based on teaching games for understanding model on volleyball skills and enjoyment in secondary school students	A TGfU programme improved secondary students' volleyball skills and enjoyment versus usual PE.
Nazari et al. 2025	Iran	Quasi-experimental	Combined teaching games for understanding and sport education in PE can improve student emotion regulation, intrapersonal intelligence and psychomotor skills	Combined TGfU+SE improved students' intrapersonal intelligence, metacognition, emotion regulation and psychomotor skills.
García-Castejón et al. 2021	Spain	Mixed-methods (quasi-experimental)	Implementation of a hybrid educational program between the model of personal and social responsibility (Tpsr) and the teaching games for understanding (tgfu) in physical education and its effects on health: An approach based on mixed methods	A hybrid TPSR/TGfU programme positively affected students' health and psychosocial variables.
Buendía et al. 2021	Spain	Quasi-experimental	Effects of a hybrid teaching model (SEM + TGfU) and the model of personal and social responsibility on sportsmanship and enjoyment in 4° Secondary and 1° Baccalaureate students	Hybrid SEM+TGfU and the personal-and-social-responsibility model both enhanced sportsmanship and enjoyment.
Rezaee et al. 2025	Iran	Quasi-experimental	Comparison of the Effectiveness of a Gymnastics Training Program and Teaching	Both gymnastics training and TGfU improved children's gross motor

Author(s) & Year	Country	Design	Title	Key findings
			Games for Understanding on Improving Gross Motor Skills in Children Aged 4 to 11 Years	skills, with age-dependent differences.
Gil-Arias et al. 2021	Spain	Quasi-experimental	Effect of a hybrid teaching games for understanding/sport education unit on elementary students' self-determined motivation in physical education	A hybrid TGfU/SE invasion-game unit promoted self-determined motivation for both boys and girls.

Table 3. Classification of included studies by theme, intervention and outcome

Author(s) & Year	Country	Research design	Theme / focus	Intervention	Outcome
Arias-Estero et al. 2020	Spain	Mixed-methods (quasi-experimental)	Game performance & tactical understanding	TGfU floorball (elementary)	Positive (improved over baseline)
Cocca et al. 2020	Mexico	Quasi-experimental (cluster)	Physical fitness	Multi-sport TGfU (6 months)	Positive (fitness gains)
Gil-Arias et al. 2020	Spain	Quasi-experimental (crossover)	Motivation & psychosocial outcomes	Hybrid TGfU/SE	Positive (motivation, enjoyment)
Santoso et al. 2024	Indonesia	Quasi-experimental	Technical skill development	TGfU vs Problem-Based Learning (football)	Positive (skills; TGfU stronger)
Harvey et al. 2020	Spain	Quasi-experimental	Tactical knowledge & decision-making	TGfU soccer (middle school)	Positive (tactical knowledge)
Ferraz et al. 2024	Portugal	Quasi-experimental	Motivation & psychosocial outcomes	Hybrid SEM/TGfU (basketball)	Positive (performance, motivation)
Sholehudin et al. 2025	Indonesia	Quasi-experimental	Physical fitness & motor competence	TGfU (motor educability)	Positive (motor educability)
Gaspar et al. 2021	Spain	Quasi-experimental	Motivation & psychosocial outcomes	TGfU + questioning	Positive (motivation, BPN)
Wibowo et al. 2024	Indonesia	Experimental	Technical skill development	Modified TGfU (volleyball)	Positive (technical skills)
Neira-Navarrete et al. 2024	Chile	Quasi-experimental	Physical fitness & motor competence	Modified invasion games	Positive (motor competence)
Tangkudung & Mahyudi 2022	Indonesia	Quasi-experimental	Game performance &	TGfU basketball design	Positive (decision-making, performance)

