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Role of Strength Training for female Soccer athletes: An Overview

Aparna Rathi

Assistant Professor, Jawaharlal Nehru Smarak P.G. College, Maharajganj, (U.P.) India

Received-11.07.2024, Revised-17.07.2024, Accepted-02.08.2024 E-mail : aaryvart2013@gmail.com

Abstract: Soccer is the most popular sport in the world performed by men and women, children and adults with different levels of expertise. The performance depends upon a myriad of factors such as technical, tactical, physical, physiological and mental areas. Distances covered during a game of soccer at top level are in the order of 10–12km for the field players, and about 4km for goalkeeper. Both female and male players tax the aerobic and anaerobic energy systems to a similar level but female soccer players appear to run a shorter distance compared with male players. Although there is a great range and overlap of strength abilities in men and women. Much of the absolute difference in strength between males and females seems to be explained by absolute differences in the amount and location of muscle tissue, so it is not surprising that when males and females do participate in various types of weight-training, they respond in a very similar fashion. Muscle tissue in females and males has the same training potential, and men and women have similar responses to strength training from their pre training baselines. The goals of the individual should be analysed and the choices of exercises, intensities, and set, repetition, and rest period combinations, as well as variations needed in training, should be made to further those goals.

Key words: Soccer, Myriad, Top Level, Goalkeeper, Aerobic, anaerobic energy systems,tissue

Soccer- Soccer is the most popular sport in the world, performed by men and women, children and adults with different levels of expertise. As with other sports, soccer is not a science but science may help improve performance. The performance depends upon a myriad of factors such as technical, tactical, physical, physiological and mental areas. This article provides an overview of important literature in soccer physiology describes relevant physiological tests and gives examples of effective strength training regimens to improve on-field soccer performance not highlighted in previous reviews. Furthermore, this article presents up-to-date data about the need of strength training for female soccer players.

Physical Demands required in Soccer- Distances covered at top level are in the order of 10–12km for the field players, and about 4km for goalkeeper. Several studies report that the midfield players run the longest distances during a game and that professional players run longer distances than non-professionals. The exercise intensity is reduced and the distance covered is 5–10% less in the second half compared with the first. During a soccer game, a sprint bout occurs approximately every 90 seconds, each lasting an average of 2–4 seconds. Sprinting constitutes 1–11% of the total distance covered during a match corresponding to 0.5–3.0% of effective play time (i.e. the time when the ball is in play). In the endurance context of the game, each player performs 1000–1400 mainly short activities changing every 4–6 seconds. Activities performed are: 10–20 sprints; high-intensity running approximately every 70 seconds; about 15 tackles; 10 headings; 50 involvements with the ball; about 30 passes as well as changing pace and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure. Withers et al. noted that fullbacks sprinted more than twice as much as the central-defenders (2.5 times longer), whilst the midfielders and the attackers sprinted significantly more than central-defenders (1.6–1.7 times longer) This is in line with Mohr et al. who reported that fullbacks and attackers sprinted significantly longer than central-backs and midfielders. Strength and power are equally as important as endurance in soccer. Maximal strength refers to the highest force that can be

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performed by the neuromuscular system during one maximum voluntary contraction (one repetition maximum [1 RM]), whereas power is the product of strength and speed and refers to the ability of neuromuscular system to produce the greatest possible impulse in a given time period. Maximal strength is one basic quality that influences power performance; an increase in maximal strength is usually connected with an improvement in relative strength and therefore with improvement of power abilities. A significant relationship has been observed between 1RM and acceleration and movement velocity. This maximal strength/power performance relationship is supported by jump test results as well as in 30m sprint results. By increasing the available force of muscular contraction in appropriate muscles or muscle groups, acceleration and speed may improve in skills critical to soccer such as turning, sprinting and changing pace. High levels of maximal strength in upper and lower limbs may also prevent injuries in soccer. Furthermore, Lehnhart et al. showed that introducing a strength training regimen reduced the number of injuries by about 50%. From this it should be obvious that superior technical and individual (and team) tactical ability in soccer can only be consistently demonstrated throughout the course of a 90-minute competition by soccer players with high endurance capacity and strength.

Demands for Female Soccer Players- Previous research suggests that both female and male players tax the aerobic and anaerobic energy systems to a similar level, but female soccer players appear to run a shorter distance compared with male players. Unfortunately, few studies have examined the physiological profile of female soccer players. There is a reported VO2max of 38.6–57.6 mL/kg/min or 109.7–160.3 mL/kg0.75/ min. The Danish nationals, as a team, had 100 mL/kg/min higher VO2max than the least fit team. The huge differences observed may have a connection with the level of women's soccer in general. Differences in physical resources, determined as strength and endurance parameters, between male and female elite soccer teams, are similar to their sedentary counterparts. This means that compared with sedentary counterparts within the same sex, the female elite soccer players have improved as much as the male elite soccer players. Therefore, there is no reason to claim that female soccer has shortcomings compared with elite male soccer in terms of strength and endurance.

