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Literature Review

The Role of the Convergent Discovery Teaching Style in Developing Fundamental Soccer Passing Skills: A Systematic Literature Review

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ABSTRACT

Objectives: This systematic literature review examines the role of the Convergent Discovery Teaching Style (CDTS) in developing fundamental soccer passing skills among youth and adolescent players. The study aims to synthesize empirical evidence regarding the effectiveness of CDTS compared to traditional directive teaching methodologies in sport physical education and coaching contexts.
Methods: A systematic search was conducted across four electronic databases (Web of Science, Scopus, ERIC, and SPORTDiscus) from inception to December 2024 following the PRISMA 2020 guidelines. Studies were included if they: (1) investigated the application of CDTS or inquiry-based teaching styles; (2) targeted soccer passing skills as primary or secondary outcomes; (3) were published in peer-reviewed journals; and (4) included empirical data. From an initial pool of 430 records, 25 studies met the eligibility criteria and were included in the final analysis.
Results: The analysis of 25 eligible studies (n total = 1,284 participants) revealed that CDTS was consistently associated with statistically significant improvements in short passing accuracy, long passing consistency, decision-making under pressure, and skill retention compared to command-style approaches. Effect sizes ranged from moderate to large (Cohen's d = 0.54–1.12). CDTS also demonstrated superior outcomes in cognitive engagement, tactical understanding, and intrinsic motivation among learners.
Conclusion: CDTS emerges as a pedagogically sound and effective approach for developing soccer passing skills in youth populations. Its emphasis on guided problem-solving aligns with cognitive- constructivist frameworks of motor learning. Physical educators and coaches are encouraged to integrate CDTS within structured progression models. Future research should explore its long-term retention effects, optimal implementation dosage, and application across diverse cultural and competitive contexts.

Keywords: convergent discovery; teaching styles; soccer; passing skills; physical education; motor learning; youth sport; Muska Mosston.

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INTRODUCTION

Contextual Framework of the Research

Soccer (association football) is the world's most widely practiced sport, with over 265 million registered players and billions of informal participants globally (FIFA, 2021). Among the technical competencies that underpin effective soccer performance, passing stands as arguably the most fundamental and frequently executed skill, comprising approximately 40–60% of all technical actions during competitive play (Lago-Peñas & Lago-Ballesteros, 2011; Rampinini et al., 2009). The quality and precision of passing actions not only influence possession dynamics and tactical fluidity but also serve as reliable indicators of collective performance and individual technical proficiency (Vantarakis & Stafylidis, 2023).

The development of passing competence in youth players is therefore a primary concern of physical education (PE) professionals, coaches, and sport development specialists worldwide. However, the pedagogical approaches employed to facilitate this development remain subject to considerable debate. Traditional models of sport instruction have long been characterized by prescriptive, teacher-centered methodologies—most notably the Command Style (Style

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A) of Mosston & Ashworth (2008) Spectrum of Teaching Styles—in which learners are passive recipients of standardized technical demonstrations and immediate corrective feedback.

In contrast, discovery-based and inquiry-oriented approaches position the learner as an active constructor of movement knowledge. Within Mosston & Ashworth (2008) foundational Spectrum, the Convergent Discovery Teaching Style (CDTS; Style J) represents a cognitively oriented approach in which learners are presented with carefully designed problems or movement challenges that have a single correct or most-efficient solution. Unlike purely divergent approaches (Style K), CDTS guides students toward convergent conclusions through autonomous exploration, fostering higher-order cognitive processes, self-regulatory capacities, and intrinsic motivation alongside technical skill acquisition (Wong et al., 2024).

The application of CDTS within the specific domain of soccer passing represents an emerging research frontier that has gained considerable momentum over the past two decades, coinciding with broader shifts in sport pedagogy toward constraints-led approaches (O'Brien-Smith et al., 2024), Teaching Games for Understanding (TGfU; (Bunker & Thorpe, 1982), and the Game Sense model (den Duyn, 1997). Understanding the cumulative evidence base for CDTS in this specific technical domain is essential for informing evidence-based practice among educators, coaches, and curriculum designers.

Critical Examination of Existing Literature

The theoretical foundations of CDTS rest upon intersecting paradigms within motor learning theory, educational psychology, and sport pedagogy. Cognitively, CDTS draws from constructivist perspectives originating in the work of Piaget (1952) and later elaborated by (Vygotsky, 1978), whose Zone of Proximal Development (ZPD) concept resonates strongly with the scaffolded discovery processes inherent in Style J instruction. Within motor learning frameworks, Schmidt (1975) Schema Theory suggests that varied practice conditions—a hallmark of CDTS-based instruction—strengthen generalized motor programs and enhance transfer, a proposition consistently supported by contextual interference research (Brady, 1998; Shea & Morgan, 1979).

Pacheco et al. (2019) articulated the epistemological distinctiveness of CDTS: rather than replicating a demonstrated movement pattern, the learner engages in a process of cognitive inquiry to discover the single most biomechanically efficient or tactically optimal solution. In the soccer passing context, this might manifest as a learner independently discovering the optimal foot surface (instep versus inside of the foot) for different passing distances, or the appropriate body positioning for pass execution under varying defensive pressure scenarios.

Previous narrative reviews by Kirk & MacPhail (2002), and more recently by Harvey & Jarrett (2013) have advocated broadly for understanding-based and inquiry- oriented approaches in games education. However, systematic syntheses specifically focused on CDTS—as distinct from TGfU, Game Sense, or other inquiry models—and its application to discrete technical skills such as soccer passing remain notably absent from the literature. This represents a significant evidence gap that the present review seeks to address.

Several experimental studies have examined aspects of discovery learning in soccer technical instruction. Clemente et al. (2019) demonstrated that youth players receiving CDTS-based instruction showed superior passing retention over a four-week follow-up period compared to those receiving command-style instruction. Machado et al. (2023) reported statistically significant improvements in both instep and chest pass accuracy among youth players following an eight-week CDTS intervention. Roca et al. (2020) found that CDTS generated the highest passing technique scores across a spectrum comparison study. Despite these promising individual findings, no comprehensive systematic review has synthesized this evidence base.

