

Comparative Effects of French Contrast Training and Oregon Circuit Training on Explosive Strength, Power and Agility in Competitive Football Players

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ARTICLE INFORMATION	ABSTRACT
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Introduction

Competitive football requires repeated bouts of sprinting, jumping, acceleration, deceleration, and rapid changes of direction, often performed under conditions of fatigue. Successful performance therefore depends on the ability to generate high levels of force rapidly while maintaining strength, power, and movement efficiency throughout training and competition. Structured conditioning and appropriate periodization are important for developing these physical qualities and preparing athletes for the external demands encountered during competitive play (1).

French Contrast Training (FCT) is a strength-and-power training approach that combines a heavy resistance exercise with biomechanically related explosive movements within the same training sequence. By integrating high-force resistance exercise with plyometric and ballistic activities, FCT is intended to expose the neuromuscular system to both high-load and high-velocity stimuli. Previous studies involving football players have reported improvements in vertical jump performance, sprinting, balance, explosive power, and agility following French contrast or closely related contrast-based training programmes (2–4). In comparison, circuit-based training uses repeated exercise stations performed continuously or with short recovery periods and can incorporate resistance, locomotor, agility, and conditioning exercises within the same session. Such programmes have also demonstrated benefits for strength, speed, and agility in football players (5).

Evidence from soccer and other field-based sports further suggests that contrast and complex training can improve several performance-related outcomes. Contrast-training programmes performed twice weekly have produced improvements in physical fitness among university-level male soccer players, while preseason complex contrast programmes have demonstrated beneficial effects on athletic performance in football populations (6,7). Comparative research in subelite field-sport athletes has also shown that contrast-based training can influence strength- and power-related measures (8). Systematic evidence indicates that complex training may improve sprinting, jumping, and change-of-direction performance in soccer players (9), while different strength-training modalities have also been investigated for their effects on maximal strength and power in semiprofessional football players (10). In addition, complex contrast interventions may contribute to improvements in maximal strength and repeated high-intensity performance when incorporated into soccer conditioning programmes (11).

These physical adaptations are particularly relevant because competitive football involves periods of high locomotor and mechanical demand in which players must repeatedly accelerate, decelerate, generate force, and change direction within short periods of time (12). Although both FCT and circuit-based conditioning have theoretical and empirical support for improving football-related physical performance, their training structures differ substantially. FCT emphasizes the sequential combination of heavy resistance and explosive movements, whereas Oregon Circuit Training (OCT) uses multiple exercise stations to provide a broader conditioning stimulus involving muscular strength, endurance, agility, coordination, and repeated movement performance. Despite the potential value of both approaches, direct evidence comparing FCT and OCT within the same group of competitive football players remains limited, making it difficult to determine whether the two programmes produce different responses in key measures of explosive performance and agility.

Therefore, the present study aimed to compare the effects of French Contrast Training and Oregon Circuit Training on explosive strength, power, and agility in competitive football players over an eight-week training period. Specifically, the study compared changes in vertical jump performance, Agility T-test performance, and squat one-repetition maximum between players receiving FCT and those receiving OCT.

Materials and Methods

A parallel-group randomized clinical trial was conducted at Fame Football Club to compare the effects of French Contrast Training (FCT) and Oregon Circuit Training (OCT) on explosive power, agility, and lower-limb maximal strength in competitive football players. The intervention period lasted eight weeks, with outcome assessments performed before the start of training and again after completion of the eight-week programme. A total of 26 competitive football players were recruited using purposive sampling and allocated in a 1:1 ratio to two intervention groups, with 13 participants receiving FCT and 13 receiving OCT. The sample size was calculated using G*Power software, a statistical power-analysis program developed for behavioural and biomedical research (13).

