THE FRENCH CONTRAST METHOD—THEORY AND APPLICATION

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The French Contrast Method (FCM) is a training method created by Gilles Cometti, a French track and field coach (7). After its creation, its use has become widespread by many strength and conditioning coaches, despite limited research on its effectiveness and proper implementation. The method is executed by taking four exercises that exploit various areas of the force-velocity curve in order to bring out an acute physiological response. The method aims to increase post-activation performance enhancement through a combination of traditional resistance training and plyometrics exercises leading to greater rate of force development, movement velocity, and power production. This protocol structure is a combination of complex and contrast training, designed to improve anaerobic performance. The purpose of this article is to discuss the theory behind the FCM, current evidence demonstrating its effectiveness, as well as proper implementation and execution for athletic populations.

COMPLEX TRAINING

Complex training is a combination of a high-load resistance exercise, followed by a biomechanically similar plyometric exercise (1). The basis of complex training is the acute aftereffect known as post-activation performance enhancement (PAPE) (2). The exact mechanisms leading to PAPE are not fully understood, but are thought to be related to changes in muscle temperature, calcium kinetics, myosin light chain upregulation, and nervous system activation (9). In this training method, the athlete will perform a set of a heavy resistance exercise, typically 80% or more of their one-repetition maximum (1RM), before performing a set of a non-resisted or lightly-resisted plyometric exercise immediately after. In doing this, the athlete has an increase in motor unit recruitment and will acutely increase their rate of force development, power output, and movement velocity, due to previous muscle activation (2,11).

Chronically, it is speculated, that athletes will develop more power with this method than standard loading of resistance training or plyometrics alone (3). Studies have demonstrated that incorporating complex training causes a decrease in short-distance (5- and 15-m) sprint times and improvements in vertical jump height in 17 year old elite male soccer players, when compared to a control group (1). Additional studies have shown increases in squat jump and countermovement jump height, Abalakov (vertical jump containing arm swing and quarter squat landing) test performance, and medicine ball throw distance in youth male basketball players (12). There have been increases in power measures of jump height (squat, countermovement, and depth), as well as decreases in short distance sprint times for studies implementing complex training. The theorized increases in performance are likely due to greater recruitment of motor units and the acute PAPE effect, which may lead to the potential of greater force to the subsequent movements. In the cases of testing for sprints or jump height, the power output is increased, and therefore an increase in acute performance occurs. A recent meta-analysis has highlighted the positive effects of both complex and contrast training, but determined that complex training may have a slight advantage in performance development in athletes (4).

CONTRAST TRAINING

Contrast training is the use of heavy and light loads acutely within the same session (4). Similarly, to complex training, contrast training also involves the pairing of a heavy resistance exercise and an explosive exercise directly after. For example, while complex training might call for a set of box jumps directly after a set of heavy squats, contrast training would instead have the athlete perform their set of heavy squat repetitions, alternated with lighter squat repetitions of the same exercise, and all exercises being completed with maximal intent. The combination of high and low loads has demonstrated different velocities of muscle contraction, leading to increases in power development (4). The rationale is that the heavy loaded exercise leads to an increase in neuromuscular activation, which may enhance the performance of the subsequent exercise. In this case, the subsequent exercise is a light "explosive" exercise performed at maximum velocity, another variation to develop power (14). Similarly, studies have demonstrated that there is a range of loads for the most favorable power development adaptations, which may exist on a spectrum (15). Heavy loads recruit high threshold, fast-twitch motor units, but other studies suggest that training with a higher velocity and thus lighter loads, leads to maximum power output (8,10). Therefore, using a combination of the two load methods would result in a "best of both worlds" scenario. Similar to complex training, studies on contrast training have demonstrated increases in jump height and decreases in sprint times for short-distance sprints (1). It was concluded that both complex and contrast training methods were suitable methods for developing muscle power and speed in young male soccer players (1).