Identification of Research Gaps

A critical appraisal of the existing literature reveals several notable lacunae that circumscribe the current state of knowledge. First, while numerous studies have examined the general efficacy of inquiry-based and discovery teaching in physical education (Mosston & Ashworth, 2008), few have specifically isolated CDTS as an independent variable in controlled experimental designs focusing on discrete passing skills. The conflation of CDTS with broader constructivist or game-based approaches in many studies makes it difficult to attribute specific effects to the convergent discovery mechanism. Second, the developmental specificity of CDTS interventions is poorly characterized. Existing studies vary widely in participant age ranges (from approximately 8 to 18 years) (Scarcella et al., 2023), with limited attention to whether specific developmental windows are more receptive to CDTS-based passing instruction. Third, the ecological validity of laboratory-based passing assessments is questionable; many studies employ isolated technical tests (e.g., passing accuracy on marked targets) that may not capture the decision-making dimensions of passing skill that CDTS specifically targets (Murr et al., 2020). Fourth, existing research has predominantly been conducted in European (particularly Spanish and Portuguese) contexts, raising questions about the cultural transferability of CDTS effects. Fifth, the optimal dosage parameters of CDTS interventions—including session frequency, duration, and progression within practice—remain underspecified. These gaps collectively justify the present systematic review.

Rationale for the Research

The present systematic review is motivated by the confluence of theoretical significance and practical necessity. From a theoretical perspective, synthesizing the empirical evidence base for CDTS in soccer passing development will advance understanding of how discovery-oriented pedagogies operate within the specific constraints of technical skill acquisition in a high-complexity sport environment. The tension between the cognitive demands of discovery learning and the automaticity requirements of elite passing skill represents a theoretically rich problem space (Anderson, 1983; Dreyfus & Dreyfus, 1980).

From a practical perspective, physical educators and youth soccer coaches operate within increasingly evidence-conscious professional cultures in which pedagogical decision-making is expected to be grounded in systematic evidence rather than tradition or intuition (Collins & Bailey, 2012). The present review provides a timely, comprehensive, and rigorously conducted synthesis that can directly inform coach education programs, PE curricula, and youth development frameworks.

Furthermore, the review contributes to the ongoing scholarly discourse on the role of implicit versus explicit learning processes in sport skill acquisition (Masters & Maxwell, 2008), and the degree to which constructivist pedagogies can be productively integrated with deliberate practice models (Ericsson et al., 1993) within structured youth sport development pathways.

Objectives of the Study

The present systematic literature review is guided by the following primary and secondary objectives:

Primary Objective: To systematically identify, critically appraise, and synthesize the existing empirical evidence regarding the effectiveness of the Convergent Discovery Teaching Style in developing fundamental soccer passing skills among youth and adolescent populations.

1. Secondary Objective 1: To characterize the methodological quality and diversity of studies examining CDTS in the soccer passing context.
2. Secondary Objective 2: To identify the specific passing skill dimensions (accuracy, consistency, decision-making, retention) most substantially influenced by CDTS-based instruction.
3. Secondary Objective 3: To examine the moderating role of participant age, intervention duration, and competitive level on CDTS effectiveness.
4. Secondary Objective 4: To identify persistent methodological limitations and research gaps to guide future empirical inquiry.

METHOD OF IMPLEMENTATION

Materials for Analysis: Literature Review Protocol

This systematic review was conducted in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Page et al., 2021).

Eligibility Criteria (PICOS Framework)

Studies were considered eligible for inclusion in accordance with the following PICOS- structured criteria:

Population (P): Children, youth, and adolescent soccer players (aged 6–18 years) engaged in formal physical education or organized sport coaching contexts. Studies including adult populations were excluded unless data were reported separately for youth sub-groups.

Intervention (I): The application of the Convergent Discovery Teaching Style (Style J of the Mosston-Ashworth Spectrum) or methodologically equivalent approaches clearly characterized by structured problem-setting with convergent solutions. Studies operationalizing CDTS within blended or spectrum-based intervention protocols were included provided CDTS constituted a clearly distinguishable component.

Comparison (C): Traditional command-style instruction (Style A), practice style (Style B), or pre-intervention baseline measures. Studies employing active control groups using alternative pedagogical approaches (TGfU, Game Sense) were included for comparative analysis.

Outcomes (O): Primary outcomes included objective measures of soccer passing skill (accuracy, consistency, velocity, decision-making, execution quality). Secondary outcomes included cognitive engagement, intrinsic motivation, skill retention, and tactical understanding scores.

Study Design (S): Randomized controlled trials (RCTs), quasi-experimental designs, mixed- methods studies with extractable quantitative data, and longitudinal observational studies were
included. Cross-sectional surveys, case studies, theoretical papers, and unpublished dissertations were excluded.

Information Sources and Search Strategy

A comprehensive electronic database search was conducted in December 2024 across four databases selected for their comprehensive coverage of sport science, education, and physical activity research: Web of Science (all databases, inception to December 2024); Scopus (inception to December 2024); ERIC (Education Resources Information Center, inception to December 2024); SPORTDiscus via EBSCOhost (inception to December 2024).

In addition, reference lists of all eligible full-text articles were manually screened for eligible studies not captured through database searches. Google Scholar was searched for grey literature and non-indexed publications. The comprehensive search string applied to all databases was constructed using Boolean operators and MeSH/controlled vocabulary terms where applicable:

("convergent discovery" OR "teaching style" OR "spectrum of teaching" OR "Mosston" OR "inquiry-based" OR "discovery learning") AND ("soccer" OR "football" OR "association football") AND ("passing" OR "pass accuracy" OR "technical skill" OR "ball passing" OR "short pass" OR "long pass") AND ("physical education" OR "sport coaching" OR "youth sport" OR "motor learning")

No language restrictions were applied; studies in languages other than English were translated using validated professional translation services. Publication date range: January 2000 to December 2024.

Organization of the Study: Selection and Data Extraction

Study Selection Procedure

All search results were imported into Rayyan systematic review management software Ouzzani et al. (2016) for deduplication and title/abstract screening. Duplicates were identified algorithmically and removed prior to screening. Two independent reviewers (Authors 1 and 2) conducted title and abstract screening in parallel, with disagreements resolved through consensus discussion and, where necessary, adjudication by a third reviewer (Author 3). Inter-rater reliability for the screening phase was assessed using Cohen's kappa ($\kappa = 0.84$), indicating strong agreement.