Author(s) & Year	Country	Research design	Theme / focus	Intervention	Outcome
		(mixed-methods)	tactical understanding		
López-Lemus et al. 2023	Spain	Quasi-experimental	Motivation & psychosocial outcomes	Hybrid SE/TGfU	Positive (multiple outcomes)
Pan et al. 2023	Taiwan	Quasi-experimental	Motivation & psychosocial outcomes	TGfU-SE vs TGfU	Positive (TGfU-SE > TGfU)
Arantes et al. 2025	Brazil	Quasi-experimental	Motivation & psychosocial outcomes	TGfU vs direct instruction (volleyball)	Mixed (no tactical diff; ↑ teamwork)
Gouveia et al. 2022	Portugal	Quasi-experimental	Physical fitness & motor competence	TGfU vs hybrid TGfU-SE (MVPA)	Context-dependent (MVPA)
Stojanović et al. 2023	Serbia	Cluster-randomized trial	Physical fitness & motor competence	TGfU volleyball (16 weeks)	Positive (fitness, body composition)
Práxedes et al. 2021	Spain	Quasi-experimental	Tactical knowledge & decision-making	TGfU basketball + recess practice	Positive (decision-making, execution)
Batez et al. 2021	Slovenia	Randomized controlled trial	Technical skill development	TGfU volleyball	Positive (skills, enjoyment)
Nazari et al. 2025	Iran	Quasi-experimental	Motivation & psychosocial outcomes	TGfU + SE (football)	Positive (psychosocial, psychomotor)
García-Castejón et al. 2021	Spain	Mixed-methods (quasi-experimental)	Motivation & psychosocial outcomes	Hybrid TPSR/TGfU	Positive (health, psychosocial)
Buendía et al. 2021	Spain	Quasi-experimental	Motivation & psychosocial outcomes	Hybrid SEM+TGfU vs TPSR	Positive (sportsmanship, enjoyment)
Rezaee et al. 2025	Iran	Quasi-experimental	Physical fitness & motor competence	Gymnastics vs TGfU	Positive (gross motor skills)
Gil-Arias et al. 2021	Spain	Quasi-experimental	Motivation & psychosocial outcomes	Hybrid TGfU/SE (invasion games)	Positive (self-determined motivation)

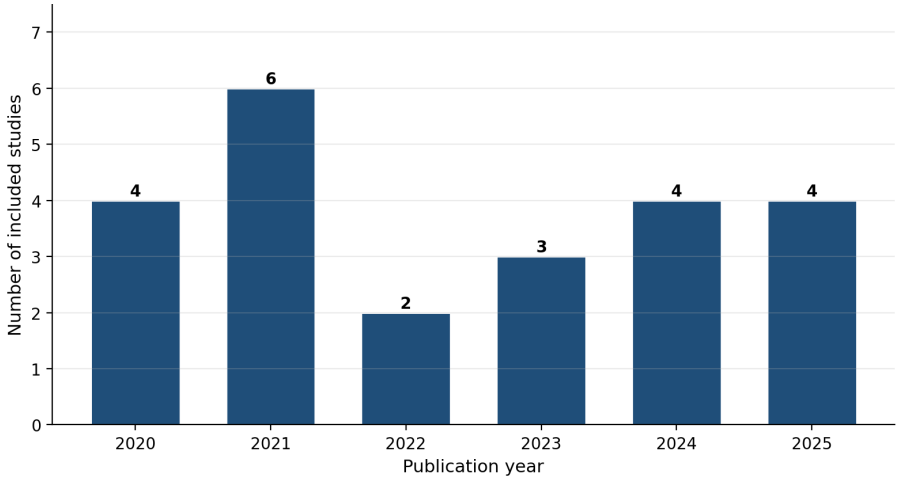

Figure 2. Annual distribution of the 23 included studies (2020–2025).

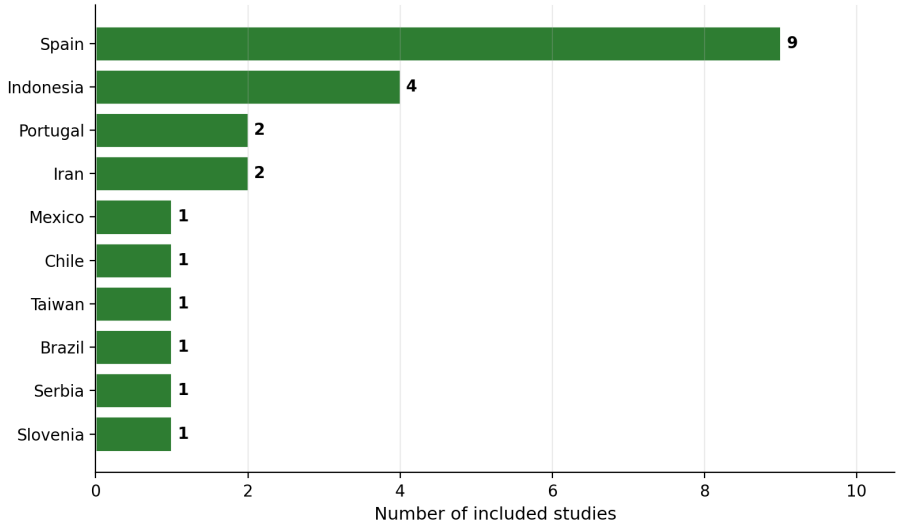

Figure 3. Contributing countries among the included studies, coded from author affiliations and study settings.