FRENCH CONTRAST METHOD STUDIES

From the original method created by Cometti, Cal Dietz and Ben Peterson have reworked the FCM as a combination of complex and contrast training methods that involve the following exercise protocol: heavy compound exercise, plyometric exercise, weighted plyometric exercise, and an assisted plyometric exercise (5). These exercises are sequenced with short inter-set rest periods (10 – 20 s) between exercises and longer rest between sets (3 – 5 min) in order to allow for restoration of adenosine triphosphate (ATP) levels and high-quality movement strategies with low fatigue. The structure of these exercises allows for development of force, velocity, power, and anaerobic capacity (5).

Few studies investigate the updated version of the FCM acutely or chronically. The first study to document the acute effects of the FCM was completed by Hernandez-Preciado et al. in 2018 (7). In the study, the intervention group performed three FCM sets of isometric partial squats, drop jumps, dynamic half-squats, and hurdle jumps. Jump height was measured after each round and compared against a control group. The FCM group improved acute countermovement jump height in each subsequent round compared to baseline by 5.1, 6.8, and 8.5% after the first, second, and third set, respectively. The study demonstrated that multiple rounds of the FCM had a positive effect on countermovement jumps and it was concluded that the FCM is a valid strategy to acutely improve an athlete's jumping capacity, as well as enhance lower body force and power production within a session.

A later study by Elbadry et al. in 2019 examined the effect of the FCM chronically over eight weeks in collegiate triple jumpers (6). They investigated the training effects of the FCM on three explosive performance variables related to triple jump performance (Sargent jump test, countermovement, jump, and seated medicine ball throw) as well as kinematic triple jump variables. Over the training period, no changes were observed in arthrometric variables, while increases in all explosive strength and kinematic variables related to the triple jump increased. The explosive strength measures of the countermovement jump height increased (1.8%), seated medicine ball throw increased (2.25%), and the Sargent jump test increased (3.79%). Thirteen of the 15 kinematic variables associated with the hop, step, and jump improved from 2.4 – 16.7%. Overall, eight weeks of the FCM proved to be effective at improving explosive strength and kinematic performance variables in collegiate triple jumpers.

A training study was completed by Welch et al. where they explored the effects of the FCM on maximum strength and vertical jumping performance over six weeks (16). Subjects completed two lower-body FCM sessions per week combining back squats, countermovement jumps, trap bar jumps, and accelerated jumps. The authors reported after the six weeks of the FCM implementation, participants improved their lower body maximum strength and power (16). Absolute strength and relative strength improved in back squat (6.2%, 4.7%) and trap bar deadlift (7.7%, 5.5%) (16). Participants improved static jump height (11%), peak velocity (4.4%), and peak power (9.76%), while countermovement jumps improved in jump height (8.5%), peak velocity (3.2%), and peak power (2.3%) (16). It was concluded from this study that FCM was an effective way to increase lower body strength and power. Additionally, the authors reported that, including a warm-up, each session lasted approximately 30 min, making the FCM a time-efficient and effective method to improve performance.

These studies, while limited, demonstrate the ability of the FCM to acutely enhance lower body force and power production and chronically to improve jumping ability, maximal force production, and total body power. Because the training effects that may result from the use of the FCM beyond what could be achieved by training alone, more evidence is needed to fully elucidate both the acute and chronic mechanisms underlying this method.