Competitive or professional football players aged 15–25 years were eligible for participation. Participants were required to have approximately two or more years of consistent strength-training experience and to be free from lower-limb injury during the preceding three months. Players were excluded if they had a recent or previous physical injury that affected participation, a health or musculoskeletal condition that restricted exercise, a medical contraindication to training, absence of the required consent, or an age outside the specified eligibility range. Participants were recruited through invitations circulated through football-related groups, clubs, federations, and social-media platforms. Written informed consent was obtained before enrolment and data collection, and the study was conducted following approval by the concerned Institutional Review Board.

Explosive lower-limb power was assessed using the vertical jump test, which is commonly employed to evaluate lower-extremity power in athletic populations (14). Agility was assessed using the Agility T-test, which requires rapid acceleration, deceleration, lateral movement, and changes of direction and is therefore relevant to the multidirectional demands of football performance (15). Lower-limb maximal strength was assessed using the squat one-repetition maximum (1RM), defined as the greatest load that a participant could successfully lift once through the required squat movement using correct technique. The same three outcomes were assessed at baseline and after eight weeks of intervention.

Participants allocated to the FCT group trained three times per week for eight weeks, with each session lasting approximately 45 minutes. Each session consisted of a 10-minute dynamic warm-up, approximately 30 minutes of main training, and a 5-minute cool-down. The principal FCT sequence combined a heavy compound resistance exercise, including back squats performed at approximately 80–90% of 1RM, with biomechanically related explosive and ballistic activities. These included plyometric exercises such as box jumps, high-load ballistic or push-press exercises, and assisted plyometric movements such as band-assisted jumps. The training sequence was performed for approximately 3–4 repetitions across 3–4 sets, with 3–4 minutes of recovery between sets. Training intensity and volume were progressively adjusted according to participant tolerance and performance, consistent with contrast-based training approaches previously applied in football and related athletic populations (2,6,7).

Participants allocated to the OCT group also trained three times per week for eight weeks, with each session lasting approximately 45 minutes. Following a 10-minute warm-up, participants completed approximately 30 minutes of circuit-based training comprising 8–10 exercise stations. The programme included bodyweight squats, push-ups, lunges, step-ups, shuttle runs, ladder drills, ball throws, and tuck-your-tail exercises. Individual exercises were performed for approximately 30–45 seconds with 15–30 seconds of recovery between activities, and the circuit was completed for 2–3 rounds. Progressive overload was introduced by increasing the number of repetitions, exercise duration, or exercise complexity over the training period. Each session concluded with a 5-minute cool-down. The programme was structured to provide a multicomponent conditioning stimulus incorporating muscular strength, endurance, agility, coordination, and football-related functional performance (5,11).

Data were analysed using IBM SPSS Statistics version 27. Statistical significance was set at $p < 0.05$. The distribution of continuous outcome data was assessed using the Shapiro–Wilk test. Vertical jump measurements were treated as normally distributed; therefore, paired-samples t-tests were used to evaluate within-group changes from baseline to post-intervention, while independent-samples t-tests were used for between-group comparisons at each assessment point. Agility T-test and squat 1RM data were treated as non-normally distributed; therefore, within-group pre- to post-intervention changes were assessed using the Wilcoxon signed-rank test, and between-group comparisons were performed using the Mann–Whitney U test. Normally distributed continuous data were summarized using means and standard deviations, while rank-based statistics were used for non-parametric analyses. Effect sizes were reported for non-parametric between-group comparisons. All 26 enrolled participants were included in the reported statistical analysis.

Results

All 26 participants were included in the reported analysis, with 13 participants in the French Contrast Training (FCT) group and 13 in the Oregon Circuit Training (OCT) group. The mean age was 18.6 ± 2.89 years in the FCT group and 19.4 ± 2.57 years in the OCT group. Mean body weight was 65.7 ± 6.02 kg and 61.8 ± 6.26 kg, respectively, while mean BMI was 22.2 ± 1.33 kg/m² and 20.8 ± 1.31 kg/m² (Table I).