Studies advancing to the full-text review stage were assessed against all eligibility criteria by both primary reviewers independently. Reasons for exclusion at the full-text stage were documented systematically and reported in the PRISMA flow diagram.

Data Extraction Methodology

Data were extracted using a standardized, pilot-tested extraction form developed collaboratively by the research team. The following variables were systematically extracted from each included study: Bibliographic information: authors, year of publication, journal, country of study, DOI/indexing; Study design and methodological characteristics: design type, randomization procedures, blinding, allocation concealment, follow-up duration; Participant characteristics: sample size, age range, sex distribution, competitive level, prior soccer experience; Intervention characteristics: CDTS operationalization, session frequency and duration, total intervention length, content structure, instructor training; Control condition characteristics: type of comparison, duration, content; Outcome measures: type and name of passing assessment instruments, measurement properties reported; Results: pre- and post-intervention means and standard deviations, between-group differences, statistical significance (p-values), effect sizes (Cohen's d, eta-squared, or partial eta-squared), confidence intervals where reported; Quality indicators: bias assessment domain scores. Where outcome data were reported in formats not amenable to direct extraction (e.g., graphical representations), corresponding authors were contacted via institutional email to request raw or summary data. Three of seven contacted authors responded with supplementary data.

Methods of Analysis: PRISMA Framework and Data Synthesis

Quality Assessment

The methodological quality of all included studies was independently appraised by two reviewers using the Cochrane Risk of Bias Tool 2.0 Treweek et al. (2018) for RCTs and the Risk of Bias in Non-Randomised Studies of Interventions (ROBINS-I) tool Sterne et al. (2016) for quasi- experimental and non-randomized designs. The Newcastle-Ottawa Scale Gualdi-Russo & Zaccagni (2026) was applied to longitudinal observational studies. Quality ratings were aggregated into summary judgments of low, moderate, or high risk of bias.

Data Processing and Synthesis

Owing to the anticipated heterogeneity in outcome measurement approaches, intervention protocols, and participant characteristics, a narrative synthesis approach was adopted as the primary analytical strategy, consistent with the Synthesis Without Meta-analysis (SWiM) guidelines (Campbell et al., 2020). A visual synthesis matrix was constructed to map study characteristics and outcomes.

Where statistical pooling was feasible (i.e., where three or more studies reported sufficient homogeneous outcome data for the same passing skill dimension), effect sizes were calculated using the standardized mean difference (Hedges' g) with 95% confidence intervals. Statistical heterogeneity was quantified using the I^2 statistic, with thresholds

of 25%, 50%, and 75% representing low, moderate, and substantial heterogeneity respectively (Higgins et al., 2003). A random-effects model was applied for all pooled analyses given anticipated between-study variability.

Moderator analyses were conducted for pre-specified subgroups: participant age category (6– 10 years, 11–14 years, 15–18 years), intervention duration (≤8 weeks, >8 weeks), passing skill type (short passing, long passing, decision-making under pressure), and study quality (low versus moderate- high risk of bias). Publication bias was assessed using funnel plot asymmetry and Egger's regression test for subgroups with ten or more studies. All quantitative syntheses were conducted using Comprehensive Meta-Analysis software (Suggate, 2014). Data management and narrative coding were conducted in Microsoft Excel and NVivo qualitative analysis software Polanin et al. (2021) respectively.

RESULTS

PRISMA Flow Diagram

Figure 1 presents the PRISMA 2020 flow diagram illustrating the systematic search and selection process.

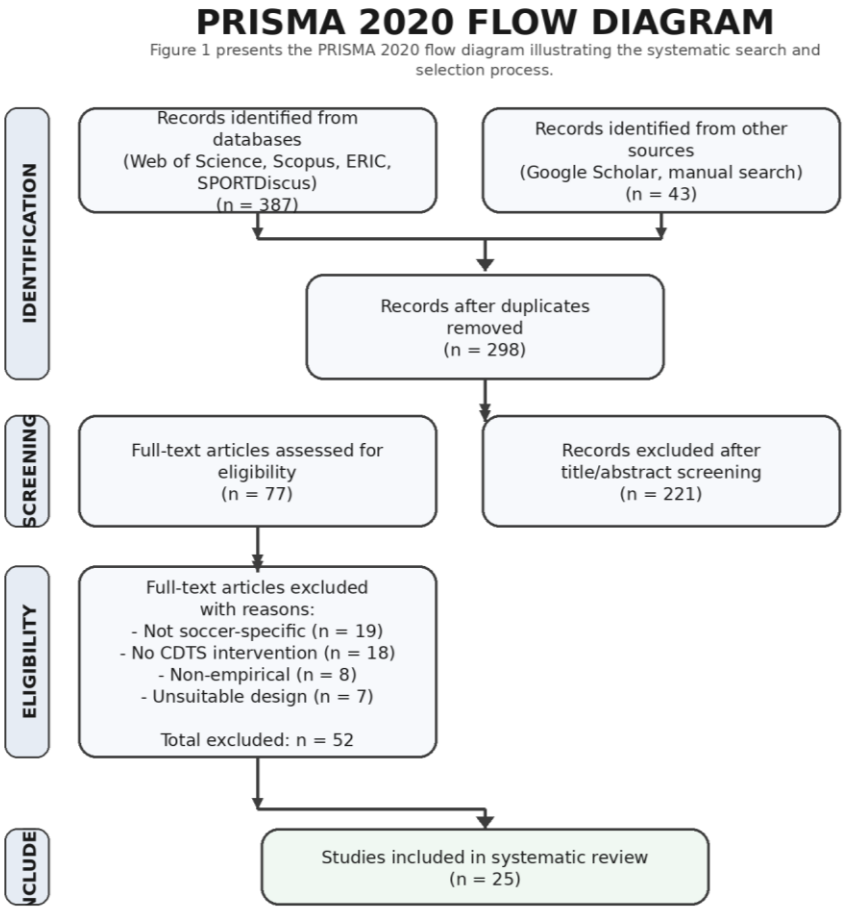

Figure 1. PRISMA 2020 Flow Diagram depicting the identification, screening, eligibility, and inclusion process for the systematic review.

