

Cluster sets vs traditional sets in soccer players: Effects on power, sprint, cod and fatigue - A scoping review

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Abstract:

Problem Statement: Cluster-set (CS) and intraset-rest configurations are training strategies designed to redistribute rest within a set in order to preserve repetition quality and manage neuromuscular fatigue. These strategies may be particularly relevant in soccer, where decisive actions depend on short-duration, high-intensity efforts such as sprinting, changes of direction (COD), and jumping. However, soccer-specific evidence directly comparing CS and traditional set (TRD) configurations remains limited. **Approach:** A scoping review was conducted following the PRISMA Extension for Scoping Reviews (PRISMA ScR, 2018). SPORTDiscus, Scopus, ScienceDirect, Web of Science, and PubMed were systematically searched. Records were exported in RIS format, deduplicated, and screened through title and abstract screening followed by full-text assessment. Eligible studies included soccer players exclusively and compared CS or rest-redistribution configurations with TRD protocols applied to resistance training, plyometrics, or acute priming. **Purpose:** The purpose of this scoping review was to map and summarize soccer-specific evidence comparing CS and TRD configurations, describe the main training protocols and performance outcomes, and identify relevant research gaps. **Results:** Fifty-seven records were identified, of which two studies met the eligibility criteria. One study examined a six-week plyometric intervention, while the other investigated acute priming effects following resistance exercise. Chronic comparisons between CS and TRD demonstrated small and inconsistent differences in sprint, COD, and jump performance. In contrast, acute findings indicated clearer improvements in 20 m sprint performance approximately 10 minutes after the conditioning stimulus, particularly when shorter inter-repetition rest was applied. **Conclusions:** Soccer-specific evidence comparing CS and TRD configurations is scarce and heterogeneous. CS appears more practically relevant as an acute priming strategy when recovery timing is optimized, whereas consistent chronic advantages over traditional sets are not evident. Practitioners should emphasize fatigue monitoring and repetition-quality indicators when implementing CS within competitive microcycles.

Key Words: rest redistribution; neuromuscular performance; post-activation performance; plyometric programming; microcycle load management

Introduction

Soccer is characterized as an intermittent, high-intensity team sport in which match performance is strongly influenced by the execution of short-duration, explosive actions such as sprinting, rapid accelerations, changes of direction (COD), and jumping. Match-analysis studies have consistently shown that high-speed running and sprinting actions, although relatively infrequent, are decisive for performance and vary markedly according to playing position and tactical demands (Andrzejewski et al., 2015; Kalema et al., 2022). Consequently, physical preparation strategies in soccer aim to enhance neuromuscular qualities while simultaneously managing fatigue accumulated across congested training and competition schedules.

Strength and power training are fundamental components of soccer conditioning programs, supporting sprinting speed, jumping ability, and COD performance (Haff, 2012). However, the effectiveness of resistance and plyometric training is not solely determined by exercise selection or load prescription, but also by how training volume and rest are organized within and between sets. Traditional set (TRD) configurations, typically performed with continuous repetitions, may induce substantial neuromuscular and metabolic fatigue, potentially compromising movement quality and acute performance. In response, alternative set structures such as cluster sets and rest-redistribution approaches have been proposed to better preserve repetition quality while controlling fatigue accumulation. Cluster-set configurations introduce brief intra-set rest intervals between repetitions or small clusters of repetitions, thereby reducing velocity loss and perceived exertion during high-intensity resistance exercise. Acute investigations in soccer players have reported meaningful performance benefits when cluster-set configurations are implemented as part of priming or warm-up strategies. For example, Nickerson et al. (2018) demonstrated faster 20-m sprint performance approximately 10 minutes after a cluster-set back squat protocol with short inter-repetition rest compared with a traditional continuous set. Similar acute responses have been observed for jumping, sprinting, and agility performance following cluster-set resistance protocols (Dello