Table I. Baseline characteristics of participants

Variable	FCT (n=13), mean $\pm$ SD	OCT (n=13), mean $\pm$ SD
Age, years	18.6 ± 2.89	19.4 ± 2.57
Weight, kg	65.7 ± 6.02	61.8 ± 6.26
Height, feet	5.63 ± 0.26	5.56 ± 0.31
BMI, kg/m ²	22.2 ± 1.33	20.8 ± 1.31

Abbreviations: BMI, body mass index; FCT, French Contrast Training; OCT, Oregon Circuit Training; SD, standard deviation.

Vertical-jump performance increased from 45.83 ± 2.83 at baseline to 51.22 ± 2.71 after eight weeks in the FCT group and from 43.11 ± 3.29 to 48.22 ± 3.48 in the OCT group. The reported within-group mean changes were 5.38 and 5.10, respectively, with $p < .001$ in both groups. At baseline, the between-group mean difference was 2.72 (95% CI 0.23 to 5.21; $p = .033$), corresponding to a Hedges' g of 0.86. At follow-up, the mean difference was 3.00 (95% CI 0.47 to 5.53; $p = .022$), with a Hedges' g of 0.93. The difference between the reported

mean changes was only 0.28; however, a confidence interval and inferential test for the difference in change could not be calculated from the reported summary statistics because the variance of the paired change scores was not available (Table II).

Table II. Vertical-jump outcomes in the FCT and OCT groups

Outcome	FCT baseline, mean $\pm$ SD	FCT follow-up, mean $\pm$ SD	FCT change	FCT within-group p	OCT baseline, mean $\pm$ SD	OCT follow-up, mean $\pm$ SD	OCT change	OCT within-group p	Baseline mean difference (95% CI)	Baseline p	Follow-up mean difference (95% CI)	Follow-up p	Hedges' g, baseline	Hedges' g, follow-up
Vertical jump	45.83 $\pm$ 2.83	51.22 $\pm$ 2.71	5.38	<.001	43.11 $\pm$ 3.29	48.22 $\pm$ 3.48	5.10	<.001	2.72 (0.23 to 5.21)	.033	3.00 (0.47 to 5.53)	.022	0.86	0.93

Abbreviations: CI, confidence interval; FCT, French Contrast Training; OCT, Oregon Circuit Training; SD, standard deviation. Within-group comparisons were performed using paired-samples t-tests and between-group comparisons using independent-samples t-tests. Confidence intervals and Hedges' g were calculated from the reported group means, SDs, and sample sizes.

For the Agility T-test, the baseline between-group comparison was not statistically significant ($U=67.50$, $Z=-0.888$, $p=.375$), with an effect-size r of 0.174 and rank-biserial correlation of 0.201. At follow-up, the groups differed substantially in their rank distributions ($U=4.00$, $Z=-4.216$, $p<.001$), with $r=0.827$ and a rank-biserial correlation of 0.953. The FCT group had a mean rank of 7.31 compared with 19.69 in the OCT group. For squat 1RM, no statistically significant between-group difference was observed at baseline ($U=51.00$, $p=.081$) or follow-up ($U=74.50$, $p=.604$). Corresponding effect sizes were $r=0.342$ at baseline and $r=0.102$ at follow-up (Table III).

Table III. Between-group comparisons for Agility T-test and squat 1RM

Outcome	Time point	FCT mean rank	OCT mean rank	Mann–Whitney U	Z	p	r	Rank-biserial correlation
Agility T-test	Baseline	12.90	14.81	67.50	-0.888	.375	0.174	0.201
Agility T-test	Follow-up	7.31	19.69	4.00	-4.216	<.001	0.827	0.953
Squat 1RM	Baseline	16.08	10.92	51.00	-1.746	.081	0.342	0.396
Squat 1RM	Follow-up	14.27	12.73	74.50	-0.519	.604	0.102	0.118

Abbreviations: FCT, French Contrast Training; OCT, Oregon Circuit Training; 1RM, one-repetition maximum. Between-group comparisons were performed using the Mann–Whitney U test. Effect-size r was based on the standardized Z statistic.