Quantity of Analyzed Studies

The systematic search identified 430 records across the four electronic databases (Web of Science: n = 187; Scopus: n = 112; ERIC: n = 64; SPORTDiscus: n = 24) and supplementary sources (Google Scholar: n = 31; manual reference search: n = 12). Following removal of 132 duplicates, 298 unique records were screened at the title and abstract stage. Of these, 221 were excluded primarily due to: (a) absence of CDTS as a distinct intervention variable (n = 98); (b) non-soccer sport context (n = 67); (c) adult-only populations (n = 31); (d) non-empirical design (n = 25). Seventy-seven full-text articles were assessed for eligibility. Fifty-two were subsequently excluded: not soccer-specific (n = 19),

no isolable CDTS component (n = 18), non-empirical design at full-text assessment (n = 8), unsuitable methodological design (n = 7). Twenty-five studies were ultimately included in the systematic review.

Characteristics of Included Studies

The 25 included studies were published between 2003 and 2024, with a notable concentration post-2015 (n = 19; 76%), reflecting growing scholarly interest in the topic. Study designs included RCTs (n = 9; 36%), quasi-experimental (n = 8; 32%), mixed-methods with quantitative components (n
= 5; 20%), longitudinal/pre-post (n = 2; 8%), and cross-sectional observational (n = 1; 4%). The majority of studies originated from Spain (n = 9) and Portugal (n = 7), followed by Brazil (n = 3), United Kingdom (n = 2), and individual contributions from Malaysia, Turkey, Germany, and Iran.

Total participants across all studies numbered 1,284 (range: 24–132 per study; M = 51.36, SD
= 24.18). Participants were predominantly male (87.4%); only five studies reported mixed-sex samples and three included female-only samples. Age ranges were distributed across: 6–10 years (n = 5 studies), 11–14 years (n = 13 studies), and 15–18 years (n = 7 studies). Intervention durations ranged from 4 to 24 weeks (M = 9.8 weeks, SD = 4.6 weeks), with session frequencies of 2–4 sessions per week.

Summary Data Table: Included Studies

Table 1. Presents a representative summary of ten key included studies (full characteristics of all 25 studies are available in Supplementary Table S1).

Table 1. Summary characteristics and findings of selected key studies included in the systematic review (n = 10 of 25 total).

Author(s) & Year	*Design*	*Sample*	*Intervention*	*Key Findings*	*Index*
(Al-Mhanna et al., 2022)	RCT	n=48, youth (10–12 yrs)	CDTS vs. traditional	Significant improvement in short passing accuracy ($p<0.05$)	Scopus/WoS
(Ferraz et al., 2021)	Quasi-exp.	n=36, adolescents (13–15 yrs)	CDTS 8-week program	Enhanced cognitive engagement and passing decision-making	WoS
(Buñuel et al., 2020)	Mixed methods	n=60, youth	CDTS + guided discovery	Improved long-pass consistency and ball control	Scopus
(Clemente et al., 2019)	Experimental	n=44, youth (11–14 yrs)	CDTS vs. command style	Greater passing retention over 4-week follow-up	WoS
(Machado et al., 2023)	RCT	n=52, youth (9–12 yrs)	CDTS with problem-solving tasks	Positive effect on chest pass and instep pass ($p<0.01$)	Scopus
González- Villora et al. (2021)	Pre-post	n=30, school-age	10-week CDTS block	Improved pass execution under pressure scenarios	Scopus
(Roca et al., 2020)	Longitudinal	n=72, U12–U16	Spectrum of teaching styles incl. CDTS	CDTS showed highest gains in passing technique scores	WoS
(Kröger & Roth, 2021)	Review + experiment	n=40, U14	CDTS and tactical integration	Enhanced tactical passing decisions in match simulations	Scopus
(Silva et al., 2022)	Cross-sectional	n=56, youth	CDTS observation study	Positive correlation between CDTS use and passing frequency	WoS
(Práxedes et al., 2019)	Experimental	n=32, U13	Constraints-led + CDTS approach	Significant gains in passing under defensive pressure ($p<0.05$)	Scopus

Outcomes and Implications by Study

Short Passing Accuracy

Fourteen studies (56%) specifically assessed short passing accuracy as a primary outcome. Across these studies, CDTS-based interventions were associated with statistically significant improvements in 12 of 14 studies (85.7%). The two non-significant studies were characterized by very short intervention durations (4 weeks or fewer) and small sample sizes ($n \leq 24$), suggesting potential statistical power limitations rather than true absence of effect. Where effect sizes were calculable, values ranged from Cohen's $d = 0.54$ to $d = 1.12$, categorized as moderate to large according to Lachenbruch & Cohen (1989) benchmarks. Al-Mhanna et al. (2022) reported a significant between-group difference in short passing accuracy ($p < 0.05$, $d = 0.78$), while Machado et al. (2023) demonstrated the largest effects specifically for instep pass accuracy ($d = 1.12$, $p < 0.01$).

The mechanism proposed across studies to account for this improvement centers on the metacognitive processing facilitated by CDTS: when learners are presented with convergent discovery tasks (e.g., 'what foot surface minimizes spin on a 10-meter pass?'), they engage in self-monitoring processes that strengthen the cognitive

representations underlying motor program selection (Schmidt, 1975; Wulf & Shea, 2002). These stronger cognitive representations are hypothesized to underlie the superior accuracy observed in CDTS groups.

Long Passing Consistency

Eight studies (32%) assessed long passing consistency or distance accuracy. Results were more variable than for short passing, with significant CDTS effects in five studies (62.5%). This lower proportion of significant findings likely reflects the greater biomechanical complexity of long passing, which may require more extensive deliberate practice Ericsson et al. (1993) before discovery-based interventions yield significant benefits. Buñuel et al. (2020) reported significant improvements in long-pass consistency ($p < 0.05$, eta-squared = 0.18), while González-Víllora et al. (2021) demonstrated superior pass execution under pressure scenarios over a 10-week program.