Iacono et al., 2020; Keskin et al., 2025). Beyond acute applications, cluster and rest-redistribution configurations have also been explored as chronic training strategies, particularly within plyometric programs. The underlying rationale is that maintaining repetition quality and limiting excessive fatigue across training sessions may enhance long-term neuromuscular adaptations. However, soccer-specific evidence remains limited and inconsistent. Recent controlled research in youth soccer players reported that neither traditional nor cluster-set plyometric training clearly outperformed regular soccer training in improving sprint, COD, or jump performance, highlighting the complexity of training transfer in competitive environments (Alves et al., 2025). These findings suggest that set configuration alone may not be sufficient to elicit superior chronic adaptations without appropriate consideration of training context, load, and competition demands. Despite the growing interest in cluster-set and rest-redistribution strategies within strength and conditioning practice, soccer-specific evidence directly comparing cluster-set and traditional-set configurations remains scarce and heterogeneous. Existing studies differ substantially in study design, player characteristics, intervention type (acute vs. chronic), and performance outcomes assessed, which limits the ability of practitioners to draw consistent, evidence-based conclusions regarding their effectiveness. Moreover, much of the current understanding in soccer is derived from extrapolation of findings in other sports or from general resistance training literature, rather than from soccer-only populations.

Fatigue management represents a critical concern in modern soccer preparation, as psychophysiological fatigue can manifest across mechanical, metabolic, and perceptual domains, influencing performance and injury risk (Polito et al., 2017; Thurlow et al., 2023). Training strategies that allow coaches to modulate intra-set fatigue and preserve neuromuscular output may therefore offer practical value, particularly during congested microcycles with limited recovery time. Contemporary approaches, such as velocity-based resistance training, further emphasize the importance of monitoring performance and controlling fatigue during resistance exercise in soccer populations (Hernández-Belmonte et al., 2023).

Given the limited and fragmented nature of the available soccer-specific literature, a structured mapping of existing evidence is warranted. A scoping review is therefore an appropriate methodological approach to summarize current research, clarify how cluster-set and traditional-set configurations have been implemented in soccer contexts, and identify gaps that require further investigation. By synthesizing the characteristics, outcomes, and practical implications of existing studies, this review aims to support more informed decision-making for both researchers and practitioners working in soccer performance environments.

Material & methods

Study Design and Reporting Framework: This study was designed as a scoping review to systematically map the available soccer-specific evidence comparing cluster-set (CS) and traditional-set (TRD) configurations. The review was conducted and reported in accordance with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guidelines (Tricco et al., 2018), ensuring transparency and methodological rigor throughout the evidence identification and selection process.

Information Sources and Search Strategy: A systematic literature search was performed in the following electronic databases: SPORTDiscus, Scopus, ScienceDirect, Web of Science, and PubMed. These databases were selected due to their comprehensive coverage of sport science, strength and conditioning, and applied physiology research. All searches were conducted using combinations of keywords related to cluster sets, intra-set rest, rest redistribution, resistance training, plyometrics, priming strategies, and soccer. Records identified from each database were exported in RIS format and consolidated into a single reference library for subsequent screening. **Eligibility Criteria:** Eligibility criteria were defined using an adapted Population–Concept–Context (PCC) framework. The population was restricted exclusively to soccer players (association football), without restrictions on age, sex, or competitive level. The concept of interest included cluster-set configurations, intra-set rest, or rest-redistribution strategies applied within resistance training, plyometric training, or acute priming protocols. Studies were required to include a comparator condition using traditional-set configurations without intra-set rest. The context included both acute and chronic training interventions conducted in soccer settings.

Studies were excluded if they: (a) involved non-soccer sports or mixed-sport samples without separable soccer-only data; (b) examined small-sided games or conditioning drills with intermittent rest not directly related to set configuration; or (c) did not provide relevant performance outcomes or sufficient methodological detail.

Selection of Sources of Evidence: Study selection followed a two-stage screening process. In the first stage, titles and abstracts were screened to remove clearly ineligible records. In the second stage, full-text articles were assessed to confirm eligibility based on the predefined criteria. Reasons for exclusion at the full-text stage were documented and reported in the PRISMA flow diagram. The final set of included studies comprised those meeting all inclusion criteria and providing soccer-specific comparisons between CS and TRD configurations.