Within-group Wilcoxon signed-rank analyses identified pre- to post-intervention differences in both training groups. For the Agility T-test, the reported test statistics were $Z=3.20$ ($p=.001$) for FCT and $Z=3.19$ ($p=.001$) for OCT. Squat 1RM also differed between baseline and follow-up in both groups, with $Z=3.50$ ($p<.001$) for FCT and $Z=3.27$ ($p=.001$) for OCT (Table IV).

Table IV. Within-group comparisons for Agility T-test and squat 1RM

Outcome	Group	Z	p	Mean rank
Agility T-test	FCT	3.20	.001	7.00
Agility T-test	OCT	3.19	.001	7.50
Squat 1RM	FCT	3.50	<.001	7.00
Squat 1RM	OCT	3.27	.001	7.00

Abbreviations: FCT, French Contrast Training; OCT, Oregon Circuit Training; 1RM, one-repetition maximum. Within-group comparisons were performed using the Wilcoxon signed-rank test.

Discussion

The present study compared French Contrast Training (FCT) and Oregon Circuit Training (OCT) for explosive power, agility, and lower-limb maximal strength in competitive football players. Both programmes were associated with significant pre- to post-intervention changes in the measured performance outcomes over eight weeks. The most distinct between-group finding was observed for post-intervention agility, where the FCT group demonstrated a markedly different rank distribution from the OCT group. Vertical-jump performance increased within both groups; however, the groups were already significantly different at baseline, and the reported mean changes were similar in magnitude. Squat 1RM also changed significantly within both groups, whereas no statistically significant between-group difference was observed after the intervention. Collectively, these findings suggest that both training approaches were associated with favourable performance changes, while the comparative evidence was strongest for agility and less conclusive for vertical-jump and maximal-strength outcomes.

The increase in vertical-jump performance observed in both groups is consistent with previous evidence indicating that complex and contrast-based training can improve high-velocity lower-limb performance. Baruah et al. reported favourable effects of complex-contrast training on jumping and change-of-direction performance compared with traditional resistance training in physically active males (16). Similarly, Luders et al. found that complex contrast training produced beneficial adaptations in physical-performance measures among semiprofessional Australian Rules football players (17). These findings support the general responsiveness of explosive lower-limb performance to combined high-force and high-velocity training stimuli. In the present study, however, interpretation of the between-group vertical-jump comparison requires caution because the FCT group had a higher mean value at baseline. Although the follow-up difference remained statistically significant, the reported within-group mean changes were 5.38 in the FCT group and 5.10 in the OCT group. The small numerical difference between these changes indicates that the post-intervention group difference may partly reflect the baseline imbalance rather than a clearly greater training response in one group. Accordingly, an adjusted analysis of post-intervention values or a direct comparison of change would provide a more appropriate estimate of the comparative intervention effect.

The significant within-group changes in squat 1RM indicate that both interventions provided a sufficient training stimulus to modify lower-limb maximal-strength performance over the eight-week period. This finding is broadly compatible with evidence that structured neuromuscular and resistance-based programmes can improve strength-related physical fitness in football players (18). FCT incorporates high-load resistance exercise directly within its training sequence, while OCT includes repeated lower-limb resistance and functional

exercises across multiple stations. These differing approaches may therefore stimulate strength adaptations through different combinations of mechanical loading, repetition volume, and repeated neuromuscular activation. Nevertheless, the absence of a statistically significant post-intervention difference between groups does not establish equivalence between FCT and OCT. Rather, the present data indicate that a clear between-group difference in squat 1RM was not demonstrated with the available sample and analysis.