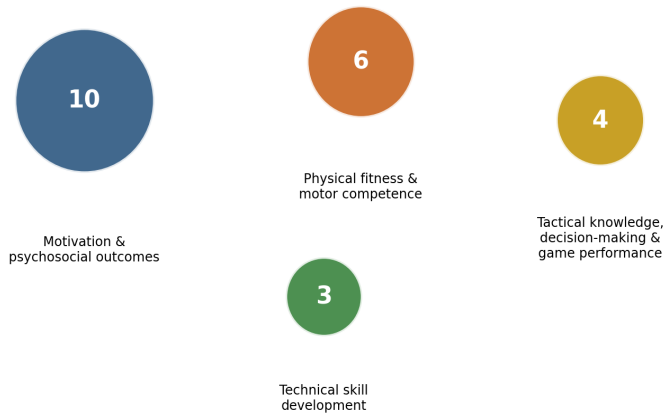

Figure 4. Thematic clusters of included studies; bubble size denotes the number of studies assigned to each primary outcome focus.

Thematic Synthesis

RQ1: Types of Learning Outcomes Examined

Across the 23 controlled studies, learning outcomes clustered into four domains: affective-motivational, physical-motor, tactical-cognitive, and technical-skill (Figure 4). The affective-motivational domain was the most heavily represented, reflecting the field's strong alignment with self-determination theory. Studies measured enjoyment, perceived competence, autonomy support, basic psychological need satisfaction and self-determined motivation (Gil-Arias et al. (2020); Gaspar et al. (2021); Gil-Arias et al. (2021); López-Lemus et al. (2023); Pan et al. (2023)). Related social-moral outcomes-sportsmanship, responsibility, life skills and emotion regulation-were investigated in a further set of studies that extended the model toward character and affective education (Buendía et al. (2021); Arantes et al. (2025); Nazari et al. (2025); García-Castejón et al. (2021)).

The physical-motor domain, though less frequently targeted, was substantive. Investigations addressed physical fitness, body composition, moderate-to-vigorous physical activity and motor competence (Cocca et al. (2020); Stojanović et al. (2023); Gouveia et al. (2022); Neira-Navarrete et al. (2024); Rezaee et al. (2025); Sholehudin et al. (2025)). These studies typically employed longer interventions and objective measures such as fitness batteries and accelerometry, situating TGfU within health-oriented PE outcomes rather than narrowly tactical ones.

The tactical-cognitive and technical-skill domains completed the outcome landscape. Several studies treated tactical knowledge, decision-making and game performance as the defining target of TGfU (Harvey et al. (2020); Tangkudung & Mahyudi (2022); Práxedes et al. (2021); Arias-Estero et al. (2020)), while others focused on the acquisition of sport-specific technical skills (Santoso et al. (2024); Wibowo et al. (2024); Batez et al. (2021)). In answer to RQ1, the controlled evidence demonstrates that TGfU has been studied as a multidimensional pedagogy whose investigated outcomes span affective, physical, cognitive and technical domains, with motivational and psychosocial outcomes most prominent and physical-fitness outcomes comparatively underrepresented.

RQ2: Evidence of Effectiveness

The weight of evidence indicates that TGfU and its hybrid variants are effective for motivational and psychosocial outcomes. Controlled and crossover studies reported gains in enjoyment, perceived competence and autonomous motivation relative to direct instruction (Gil-Arias et al. (2020); Gil-Arias et al. (2021); López-Lemus et al. (2023)), and these benefits frequently extended across both sexes and to initially less-motivated learners (Gil-Arias et al. (2021); Gaspar et al. (2021)). Hybrid TGfU–Sport Education configurations were repeatedly associated with superior motivational and engagement outcomes compared with single-model conditions (Pan et al. (2023); Ferraz et al. (2024); Buendía et al. (2021)), suggesting that the structural features of Sport Education amplify the motivational affordances of game-centred learning.