Data Charting and Extraction: Data were systematically extracted from each included study using a standardized data charting form. Extracted information included author and year of publication, study design, sample characteristics (sample size, age, and competitive level), intervention and comparator descriptions (exercise type, load, sets and repetitions, intra- and inter-set rest, and intervention duration), and reported performance outcomes. For acute studies, all time points at which outcomes were assessed (e.g., pre-exercise and multiple post-exercise intervals) were recorded. **Critical Appraisal:** In line with scoping review methodology,

formal risk-of-bias assessment was considered optional and was not used to exclude studies. Critical appraisal tools were planned as complementary descriptive information to contextualize the evidence, without influencing study inclusion. The primary focus of this review was to map the extent and characteristics of the existing soccer-specific literature.

Synthesis of Results: Findings were synthesized descriptively and grouped according to the applied context (acute priming versus chronic training interventions). Performance outcomes related to sprinting, change of direction, and jumping were summarized to highlight trends, inconsistencies, and knowledge gaps across studies. No meta-analytic pooling was performed due to the limited number of eligible studies and the heterogeneity of designs and outcome measures.

Results

Study selection: The literature search across the five electronic databases identified a total of 57 records. After removal of five duplicate records, 52 unique studies were screened at the title and abstract level. Of these, 49 records were excluded for not meeting the predefined eligibility criteria. Three full-text articles were assessed for eligibility, and one study was excluded due to the inclusion of mixed-sport samples without separable soccer-only data. Consequently, two studies met all inclusion criteria and were included in the final scoping review. The study selection process and reasons for exclusion are summarized in the PRISMA flow diagram (Fig. 1).

Characteristics of included sources: The characteristics of the included studies are summarized in Table 1. The two eligible studies differed substantially in design, population, and training context. One study employed an acute randomized crossover design to examine the short-term effects of set configuration during resistance exercise on sprint performance. The second study implemented a controlled six-week plyometric training intervention to compare chronic adaptations between cluster-set (CS) and traditional-set (TRD) configurations. The acute study was conducted in collegiate male soccer players and investigated a back squat protocol performed under three conditions: traditional continuous repetitions, CS with 30-s inter-repetition rest, and CS with 60-s inter-repetition rest. Performance outcomes were assessed at baseline and at multiple post-exercise time points. The chronic intervention study involved youth male soccer players and compared CS and TRD plyometric programs with matched training volume. Sprinting, change of direction, and jump performance were assessed before and after the six-week intervention period.

Performance Outcomes

Acute Priming Outcomes: Acute performance outcomes are reported in (Fig. 2). Sprint performance was evaluated at baseline and at several post-conditioning time points. The time-course data demonstrated variation in sprint performance depending on the set configuration used. Improvements in 20-m sprint performance were observed approximately 10 minutes after the conditioning stimulus when the CS configuration with shorter inter-repetition rest was applied. No consistent performance enhancements were reported at earlier post-exercise time points, and baseline sprint performance did not differ between conditions.

Chronic Training Outcomes: Pre- and post-intervention performance data for the chronic plyometric training study are presented in Table 2. Both CS and TRD groups showed changes across sprint, change of direction, and jump performance measures over the six-week intervention. Exploratory between-group effect estimates derived from pre-post comparisons are summarized in Table 3 and visually represented in (Fig. 3). The magnitude of differences between CS and TRD configurations was generally small across outcomes, with no consistent pattern favoring one set structure over the other. **Summary of Evidence:** Taken together, the results indicate that soccer-specific evidence directly comparing CS and TRD configurations is limited in quantity and heterogeneous in design. Acute evidence suggests time-dependent performance responses following CS protocols, whereas chronic intervention data show small and inconsistent differences between training configurations. A detailed overview of study designs, protocols, and performance outcomes is provided in Tables 1–3 and (Fig. 1–3).