PRACTICAL APPLICATION AND IMPLEMENTATION

Strength and conditioning coaches should carefully contemplate how and when to implement the FCM for their athletes. First, an athlete's training age and experience should be considered. Because this method incorporates compound movements and may cause fatigue between rounds, athletes should be competent in all compound exercises and have a baseline of maximal strength in order to handle the acute fatigue (13). The second consideration should be the time of year for using the FCM. The purpose of the FCM is to increase the power production of the upper and lower body through the exposure to resistance training and plyometrics. For this reason, the FCM should be used later in the annual plan when maximal power production is a desirable quality to pursue. Due to the higher training density, intensity, and lower volume, this method can be used in the pre-season and competitive season as a viable method for preparing athletes in the weight room. Finally, from a practical standpoint, exercise selection should reflect the demands of the sport and available equipment and space. When choosing exercises, large, multi-joint, compound exercises should be chosen for the ability to load sufficiently and contain similar muscle actions and joint angles found in sport. From the choice of the main compound movement, the remaining plyometrics exercises should reflect similar biomechanical parameters in order have the greatest acute transfer of PAPE. Once exercises have been selected, the weight room should be arranged to allow for optimal flow of athletes so they can maintain the short rest periods (10 – 20 s) between exercises. The use of small groups may provide an efficient way to organize larger teams and minimize the need for multiple pieces of additional equipment.

Table 1 provides sample exercises and training prescription during an off-season for collegiate football or rugby athletes providing workouts focusing on power production with the inclusion of heavier weights to stimulate a maximal strength adaptation in the main compound exercise. Table 2 focuses on a competitive season workout where the main focus is power production and the main compound exercise has an emphasis on velocity of movement and moving submaximal weights as quickly as possible. Tables 3 and 4 contain sample workouts for a laterally-focused athlete, such as ice hockey and baseball, where the emphasis is placed on training outside of the sagittal plane.

CONCLUSION

Overall, from the limted evidence available, the FCM is a practical method to acutely increase force, velocity, and power production in athletes. Two studies have highlighted that in the short-term (6 – 8 weeks) the FCM improved maximal strength, explosive power, and sport performance. This method serves as a time-efficient method to develop power and improve anaerobic capabilities. Strength and conditioning coaches can consider implementing this method if their athletes have a sufficient training age, proficient technique execution, and are entering the pre-season or competitive phase of the annual plan. Future studies should endevour to explore the mechamisms underlying the FCM both actuely and chronically. Additonally, this method should be compared to already established protocols for increasing power and jump height, such as plyometrics and post-activation performance enhancement.

FIGURE 1. BARBELL BENCH PRESS

FIGURE 2. PLYOMETRIC PUSH-UP

FIGURE 3. MEDICINE BALL PUSH SLAM

FIGURE 4. BAND-ASSISTED PUSH-UP

FIGURE 5. BARBELL BACK SQUAT

FIGURE 6. COUNTERMOVEMENT JUMP

FIGURE 7. LOADED TRAP BAR JUMP

FIGURE 8. BAND-ASSISTED VERTICAL JUMP

TABLE 1. PRE-SEASON SAMPLE WORKOUT

	HEAVY COMPOUND MOVEMENT	PLYOMETRIC MOVEMENT	WEIGHTED JUMP OR LIGHT COMPOUND MOVEMENT	ASSISTED PLYOMETRIC MOVEMENT
Upper Body Exercise	Bench press	Plyometric push-up	Medicine ball push slam	Band-assisted push-up
Sets x Repetitions	5 x 3	5 x 3	5 x 3	5 x 3
Intensity (%1RM)	40 – 70%	Bodyweight	10 – 30%	Bodyweight
Lower Body Exercise	Back squat	Countermovement jump	Loaded trap bar jump	Band-assisted jump
Sets x Repetitions	5 x 3	5 x 3	5 x 3	5 x 3
Intensity (%1RM)	40 – 70%	Bodyweight	10 – 30%	Bodyweight

TABLE 2. COMPETITION PERIOD SAMPLE WORKOUT

	HEAVY COMPOUND MOVEMENT	PLYOMETRIC MOVEMENT	WEIGHTED JUMP OR LIGHT COMPOUND MOVEMENT	ASSISTED PLYOMETRIC MOVEMENT
Upper Body Exercise	Bench press	Plyometric push-up	Medicine ball push slam	Band-assisted push-up
Sets x Repetitions	6 x 2	6 x 3	6 x 3	6 x 3
Intensity (%1RM)	60 – 90%	Bodyweight	10 – 30%	Bodyweight
Lower Body Exercise	Back squat	Countermovement jump	Loaded trap bar jump	Band-assisted jump
Sets x Repetitions	6 x 2	6 x 2	6 x 2	6 x 2
Intensity (%1RM)	60 – 90%	Bodyweight	10 – 30%	Bodyweight