Evidence for tactical-cognitive and technical effectiveness was positive but more contingent on design. Studies documented significant improvements in tactical knowledge, decision-making and game performance (Harvey et al. (2020); Tangkudung & Mahyudi (2022); Práxedes et al. (2021)), and modified TGfU programmes improved sport-specific technical skills relative to traditional classes (Wibowo et al. (2024); Santoso et al. (2024); Batez et al. (2021)). However, comparative studies sometimes found no significant tactical-technical advantage of TGfU over direct instruction, even where psychosocial benefits such as teamwork emerged (Arantes et al. (2025)). Such results temper any blanket claim of cognitive superiority and indicate that effects depend on the outcome measured and the comparison condition.

In the physical-motor domain the evidence was favourable but more heterogeneous. Sustained interventions improved physical fitness, body composition and motor competence (Cocca et al. (2020); Stojanović et al. (2023); Neira-Navarrete et al. (2024); Sholehudin et al. (2025)), yet moderate-to-vigorous physical activity appeared sensitive to lesson length and model configuration rather than to TGfU per se (Gouveia et al. (2022)). Where TGfU was compared with specialised training, both approaches produced motor gains, implying that TGfU is competitive rather than uniquely superior for motor development (Rezaee et al. (2025)). In answer to RQ2, TGfU is consistently effective for motivational, psychosocial and tactical outcomes and beneficial but more variable for physical-fitness and isolated technical outcomes, with effect magnitude moderated by intervention duration, fidelity and comparison condition.

RQ3: Methodological and Contextual Characteristics and Gaps

Methodologically, the included evidence is dominated by quasi-experimental designs, frequently of short duration and modest sample size (Arias-Estero et al. (2020); Gaspar et al. (2021); García-Castejón et al. (2021); López-Lemus et al. (2023)). Randomised and cluster-randomised trials were present but

comparatively rare (Stojanović et al. (2023); Batez et al. (2021)), and crossover and mixed-method designs contributed additional rigour and contextual insight (Gil-Arias et al. (2020); Tangkudung & Mahyudi (2022)). A defining design feature is hybridisation: rather than implementing TGfU in isolation, many studies combined it with Sport Education or the model of personal and social responsibility to target multidimensional outcomes (Gil-Arias et al. (2020); Gil-Arias et al. (2021); García-Castejón et al. (2021); Buendía et al. (2021); Ferraz et al. (2024)). This integrative orientation positions TGfU as the tactical engine within broader pedagogical architectures.

Temporally, the corpus rose from four included studies in 2020 to a sustained four to six per year through 2025 (Figure 2), indicating an active and maturing field. Geographically, however, the evidence is concentrated: Spain alone contributed nine of the 23 studies, followed by Indonesia, with Portugal and Iran next (Figure 3). The Spanish cluster is distinguished by motivation-focused, self-determination-theory-driven hybrid designs (Gil-Arias et al. (2020); Gil-Arias et al. (2021); Gaspar et al. (2021); García-Castejón et al. (2021)), whereas other settings contributed fitness- and skill-oriented interventions (Stojanović et al. (2023); Wibowo et al. (2024); Rezaee et al. (2025)). Such concentration raises questions about the cultural and curricular transferability of findings.

Several gaps follow from these patterns. First, interventions are predominantly brief, leaving the durability and transfer of TGfU-induced learning largely unexamined (Arias-Estero et al. (2020); Práxedes et al. (2021)). Second, the reliance on quasi-experimental designs with asserted rather than measured fidelity limits causal inference, with adequately powered randomised trials remaining the exception (Stojanović et al. (2023); Batez et al. (2021)). Third, the geographic concentration and the relative scarcity of fitness-focused controlled trials constrain generalisation across populations and outcome domains. In answer to RQ3, the controlled evidence is increasingly hybrid yet methodologically modest, temporally recent and geographically narrow, with clear gaps in longitudinal, adequately powered and geographically diverse research.

Comparative and Critical Analysis

Comparing designs across the corpus reveals a field that privileges pedagogical plausibility over methodological rigour. Of the 23 included studies, the large majority employed quasi-experimental designs-typically pre-test/post-test structures with non-equivalent comparison groups and short intervention windows of four to sixteen lessons (Arias-Estero et al. (2020); Gaspar et al. (2021); López-Lemus et al. (2023); García-Castejón et al. (2021)). Such designs are well suited to demonstrating proximal change but are vulnerable to selection, maturation and teacher-as-researcher effects, particularly where fidelity is asserted rather than measured.