Fig. 1. PRISMA-ScR flow diagram (Option A: CS vs TRD; soccer only).

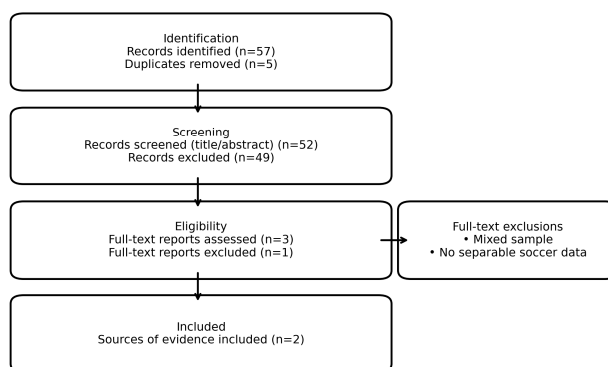


Table 1. Characteristics of included studies.

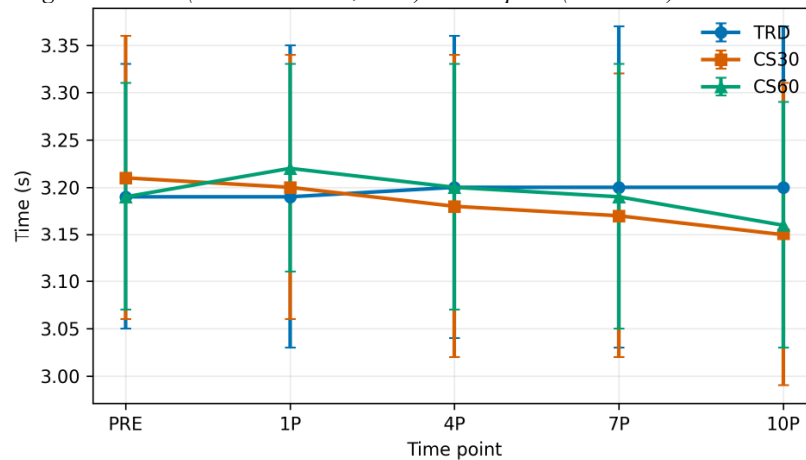
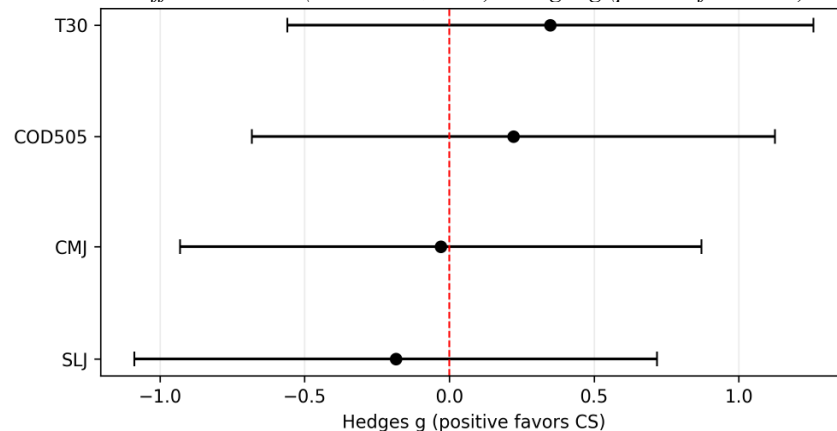
Study	Design	Sample	Intervention (CS)	Comparator (TRD)	Outcomes	Timepoints	Notes
Nickerson et al., 2018	Randomized crossover (acute priming)	n=12 collegiate male soccer players	Back squat 1×3 @85%1RM: CS30 (30 s) and CS60 (60 s) inter-repetition rest	Back squat 1×3 @85%1RM traditional (continuous)	Sprint 10 m, 10–20 m, 20 m; barbell velocity	PRE, 1P, 4P, 7P, 10P	Acute time-course
Alves et al., 2025	Controlled trial (6 weeks)	U-15 male soccer: CS n=10; TRD n=9	Drop-jump plyometrics: 3×5×2 with 30 s intra-set + 45 s inter-set (volume matched)	Drop-jump plyometrics: 3×10 with 225 s inter-set (no intra-set rest)	T30, COD505, CMJ, SLJ	Pre and Post	Control group reported in original paper

Table 2. Pre-post outcomes for the chronic study (Alves et al., 2025): CS vs TRD.