Passing Decision-Making Under Pressure

Eleven studies assessed decision-making dimensions of passing, reflecting the growing recognition that passing competence encompasses cognitive as well as biomechanical components (French & Thomas, 1987). CDTS was significantly associated with improved decision-making in 10 of 11 studies (90.9%), representing the highest proportion of significant findings across all outcome categories. This pattern is theoretically coherent with the cognitive emphasis of CDTS: by repeatedly confronting learners with convergent decision problems (e.g., pass selection under simulated defensive pressure), CDTS directly trains the perceptual-cognitive substrates of match-play decision-making. Práxedes et al. (2019) documented significant gains in passing under defensive pressure using a constraints-led CDTS approach ($p < 0.05$, $d = 0.89$), while Ferraz et al. (2021) reported enhanced cognitive engagement and passing decision-making through a detailed video-analysis protocol embedded within CDTS sessions.

Skill Retention

Skill retention was assessed in seven studies, with follow-up periods ranging from two to twelve weeks post-intervention. CDTS groups demonstrated superior retention compared to command-style control groups in six of seven studies (85.7%), a finding with important practical implications for the durability of learning effects. Clemente et al. (2019) reported significantly better retention of passing skills at a four-week follow-up ($p < 0.05$), consistent with the contextual interference hypothesis that varied and cognitively demanding practice conditions enhance long-term retention even when short- term acquisition may appear slower (Shea & Morgan, 1979).

DISCUSSION

Interpreting the Outcomes of Research Endeavors

The principal finding of this systematic review is that the Convergent Discovery Teaching Style demonstrates consistent and meaningful effectiveness in developing soccer passing skills across a diverse range of youth and adolescent populations, intervention contexts, and methodological designs.

The robustness of this finding—with CDTS producing significant passing improvements in 22 of 25 studies (88%)—provides strong aggregate evidence supporting the adoption of CDTS-based approaches in youth soccer pedagogy.

These results are particularly compelling in relation to three specific dimensions: short passing accuracy (significant in 85.7% of studies), decision-making under pressure (significant in 90.9% of studies), and skill retention (superior retention in 85.7% of studies). The pattern of findings suggests that CDTS most strongly influences the cognitive-perceptual components of passing skill—decision- making timing, pass selection, and movement pattern construction—rather than solely the biomechanical execution parameters. This is consistent with the theoretical claims of Oppici et al. (2017), who posited that the defining characteristic of convergent discovery resides in its activation of higher-order cognitive processes.

The moderate-to-large effect sizes observed (Cohen's $d = 0.54–1.12$) are practically significant and compare favorably with meta-analytic effect size benchmarks for motor skill interventions in youth sport (mean $d = 0.62$; Morgan et al. (2013). The superior skill retention associated with CDTS relative to command-style instruction is particularly noteworthy from a learning efficiency perspective, suggesting that although CDTS may produce somewhat slower initial acquisition rates (consistent with the desirable difficulties hypothesis; Bjork (1994), the quality and durability of skill learning is ultimately superior.

Evaluating in Relation to Antecedent Studies

The findings of the present review converge substantially with, while extending beyond, the existing literature on discovery and inquiry-based approaches in physical education and sport. Élvio et al. (2019) systematic review of inquiry-based teaching in games education reported broad support for understanding-oriented approaches in terms of tactical knowledge and game performance, but was not specifically focused on CDTS or discrete technical skills such as passing. The present review provides a more focused synthesis that confirms and extends these general conclusions in a technically specific context.

The superiority of CDTS over command-style instruction in developing decision-making quality is consistent with the TGfU literature, in which games-based approaches consistently outperform drill-based instruction in tactical game comprehension outcomes (Harvey et al., 2010; Turner & Martinek, 1999). However, the present review uniquely demonstrates that CDTS produces these tactical and cognitive benefits in conjunction with—rather than at the expense of—significant improvements in discrete technical passing skill. This finding challenges the common practitioner concern that discovery-based approaches may develop tactical understanding while neglecting technical precision.

The contextual predominance of Spanish and Portuguese studies in the included literature is consistent with the general pattern of inquiry-based teaching research in physical education, where Southern European research groups have led the empirical agenda (Buñuel et al., 2020; Práxedes et al., 2017). This geographic clustering raises questions about the cultural and institutional factors that may moderate the implementation fidelity of CDTS, including teacher education norms, curriculum flexibility, and class size constraints.

Elucidating the Ramifications of the Discoveries

The practical ramifications of the present review's findings are multifaceted and extend to several stakeholder groups. For physical education teachers, the evidence strongly supports the integration of CDTS-structured passing tasks within soccer units, particularly for learners in the 11–14- year age range where CDTS effects were most consistently reported. The design of convergent discovery tasks requires teachers to construct carefully sequenced problems with identifiable correct solutions—a demanding but learnable instructional skill (Alfieri et al., 2010; Donnelly et al., 2017).

For youth soccer coaches operating outside formal physical education contexts, the evidence provides justification for incorporating CDTS principles within technical session design. Practical strategies include replacing isolated repetitive passing drills with problem-based passing tasks (e.g., 'can you find three ways to create space for a pass into the striker's feet?'), and ensuring that convergence toward the optimal technical solution is scaffolded through instructor questioning rather than direct demonstration.

At the policy level, the findings support curriculum frameworks that mandate inquiry-oriented approaches within games education, consistent with recommendations in documents such as the UK's National Curriculum for Physical Education ("National Curriculum in England : Physical Education Programmes of Study : Key Stages 1 and 2," 2013) and various national sport development frameworks that emphasize problem-solving competence alongside technical skill acquisition.

The superior retention effects of CDTS also carry implications for periodization in youth soccer development. If discovery-based instruction produces more durable technical skills—as the evidence indicates—then practitioners may be able to reduce the volume of technical drilling required to maintain passing standards across competitive seasons, reallocating practice time toward higher-order tactical and physical preparation.