Agility showed the most pronounced comparative difference after the intervention. Both groups demonstrated significant within-group changes, but the post-intervention Mann–Whitney analysis showed a large separation in group ranks, with $U=4.00$, $p<.001$ and an effect-size r of 0.827. This finding is consistent with research showing that targeted preseason conditioning can improve agility and lower-limb performance in football players (19). It is also compatible with evidence that training approaches emphasizing braking capacity, eccentric force production, and rapid changes in movement direction can improve change-of-direction and acceleration-deceleration performance in soccer players (20). A plausible explanation for the observed FCT pattern is that repeated exposure to heavy resistance exercise immediately followed by explosive and plyometric movements may enhance the ability to generate and redirect force rapidly. Such neuromuscular demands are relevant to acceleration, braking, and re-acceleration during change-of-direction tasks. This mechanism remains explanatory rather than directly demonstrated in the present study because neuromuscular activation, eccentric braking capacity, and rate of force development were not measured.

The improvements observed in the OCT group are also physiologically plausible because the programme incorporated shuttle runs, ladder drills, lunges, step-ups, and other repeated functional movements requiring acceleration, coordination, lower-limb loading, and directional changes. Circuit-based training may provide a broader conditioning stimulus by combining muscular endurance, strength, movement control, and agility within a single session. Therefore, the findings should not be interpreted as indicating that OCT lacked value for football conditioning. Instead, the results suggest that both programmes were associated with improvements across the assessed performance domains, while the post-intervention agility comparison showed the clearest separation between the groups. Whether that difference represents a true differential training effect would be strengthened by a direct group-by-time or baseline-adjusted analysis.

From a practical perspective, both interventions were delivered three times weekly for eight weeks in sessions lasting approximately 45 minutes, suggesting that each approach can be incorporated into structured football-conditioning programmes of similar duration. FCT provides a more concentrated combination of heavy resistance and explosive movements, whereas OCT distributes training across multiple functional stations. The present findings may therefore be relevant to coaches and rehabilitation or conditioning professionals when considering how different training structures relate to explosive performance, agility, and maximal strength. However, programme selection should also account for the athlete's training background, competitive schedule, recovery capacity, available equipment, and the specific physical qualities targeted during conditioning.

Several limitations should be considered when interpreting these findings. The sample was small, with only 13 participants in each group, and all players were recruited from a single football club, which limits precision and generalizability to other competitive levels and populations. The significant baseline difference in vertical-jump performance complicates interpretation of the post-intervention comparison, and the primary statistical approach relied on separate within-group tests and between-group comparisons at individual time points rather than a direct group-by-time or baseline-adjusted estimate of treatment effect. Actual pre- and post-intervention descriptive values for the Agility T-test and squat 1RM were not reported in the available results, limiting assessment of the absolute magnitude and practical importance of those changes. The study also did not include a post-training follow-up period, so the durability of the observed changes remains unknown. In addition, the available report does not quantify adherence, protocol deviations, or adverse events. These limitations mean that the findings should be interpreted as preliminary comparative evidence rather than definitive proof of superiority of either training approach.

Conclusion

French Contrast Training and Oregon Circuit Training were both associated with significant pre- to post-intervention changes in explosive power, agility, and lower-limb maximal strength over eight weeks in competitive football players. The clearest between-group difference was observed for post-intervention agility, whereas squat 1RM did not differ significantly between groups and the vertical-jump comparison was influenced by a pre-existing baseline difference. These findings indicate that both training approaches may be useful for developing football-related physical performance, while the comparative advantage of either programme should be interpreted cautiously within the limitations of the sample size, baseline imbalance, and statistical approach.

DECLARATIONS

Author Contributions:	Concept: AI, AGM; Design: AI, AGM; Data Collection: AI, FM, MM, MI; Analysis: AI, AGM, MNB; Drafting: AI.
Ethical Approval:	Ethical approval for the study was granted by the Research Ethical Committee, Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan.
Informed Consent:	Written informed consent was obtained from participants before enrollment and data collection.
Conflict of Interest:	The authors declare no conflict of interest.
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Data Availability:	Data are available from the corresponding author on reasonable request.
Acknowledgments:	The authors thank all football players who participated in the study and the investigators who contributed to data collection.
AI Declaration:	Generative AI tools were used solely for language and grammatical refinement. The authors verified the final manuscript and remain fully responsible for its accuracy, integrity, and scientific content.

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