Outcome	Unit	n_CS	Pre_CS	SD	Post_CS	SD	n_TRD	Pre_TRD	SD	Post_TRD	SD
T30	s	10	4.31	0.25	4.47	0.3	9	4.3	0.31	4.55	0.38
COD505	s	10	2.44	0.1	2.43	0.12	9	2.54	0.16	2.56	0.23
CMJ	cm	10	29.26	5.08	32.61	6.55	9	29.52	6.36	33.02	6.54
SLJ	m	10	1.97	0.21	2.0	0.19	9	1.94	0.18	2.0	0.21

Table 3. Exploratory effect estimates for the chronic study (Hedges g; r=0.7). Positive values favor CS.

Outcome	Hedges g	95% CI (lower)	95% CI (upper)	Assumed r
T30 (s)	0.349	-0.559	1.257	0.7
COD505 (s)	0.222	-0.682	1.125	0.7
CMJ (cm)	-0.030	-0.930	0.871	0.7
SLJ (m)	-0.185	-1.088	0.718	0.7

Fig.2. Acute priming time-course (Nickerson et al., 2018): 20-m sprint (mean±SD).*Fig.3. Chronic intervention effect estimates (Alves et al., 2025): Hedges g (positive favors CS).*

Discussion

The aim of this scoping review was to map and synthesize the soccer-specific evidence comparing cluster-set (CS) and traditional-set (TRD) configurations in relation to sprinting, change of direction (COD), jumping performance, and fatigue-related outcomes. The main finding is that the available soccer-only literature is limited and heterogeneous, with evidence spanning acute priming contexts and short-term training interventions. While acute studies suggest time-dependent performance responses following CS configurations, chronic training evidence does not demonstrate consistent superiority of CS over TRD structures.

Acute Priming Responses

The acute evidence included in this review indicates that CS configurations may elicit transient performance benefits depending on the timing of performance assessment. In particular, improvements in 20-m sprint performance were observed approximately 10 minutes after a CS protocol with shorter inter-repetition rest, whereas no clear advantages were reported at earlier post-exercise time points. These findings align with the concept that post-activation potentiation or post-activation performance enhancement is highly time-sensitive and influenced by the balance between potentiation and fatigue (Nickerson et al., 2018; Dello Iacono et al., 2020; Niu et al., 2025). From a practical perspective, these results suggest that CS protocols may be most effective when used strategically as part of warm-up or priming routines, with careful consideration of recovery intervals before the target performance task. This is consistent with applied observations in soccer, where explosive actions are often performed within specific temporal windows during training sessions or immediately after warm-ups. The lack of consistent acute advantages across configurations highlights that set structure alone does not guarantee potentiation and must be integrated with appropriate load and recovery management (Keskin et al., 2025; Lawton et al., 2004).

Chronic Training Outcomes

In contrast to the acute findings, evidence from the chronic plyometric intervention did not show consistent performance advantages of CS over TRD configurations. Changes in sprint, COD, and jump performance were generally small and variable across outcomes, with no clear pattern favoring CS protocols. These results support the notion that long-term adaptations in soccer may be influenced more strongly by overall training content, competitive exposure, and cumulative load than by set configuration alone (Alves et al., 2025). The absence of clear chronic benefits from CS training may also reflect the complex training environment in soccer, where technical-tactical sessions, match play, and recovery demands coexist alongside strength and plyometric work. In such contexts, the marginal gains potentially offered by CS configurations may be diluted by other training stimuli or masked by match-related fatigue. This interpretation reinforces the importance of considering set configuration as one component within a broader training system rather than as an isolated determinant of adaptation.