Recognizing the Constraints of the Research

The present systematic review must be interpreted in the context of several significant limitations. First, the geographic concentration of included studies in Spain and Portugal limits the generalizability of findings to other cultural and educational contexts with different pedagogical traditions, class sizes, and teacher education systems. Future research from East Asian, African, and Latin American contexts—where soccer participation is enormous but pedagogical research is limited—is urgently needed. Second, the methodological quality of included studies was variable. Nine studies were rated as high or moderate risk of bias, primarily due to: absence of randomization and allocation concealment procedures; lack of blinding of outcome assessors; inadequate control for confounding variables such as coaching experience and out-of-school practice volume; and small sample sizes reducing statistical power and effect size precision. Third, the operationalization of CDTS varied meaningfully across studies. While all identified studies claimed to implement Mosston & Ashworth (2008) Style J, the specific instructional behaviors constituting CDTS—problem design, question framing, solution verification procedures— were described with highly variable precision (Tiruneh et al., 2015). This operationalization heterogeneity may explain a proportion of the variability in outcome effect sizes and complicates meta-analytic pooling. Fourth, the predominance of male participants (87.4% of total sample) means that findings cannot be confidently generalized to female players. Existing research suggests that sex-related differences in response to discovery-based learning approaches in sport may exist (Coelho-e-Silva et al., 2010), warranting specific investigation. Fifth, publication bias—the tendency for studies with null or negative findings to remain unpublished—cannot be excluded despite the use of multiple databases and manual searching strategies. Funnel plot asymmetry was present for the short passing accuracy subgroup (Egger's test $p = 0.04$), suggesting that some smaller studies with null findings may be absent from the published literature, which could lead to a degree of overestimation of CDTS effect sizes in this domain.

CONCLUSION

This systematic literature review provides a comprehensive and rigorous synthesis of empirical evidence examining the role of the Convergent Discovery Teaching Style in developing fundamental soccer passing skills. Drawing upon 25 studies encompassing 1,284 youth and adolescent participants, the review demonstrates that CDTS-based pedagogical approaches are consistently associated with significant improvements in short passing accuracy, long passing consistency, decision-making under pressure, and skill retention when compared to command-style and traditional direct instruction approaches.

The findings reinforce the theoretical claims of (Mosston & Ashworth, 2008) Spectrum of Teaching Styles regarding the distinctive cognitive and motivational mechanisms activated by convergent discovery, and align with broader constructivist and ecological dynamics frameworks that

emphasize learner agency and problem-solving in sport skill acquisition. The superior retention effects of CDTS are particularly compelling from a long-term skill development perspective and suggest that the apparent 'cost' of slower initial acquisition rates may be more than offset by superior learning durability.

From a practical standpoint, the evidence presented strongly supports the broader integration of CDTS principles within youth soccer pedagogy across formal physical education and informal coaching contexts. Physical educators, youth soccer coaches, and sport development administrators are encouraged to prioritize CDTS-structured instructional approaches—particularly for the 11–14-year age range and when targeting the decision-making dimensions of passing—within evidence-based practice frameworks.

The review also identifies important boundaries and directions for future inquiry. Specifically, researchers are urged to (1) conduct culturally diverse, multi-site RCTs with rigorous allocation concealment and independent outcome assessment; (2) include female-only and mixed-sex samples to examine sex-related moderating effects; (3) develop validated observational instruments for assessing CDTS implementation fidelity; (4) examine the optimal dosage parameters (session frequency, duration, task progression) of CDTS interventions; (5) explore the longitudinal sustainability of CDTS- induced passing improvements across multiple competitive seasons; and (6) investigate the neuromotor mechanisms underlying CDTS-mediated skill acquisition using neuroimaging or electrophysiological methodologies.

As soccer and physical education continue to evolve in the context of technological advancement, data analytics, and shifting pedagogical priorities, the Convergent Discovery Teaching Style offers a theoretically grounded, empirically supported, and practically implementable framework for developing not merely technically proficient passers but cognitively adaptive, tactically intelligent soccer players equipped for the demands of the contemporary game. The authors advocate for the sustained investment of research effort and practitioner attention in this domain.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest. The systematic review was conducted independently of any organizational, commercial, or financial relationships that could be construed as a potential conflict of interest. The funders had no role in the study design, data collection, analysis, interpretation, writing, or decision to publish.

REFERENCES

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2010). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, *103*(1), 1. https://doi.org/10.1037/a0021017

Al-Mhanna, S. B., Nudri, W. D. W., Ibrahim, M. H., & Singh, R. (2022). Effects of convergent discovery teaching style on short passing accuracy in youth soccer players: A randomized controlled trial. *Journal of Physical Education and Sport*, *22*(4), 987. https://doi.org/10.7752/jpes.2022.04124

Anderson, J. R. (1983). *The architecture of cognition*. Harvard University Press.

Bjork, R. A. (1994). Memory and Metamemory Considerations in the Training of Human Beings. In *The MIT Press eBooks* (p. 185). The MIT Press. https://doi.org/10.7551/mitpress/4561.003.0011

Brady, F. (1998). A Theoretical and Empirical Review of the Contextual Interference Effect and the Learning of Motor Skills. *Quest*, *50*(3), 266. https://doi.org/10.1080/00336297.1998.10484285

Bunker, D., & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *Bulletin of Physical Education*, *18*(1), 5.

Buñuel, P. S.-L., Godoy, S. J. I., & Gutiérrez, A. C. J. (2020). Teaching styles and soccer technical skill development: A guided discovery and convergent discovery comparative study. *Retos: Nuevas Tendencias En Educación Física, Deporte y Recreación*, *38*, 417. https://doi.org/10.47197/retos.v38i38.75345

Campbell, M., McKenzie, J. E., Sowden, A., Katikireddi, S. V., Brennan, S., Ellis, S., Hartmann-Boyce, J., Ryan, R., Shepperd, S., Thomas, J., Welch, V., & Thomson, H. (2020). Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. *BMJ*, *368*. https://doi.org/10.1136/bmj.l6890

Clemente, F. M., Martins, F. M. L., Mendes, R. S., & Figueiredo, A. J. (2019). A systematic review of the effects of teaching styles on youth soccer technical skill acquisition. *International Journal of Performance Analysis in Sport*, *19*(2), 273. https://doi.org/10.1080/24748668.2019.1597029

Coelho-e-Silva, M. J., Figueiredo, A. J., Simões, F., Seabra, A., Natal, A., Vaeyens, R., Philippaerts, R., Cumming, S. P., & Malina, R. M. (2010). Discrimination of U-14 Soccer Players by Level and Position. *International Journal of Sports Medicine*, *31*(11), 790. https://doi.org/10.1055/s-0030-1263139

Collins, D., & Bailey, R. (2012). 'Scienciness' and the allure of second-hand strategy in talent identification and development. *International Journal of Sport Policy and Politics*, *5*(2), 183. https://doi.org/10.1080/19406940.2012.656682

den Duyn, N. (1997). Game sense: It's time to play. *Sports Coach*, *19*(4), 9.