A minority of studies adopted more robust designs. A cluster-randomised trial and a randomised controlled trial provided stronger causal warrant for fitness and skill outcomes (Stojanović et al. (2023); Batez et al. (2021)), while a crossover design and mixed-method quasi-experiments combined internal control with contextual insight into how game-centred learning operates (Gil-Arias et al. (2020); Tangkudung & Mahyudi (2022); García-Castejón et al. (2021)). The coexistence of these traditions signals methodological pluralism, but the scarcity of adequately powered randomised and longitudinal work remains the principal weakness of the evidence base.

Examined over time, a modest evolution is discernible. Earlier studies in the window tended toward isolated TGfU implementations assessed on narrow tactical or motivational measures (Harvey et al. (2020); Gil-Arias et al. (2020)), whereas later studies increasingly embraced hybrid designs and multidimensional outcome batteries spanning motivation, psychosocial skills and physical fitness (Nazari et al. (2025); Arantes et al. (2025); Rezaee et al. (2025)). This trajectory suggests a field progressing from establishing that TGfU works toward understanding how, for whom and under what conditions it works-an advance that nonetheless awaits consolidation through powered, fidelity-controlled and longitudinal research.

Discussion

The synthesis portrays TGfU as a robust pedagogy for the affective and tactical dimensions of learning and a promising but less decisively superior approach for physical and isolated technical outcomes. The prominence of motivational benefits is theoretically coherent: by situating skill within meaningful, autonomy-supportive games, TGfU satisfies basic psychological needs and thereby fosters enjoyment and self-determined engagement (Gil-Arias et al. (2020); Gaspar et al. (2021); Gil-Arias et al. (2021)). The frequent parity between TGfU and direct instruction on narrow technical measures, alongside its advantage on transfer-relevant tactical and social measures, suggests that the model's distinctive value lies in developing

adaptive, decision-rich competence rather than decontextualised technique (Arantes et al. (2025); Harvey et al. (2020)).

The findings both extend and complicate the social-constructivist orthodoxy that has long underpinned TGfU. Emerging conceptual work positions cognitive-load and constraints-led perspectives as complementary explanatory lenses, implying that understanding may be produced through multiple, non-exclusive mechanisms (Harvey & Cope (2025); Barquero-Ruiz & Kirk (2024)). Contributions proposing classification criteria and character-oriented extensions indicate that the model's theoretical architecture is still being actively elaborated rather than settled (Ribas et al. (2023); Dudley (2025); Jones et al. (2023)).

For practitioners and teacher educators, the evidence supports deploying TGfU-especially in hybrid configurations with Sport Education-to enhance motivation, enjoyment and tactical understanding, while setting realistic expectations for fitness gains that depend on sustained, sufficiently intense engagement (Pan et al. (2023); Gouveia et al. (2022); Stojanović et al. (2023)). Because teachers report genuine difficulties enacting the model faithfully, investment in professional learning, exemplar units and structured questioning routines appears essential (Papagiannopoulos et al. (2023); Sanz-Remacha et al. (2025); Pritchard & Dockerty (2025)).

The present synthesis aligns with and sharpens earlier reviews. Consistent with the finding that game-centred-approach research is expanding and that TGfU is its most prevalent variant (Silva et al. (2021)), this review documents continued growth through 2025. It corroborates the conclusion that hybrid models integrating Sport Education optimise multidimensional outcomes (Zhang et al. (2024)) and that model-based approaches can benefit fitness, achievement and enjoyment (Elumalai et al. (2022)). Its distinctive contribution is an explicit, outcome-centred mapping restricted to controlled intervention evidence, rather than to implementation or a single hybrid family.

Notable tensions persist. Whereas many studies report tactical and cognitive benefits for TGfU, others find no significant difference from direct instruction on technical-tactical measures (Arantes et al. (2025); Arias-Estero et al. (2020)), and physical-activity outcomes appear contingent on structural factors rather than pedagogy alone (Gouveia et al. (2022)). These contradictions plausibly reflect heterogeneity in fidelity, dosage, outcome instruments and comparison conditions, underscoring the hazard of aggregating disparate studies without attention to design.