Fatigue Management and Practical Implications

A central rationale for using CS and rest-redistribution strategies is the potential to modulate intra-set fatigue while preserving movement quality. Soccer players are exposed to frequent neuromuscular and psychophysiological stress, particularly during congested competitive schedules. Monitoring and controlling fatigue within resistance and plyometric exercises may therefore offer meaningful practical value (Polito et al., 2017; Ispirlidis et al., 2024).

Contemporary training approaches, such as velocity-based resistance training, emphasize the value of maintaining neuromuscular output and limiting excessive velocity loss during training sets (Hernández-Belmonte et al., 2023). In this context, CS configurations may serve as a practical tool for coaches to manage fatigue and ensure high-quality execution, even if their direct impact on long-term performance outcomes remains inconsistent. Thus, the utility of CS in soccer may lie more in fatigue regulation and load distribution than in producing superior chronic adaptations compared to TRD structures.

Research Gaps and Future Directions

The findings of this scoping review highlight several important gaps in the current literature. Soccer-specific studies directly comparing CS and TRD configurations remain scarce, with limited sample sizes and variability in study design, outcome measures, and reporting standards. Future research should prioritize soccer-only populations, clearly distinguish between acute and chronic applications, and standardize the reporting of set structure variables, including inter-repetition rest, volume density, and performance intent.

Additionally, greater attention should be given to fatigue-related outcomes, such as perceptual responses, neuromuscular markers, and recovery dynamics, alongside traditional performance measures. Integrating training load and competition exposure data would further improve the ecological validity and applied relevance of future investigations.

Summary

In summary, the available soccer-specific evidence suggests that CS configurations may offer practical benefits primarily in acute priming contexts when recovery timing is optimized. However, consistent chronic performance advantages over TRD configurations are not evident. Coaches and practitioners should view CS as a flexible programming strategy to manage fatigue and preserve repetition quality, rather than as a universally superior training method. Further high-quality soccer-focused research is required to clarify the conditions under which CS configurations may provide meaningful performance or fatigue-management advantages.

Conclusions

This scoping review examined the soccer-specific evidence comparing cluster-set (CS) and traditional-set (TRD) configurations in relation to sprinting, change of direction, jumping performance, and fatigue-related considerations. The main conclusion is that the current body of soccer-only evidence is limited and heterogeneous, which restricts the ability to draw definitive conclusions regarding the superiority of one set configuration over the other.

The available findings suggest that CS configurations may be most relevant in acute contexts, particularly when applied as part of priming or warm-up strategies, where performance responses appear to be highly dependent on recovery timing. In contrast, chronic training evidence does not demonstrate consistent advantages of CS over TRD configurations for improving key performance outcomes in soccer players.

From an applied perspective, CS configurations should be viewed as a context-dependent programming option rather than a universally superior method. Their primary practical value may lie in fatigue management and the preservation of repetition quality within congested training and competition schedules. Future soccer-specific research with standardized methodologies and clearer differentiation between acute and chronic applications is required to better define the role of set configuration in soccer conditioning.

Declaration of generative AI

During the preparation of this work, artificial intelligence tools were used exclusively as technical support for the formulation of bibliographic search strategies applied in scientific databases. All content of the manuscript was critically reviewed and validated by the author, who assumes full responsibility for the integrity, accuracy, and conclusions of the work.

Conflicts of interest The author declares no conflicts of interest.

Limitations

This review presents several limitations that should be considered when interpreting its findings. First, the number of studies meeting the inclusion criteria was limited, and the available evidence was heterogeneous in terms of study design, participant characteristics, training protocols, and outcome measures. Second, as a scoping review, no quantitative synthesis or formal risk-of-bias assessment was performed, and results are therefore reported descriptively. Finally, the inclusion of soccer-only samples, while strengthening contextual specificity, limits the generalizability of the findings to other sports or training contexts.

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