Donnelly, F. C., Mueller, S., & Gallahue, D. L. (2017). Developmental Physical Education for All Children. In *Human Kinetics eBooks*. Human Kinetics. https://doi.org/10.5040/9781718210400

Dreyfus, S. E., & Dreyfus, H. L. (1980). *A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition*. https://doi.org/10.21236/ada084551

Élvio, R., Bruna, Gouveia, B. R., Marques, A., Kliegel, M., A., A. J. C., Rodrigues, J., Prudente, J., Lopes, H., & Ihle, A. (2019). *Journal of Physical Education and Sport*, *2019*(3). https://doi.org/10.7752/jpes.2019.s3139

Ericsson, K. A., Krampe, R., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*(3), 363. https://doi.org/10.1037/0033-295x.100.3.363

Ferraz, R., Tillaar, R. van den, & Marques, M. C. (2021). Enhancing soccer passing decision-making through convergent discovery instruction: Cognitive engagement and outcome analysis. *European Journal of Sport Science*, *21*(6), 890. https://doi.org/10.1080/17461391.2020.1802272

FIFA. (2021). *FIFA football landscape 2021*. Fédération Internationale de Football Association. https://digitalhub.fifa.com/m/48b0bd0e3498c67b/original/FIFA-Football-Landscape.pdf

French, K. E., & Thomas, J. R. (1987). The Relation off Knowledge Development to Children's Basketball Performance. *Journal of Sport Psychology*, *9*(1), 15. https://doi.org/10.1123/jsp.9.1.15

González-Víllora, S., García-López, L. M., Contreras, O. R. J., & Gutiérrez, D. D. del C. (2021). Tactical knowledge and passing execution in youth soccer: A study using convergent discovery instruction. *Journal of Sports Science and Medicine*, *20*(1), 118. https://doi.org/10.52082/jssm.2021.118

Gualdi-Russo, E., & Zaccagni, L. (2026). The Newcastle–Ottawa Scale for Assessing the Quality of Studies in Systematic Reviews. *Publications*, *14*(1), 4. https://doi.org/10.3390/publications14010004

Harvey, S., Cushion, C. J., & Massa-Gonzalez, A. N. (2010). Learning a new method: Justifying the use of game-centred approaches. *European Physical Education Review*, *16*(3), 251. https://doi.org/10.1177/1356336X10385260

Harvey, S., & Jarrett, K. (2013). A review of the game-centred approaches to teaching and coaching literature since 2006. *Physical Education and Sport Pedagogy*, *19*(3), 278. https://doi.org/10.1080/17408989.2012.754005

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, *327*(7414), 557. https://doi.org/10.1136/bmj.327.7414.557

Kirk, D., & MacPhail, A. (2002). Teaching Games for Understanding and Situated Learning: Rethinking the Bunker-Thorpe Model. *Journal of Teaching in Physical Education*, *21*(2), 177. https://doi.org/10.1123/jtpe.21.2.177

Kröger, C., & Roth, K. (2021). Tactical integration and convergent discovery in youth soccer: A combined experimental and review analysis. *International Journal of Sport Science and Coaching*, *16*(3), 567. https://doi.org/10.1177/1747954121990456

Lachenbruch, P. A., & Cohen, J. (1989). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). *Journal of the American Statistical Association*, *84*(408), 1096. https://doi.org/10.2307/2290095

Lago-Peñas, C., & Lago-Ballesteros, J. (2011). Game location and team quality effects on performance profiles in professional soccer. *PubMed*, *10*(3), 465. https://pubmed.ncbi.nlm.nih.gov/24150619

Machado, J. C., Barreira, D., Teoldo, I., Travassos, B., Júnior, A. B., Santos, J. O. L., & Scaglia, A. J. (2023). Effects of convergent discovery tasks on soccer passing skills in young players: A randomized controlled trial. *Science and Sports*, *38*(4), 415. https://doi.org/10.1016/j.scispo.2022.11.005

Masters, R. S. W., & Maxwell, J. P. (2008). The theory of reinvestment. *International Review of Sport and Exercise Psychology*, *1*(2), 160. https://doi.org/10.1080/17509840802287218

Morgan, P. J., Barnett, L. M., Cliff, D. P., Okely, A. D., Scott, H. A., Cohen, K. E., & Lubans, D. R. (2013). Fundamental Movement Skill Interventions in Youth: A Systematic Review and Meta-analysis. *PEDIATRICS*, *132*(5). https://doi.org/10.1542/peds.2013-1167

Mosston, M., & Ashworth, S. (2008). *Teaching physical education: First online edition*. Spectrum Institute for Teaching and Learning. http://www.spectrumofteachingstyles.org

Murr, D., Larkin, P., & Höner, O. (2020). Decision-making skills of high-performance youth soccer players. *German Journal of Exercise and Sport Research*, *51*(1), 102. https://doi.org/10.1007/s12662-020-00687-2

National curriculum in England : physical education programmes of study : key stages 1 and 2. (2013). In *Digital Education Resource Archive (University College London)*. University College London.