At least three gaps are evident. First, longitudinal evidence on the durability and transfer of TGfU-induced learning is scarce, as most interventions are brief (Arias-Estero et al. (2020); Práxedes et al. (2021)). Second, fidelity-controlled, adequately powered randomised trials remain rare relative to quasi-experimental studies (Stojanović et al. (2023); Batez et al. (2021)). Third, inclusive and geographically diverse research is limited, with evidence concentrated in a few countries and little attention to learners with special educational needs (Dimmick (2022); Tang (2023)).

Several threats to validity bound the strength of these conclusions. Publication and retrieval bias cannot be excluded: identification was confined to a single database (Scopus) and to English-language journal articles, so grey literature, non-English studies, and null results published elsewhere may be under-represented; because the synthesis is narrative rather than meta-analytic, this bias could not be tested through funnel-plot asymmetry or trim-and-fill estimation. Study-quality heterogeneity is substantial-most included studies are short quasi-experiments with non-equivalent groups and asserted rather than measured fidelity-so the pooled direction of effects should be read as indicative rather than definitive. Contextual moderators that plausibly shape outcomes-intervention dosage and duration, sport type, hybrid configuration, and implementation fidelity-were not systematically coded as effect moderators, limiting causal attribution. Finally, the boundary conditions for generalisation are narrow: the evidence concerns K–12 school PE, is concentrated in a small number of countries (notably Spain), and rests largely on proximal post-test outcomes, so transfer to other systems, age groups, and to durable or transferable learning remains uncertain.

Three concrete priorities follow. First, the field requires adequately powered, fidelity-controlled and longitudinal trials-including cluster-randomised designs-to establish durable, transferable effects (Stojanović et al. (2023); Batez et al. (2021)). Second, research should broaden geographically and toward under-served populations, embedding inclusive and culturally responsive designs (Dimmick (2022); Campbell et al. (2024); Tang (2023)). Third, future work should harmonise outcome instruments and pursue meta-analytic synthesis, while continuing to interrogate the digital and theoretical refinements now reshaping the model (Diekhoff & Greve (2025); Harvey & Cope (2025); Dudley (2025)).

In direct response to the review questions: RQ1-TGfU has been examined across affective-motivational, physical-motor, tactical-cognitive and technical-skill outcomes, with motivational and tactical outcomes most prominent. RQ2-the controlled evidence indicates consistent effectiveness for motivational, psychosocial and tactical outcomes and positive but more variable effects for physical-fitness and isolated technical outcomes. RQ3-the evidence is increasingly hybrid yet methodologically modest, temporally recent and geographically concentrated, with clear gaps in longitudinal, powered and geographically diverse research.

Conclusions

This systematic review synthesised 23 experimental and quasi-experimental studies published between 2020 and 2025 to clarify what Teaching Games for Understanding achieves in school physical education. The evidence shows that TGfU has been examined across affective-motivational, physical-motor, tactical-cognitive and technical-skill outcomes, with motivation, enjoyment and tactical understanding attracting the most attention. Regarding effectiveness, TGfU and, in particular, its hybrid combinations with Sport Education consistently enhanced motivational, psychosocial and tactical outcomes, while effects on physical fitness and isolated technical skills were positive but more variable and contingent on duration, dosage and faithful implementation. Methodologically, the controlled evidence is dominated by short quasi-experimental designs concentrated in a small number of countries, with adequately powered randomised and longitudinal trials remaining the exception. The principal contribution of this review is an integrated, outcome-centred evidence map of controlled TGfU research that connects what the model is used for, how well it works and where the field is heading. Practically, the findings encourage teacher educators and curriculum designers to adopt game-centred, autonomy-supportive pedagogy while investing in the professional learning needed to enact it well. The review is bounded by its single-database, English-only, and non-meta-analytic scope; because effects were not statistically pooled, the more variable technical-skill and fitness findings cannot be partitioned into genuine between-study moderation versus synthesis-method limitation, and heterogeneity (I^2) and pooled effect sizes remain unquantified. Future research should therefore prioritise pre-registered, fidelity-controlled randomised and cluster-randomised trials that are adequately powered for each outcome type-indicatively, at least ≈64 participants per arm to detect a moderate effect ($d \approx 0.5$) at 80% power, and larger samples for the smaller effects expected on fitness-that run for at least a full instructional term, incorporate delayed retention testing (≈ 8–12 weeks), and use harmonised, validated outcome instruments across geographically and demographically diverse populations.

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