TABLE 3. PRE-SEASON SAMPLE WORKOUT

	HEAVY COMPOUND MOVEMENT	PLYOMETRIC MOVEMENT	WEIGHTED JUMP OR LIGHT COMPOUND MOVEMENT	ASSISTED PLYOMETRIC MOVEMENT
Lower Body Exercise	Lateral lunge	Lateral hurdle hop	Weighted lateral hurdle hop	Band-assisted lateral lunge
Sets x Repetitions	5 x 3	5 x 3	5 x 3	5 x 3
Intensity (%1RM)	40 – 70%	Bodyweight	10 – 30%	Bodyweight
Lower Body Exercise	Reverse Lunge	Split squat jump	Weighted split squat jump	Band-assisted split squat jump
Sets x Repetitions	5 x 3	5 x 3	5 x 3	5 x 3
Intensity (%1RM)	40 – 70%	Bodyweight	10 – 30%	Bodyweight

TABLE 4. COMPETITION PERIOD SAMPLE WORKOUT

	HEAVY COMPOUND MOVEMENT	PLYOMETRIC MOVEMENT	WEIGHTED JUMP OR LIGHT COMPOUND MOVEMENT	ASSISTED PLYOMETRIC MOVEMENT
Lower Body Exercise	Lateral lunge	Lateral hurdle hop	Weighted lateral hurdle hop	Band-assisted lateral hurdle hop
Sets x Repetitions	6 x 2	6 x 3	6 x 3	6 x 3
Intensity (%1RM)	60 – 90%	Bodyweight	10 – 30%	Bodyweight
Lower Body Exercise	Reverse lunge	Split squat jump	Weighted split squat jump	Band-assisted split squat jump
Sets x Repetitions	6 x 2	6 x 2	6 x 2	6 x 2
Intensity (%1RM)	60 – 90%	Bodyweight	10 – 30%	Bodyweight

REFERENCES

1. Alves, JMVM, Rebelo, AN, Abrantes, C, and Sampaio, J. Short-term effects of complex and contrast training in soccer players' vertical jump, sprint, and agility abilities. *The Journal of Strength and Conditioning Research* 24: 936-941, 2010.

2. Blazevich, AJ, and Babault, N. Post-activation potentiation versus post-activation performance enhancement in humans: Historical perspective, underlying mechanisms, and current issues. *Frontiers in Physiology* 1359, 2019.

3. Burger, T. Complex training compared to a combined weight training and plyometric training program. University of Idaho, 1999.

4. Cormier, P, Freitas, TT, Rubio-Arias, JÁ, and Alcaraz, PE. Complex and contrast training: does strength and power training sequence affect performance-based adaptations in team sports? A systematic review and meta-analysis. *The Journal of Strength and Conditioning Research* 34: 1461-1479, 2020.

5. Dietz, C, and Peterson, B. *Triphasic Training: A Systematic Approach to Elite Speed and Explosive Strength Performance*. Bye Dietz Sport Enterprise Hudson, WI; 2012.

6. Elbadry, N, Hamza, A, Pietraszewski, P, Alexe, DI, and Lupu, G. Effect of the French contrast method on explosive strength and kinematic parameters of the triple jump among female college athletes. *Journal of Human Kinetics* 69: 225-230, 2019.

7. Hernández-Preciado, JA, Baz, E, Balsalobre-Fernández, C, Marchante, D, and Santos-Concejero, J. Potentiation effects of the French contrast method on vertical jumping ability. *The Journal of Strength and Conditioning Research* 32: 1909-1914, 2018.

8. Kawamori, N, and Haff, GG. The optimal training load for the development of muscular power. *The Journal of Strength and Conditioning Research* 18: 675-684, 2004.