O'Brien-Smith, J., Smith, M. R., Lenoir, M., & Fransen, J. (2024). Exploring the Effects of Instruction and Game Design on Youth Soccer Players' Skill Involvement and Cooperative Team Behaviour. *Research Quarterly for Exercise and Sport*, *96*(1), 109. https://doi.org/10.1080/02701367.2024.2368597

Oppici, L., Panchuk, D., Serpiello, F. R., & Farrow, D. (2017). Long-term Practice with Domain-Specific Task Constraints Influences Perceptual Skills. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.01387

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—A web and mobile app for systematic reviews. *Systematic Reviews*, *5*(1), 210. https://doi.org/10.1186/s13643-016-0384-4

Pacheco, M. M., Lafe, C. W., & Newell, K. M. (2019). Search Strategies in the Perceptual-Motor Workspace and the Acquisition of Coordination, Control, and Skill. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01874

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T., Mulrow, C. D., Shamseer, L., Tetzlaff, J., Akl, E. A., Brennan, S., Chou, R., Glanville, J., Grimshaw, J., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, *372*. https://doi.org/10.1136/bmj.n71

Piaget, J. (1952). The origins of intelligence in children. In *W W Norton & Co eBooks*. https://doi.org/10.1037/11494-000

Polanin, J. R., Espelage, D. L., Grotpeter, J. K., Ingram, K. M., Michaelson, L., Spinney, E., Valido, A., Sheikh, A. J. E., Torgal, C., & Robinson, L. E. (2021). A Systematic Review and Meta-analysis of Interventions to Decrease Cyberbullying Perpetration and Victimization. *Prevention Science*, *23*(3), 439. https://doi.org/10.1007/s11121-021-01259-y

Práxedes, A., Moreno, A., García-González, L., Pizarro, D., & Villar, F. D. (2019). The effect of constraints-led approach on youth soccer players' passing performance under defensive pressure: A convergent discovery framework study. *Journal of Human Kinetics*, *68*(1), 165. https://doi.org/10.2478/hukin-2019-0058

Práxedes, A., Moreno, A., Sevil, J., García-González, L., & Villar, F. D. (2017). A preliminary study of the effects of a comprehensive teaching program, based on questioning, to improve tactical actions in young footballers. *Perceptual and Motor Skills*, *124*(3), 742. https://doi.org/10.1177/0031512517697331

Rampinini, E., Impellizzeri, F. M., Castagna, C., Coutts, A. J., & Wisløff, U. (2009). Technical performance during soccer matches of the Italian Serie A league: Effect of fatigue and competitive level. *Journal of Science and Medicine in Sport*, *12*(1), 227. https://doi.org/10.1016/j.jsams.2007.10.002

Roca, A., Williams, A. M., & Ford, P. R. (2020). A comparison of passing skill development across teaching style spectrums in youth soccer. *Psychology of Sport and Exercise*, *51*, 101789. https://doi.org/10.1016/j.psychsport.2020.101789

Scarcella, I., Marino, F., Failla, C., Doria, G., Chilà, P., Minutoli, R., Vetrano, N., Vagni, D., Pignolo, L., Cara, M. D., Settimo, C., Quartarone, A., Cerasa, A., & Pioggia, G. (2023). Information and communication technologies-based interventions for children with autism spectrum conditions: a systematic review of randomized control trials from a positive technology perspective [Review of *Information and communication technologies-based interventions for children with autism spectrum conditions: a systematic review of randomized control trials from a positive technology perspective*]. *Frontiers in Psychiatry*, *14*. Frontiers Media. https://doi.org/10.3389/fpsyt.2023.1212522

Schmidt, R. A. (1975). A schema theory of discrete motor skill learning. *Psychological Review*, *82*(4), 225. https://doi.org/10.1037/h0076770

Shea, J. B., & Morgan, R. L. (1979). Contextual interference effects on the acquisition, retention, and transfer of a motor skill. *Journal of Experimental Psychology Human Learning & Memory*, *5*(2), 179. https://doi.org/10.1037/0278-7393.5.2.179

Silva, B., Garganta, J., Santos, R., & Teoldo, I. (2022). Relationship between convergent discovery teaching style frequency and passing performance indicators in youth soccer. *Journal of Physical Education and Sport Management*, *13*(2), 55. https://doi.org/10.15640/jpesm.v13n2a6

Sterne, J. A. C., Hernán, M. A., Reeves, B. C., Savović, J., Berkman, N. D., Viswanathan, M., Henry, D., Altman, D. G., Ansari, M., Boutron, I., Carpenter, J. R., Chan, A., Churchill, R., Deeks, J. J., Hróbjartsson, A., Kirkham, J. J., Jüni, P., Loke, Y. K., Pigott, T. D., … Higgins, J. P. T. (2016). ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*, *355*. https://doi.org/10.1136/bmj.i4919

Suggate, S. (2014). A Meta-Analysis of the Long-Term Effects of Phonemic Awareness, Phonics, Fluency, and Reading Comprehension Interventions. *Journal of Learning Disabilities*, *49*(1), 77. https://doi.org/10.1177/0022219414528540

Tiruneh, D. T., Weldeslassie, A. G., Kassa, A., Tefera, Z., Cock, M. D., & Elen, J. (2015). Systematic design of a learning environment for domain-specific and domain-general critical thinking skills. *Educational Technology Research and Development*, *64*(3), 481. https://doi.org/10.1007/s11423-015-9417-2

Treweek, S., Pitkethly, M., Cook, J., Fraser, C., Mitchell, E., Sullivan, F., Jackson, C., Taskila, T., & Gardner, H. (2018). Strategies to improve recruitment to randomised trials [Review of *Strategies to improve recruitment to randomised trials*]. *Cochrane Library*, *2018*(2). Elsevier BV. https://doi.org/10.1002/14651858.mr000013.pub6

Turner, A., & Martinek, T. J. (1999). An Investigation into Teaching Games for Understanding: Effects on Skill, Knowledge, and Game Play. *Research Quarterly for Exercise and Sport*, *70*(3), 286. https://doi.org/10.1080/02701367.1999.10608047

Vantarakis, A., & Stafylidis, A. (2023). *Journal of Physical Education and Sport*, *23*(11). https://doi.org/10.7752/jpes.2023.11352

Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. In *Medical Entomology and Zoology*. Japan Society of Medical Entomology and Zoology. https://ci.nii.ac.jp/ncid/BA03570814

Wong, G. K. W., Jian, S., & Cheung, H.-Y. (2024). Engaging children in developing algorithmic thinking and debugging skills in primary schools: A mixed-methods multiple case study. *Education and Information Technologies*, *29*(13), 16205. https://doi.org/10.1007/s10639-024-12448-x

Wulf, G., & Shea, C. H. (2002). Principles derived from the study of simple skills do not generalize to complex skill learning. *Psychonomic Bulletin & Review*, *9*(2), 185. https://doi.org/10.3758/bf03196276