9. Lorenz, D. Postactivation potentiation: An introduction. *International Journal of Sports Physical Therapy* 6: 234, 2011.

10. Newton, RU, and Kraemer, WJ. Developing explosive muscular power: Implications for a mixed methods training strategy. *Strength and Conditioning Journal* 16: 20-31, 1994.

11. Sale, DG. Postactivation potentiation: Role in human performance. *Exercise and Sport Sciences Reviews* 30: 138-143, 2002.

12. Santos, EJ, and Janeira, MA. Effects of complex training on explosive strength in adolescent male basketball players. *The Journal of Strength and Conditioning Research* 22: 903-909, 2008.

13. Seitz, LB, de Villarreal, ES, and Haff, GG. The temporal profile of postactivation potentiation is related to strength level. *The Journal of Strength and Conditioning Research* 28: 706-715, 2014.

14. Smilios, I, Pilianidis, T, Sotiropoulos, K, Antonakis, M, and Tokmakidis, SP. Short-term effects of selected exercise and load in contrast training on vertical jump performance. *Journal of Strength and Conditioning Research* 19: 135-139, 2005.

15. Soriano, MA, Jiménez-Reyes, P, Rhea, MR, and Marín, PJ. The optimal load for maximal power production during lower-body resistance exercises: A meta-analysis. *Sports Medicine* 45: 1191-1205, 2015.

16. Welch, ML, Lopatofsky, ET, Morris, JR, and Taber, CB. Effects of the French contrast method on maximum strength and vertical jumping performance. 2019.

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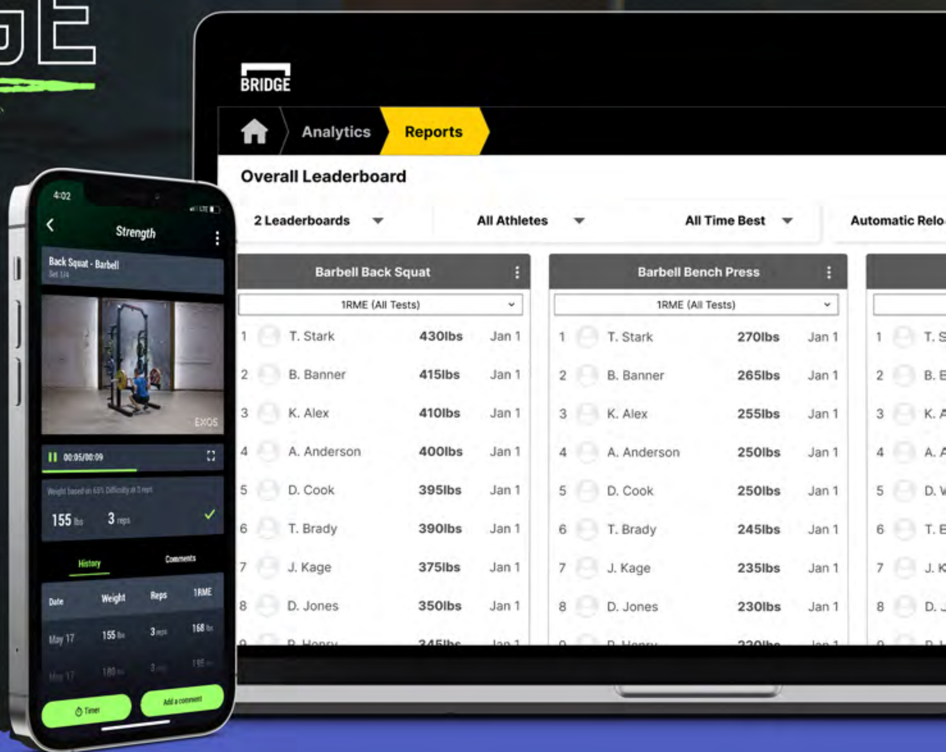

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