Absolute Strength Comparison among male and female- Although there is a great range and overlap of strength abilities in men and women, when the measure is the absolute amount of force exerted or weight lifted, the average woman is about two-thirds as strong as the average man. Laubach (1976) reviewed 9 descriptive studies, all but one of which used static measures of strength, and found absolute upper body strength in women was 35% to 79% (averaging 55.8%) that of men, while absolute lower body strength was 57% to 86% (averaging 71.9%) that of men; the mean percentage of women's total body strength was 63.5% that of men. U sing measurements of functional torque, Stobbe (1982) found lower overall values than Laubach, women overall being 56.5% as strong as men. In another review, Hudson (1978) summarised absolute strength differences as: female upper body 50% to 60% as strong as the male's, and female lower body 70% to 80% as strong as the male's. Wilmore (1974) conducted one of the first experimental studies comparing responses of women and men to strength training and Hudson's (1978) analysis of the pretraining scores of Wilmore's subjects shows an overlap of female and male scores on all strength tests; Wells and Plowman (1983), in a similar analysis, show a large overlap for Wilmore's males and females in pretraining leg press scores.

Relative Strength and Power Comparisons- Strength has been expressed relative to body mass, to lean body mass, and per unit of muscle cross-sectional area in studies comparing men and women. Morrow and Hosler (1981) compared female basketball and volleyball players with untrained men and found the men superior for both upper and lower body strength expressed both absolutely and relative to bodyweight and size. Using the same measurement techniques as Morrow and Hosler (1981), Bond et al. (1985) compared female bodybuilders to untrained men; they found

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the bodybuilders weaker in the upper body in absolute strength, but the same in absolute lower body strength, with no significant differences between the sexes for upper body or lower body strength relative to bodyweight and size. Komi and Karlsson (1978) found total isometric leg force in men and women almost identical when related to bodyweight. O'Shea and Wegner (1981) found women weaker in l RM bench press and squat than similarly experienced men, both absolutely and relative to bodyweight, both before and after 9 weeks of conditioning and weight-training in both groups. When Wilmore (1974) measured strength relative to lean body mass, thus eliminating the greater amount of body fat that women have, men still displayed greater upper body strength, but women slightly surpassed men in leg press strength. This parity of leg strength between the sexes, when expressed relative to lean body mass, was also found by Levine et a1. (1984). Hosler and Morrow (1982) used multiple regression techniques and found that once body composition and size were controlled, gender accounted for 1 % of the variance in arm strength between the sexes, and 2% in leg strength. Heyward et a1. (1986) also used multiple regression techniques and reached a similar conclusion, that gender differences in upper and lower body strength are largely a function of differences in lean body mass, and the distribution of muscle and subcutaneous fat in the body segments. However, 27% of the variance in strength between the sexes remained unaccounted for in their study. It may be speculated that biomechanical factors such as leverage, and neural factors such as training background and expectations, would help explain this variance gap.

The conclusion to be drawn from these muscle cross-sectional studies, taken together with the multiple regression studies, is that female muscle tissue, unit for unit, does not differ in potential force output from male muscle tissue. This indicates that the training potential and methods of training for men and women should be similar, although there have been doubters of this fact in the past (for a discussion see Hudson 1978). It is clear that the amount and location of muscle tissue on a given individual are major determinants of strength, and are important factors in explaining absolute strength differences between the sexes, since men typically have a larger amount of muscle mass than women, especially in the upper body.

Responses of Females to Strength Training- Much of the absolute difference in strength between males and females seems to be explained by absolute differences in the amount and location of muscle tissue, so it is not surprising that when males and females do participate in various types of weight-training, they respond in a very similar fashion. When response differences are observed, consideration of neural-related factors such as training background and the psychological interaction of the individual with the existing culture, biomechanical factors, and hormonal factors can offer insight. In addition, different styles of weight training elicit different responses.

After strength training on the same routine, men have greater absolute increases in both strength and muscular hypertrophy than women, as reviewed by Cureton et al. (1988). However, studies comparing men and women placed on the same training routines have reported women achieving percentage changes in strength similar to men's in upper and lower body (Cureton et al. 1988), or greater percentage changes than men in isometric leg extension force (Hakkinen et al. 1989) and in the bench press, back squat, and leg press (O'Shea & Wegner 1981; Wilmore 1974).

Strength Training Programme Considerations- As discussed, muscle tissue in females and males has the same training potential, and men and women have similar responses to strength training from their pre training baselines. Thus, men and women should train in the same way. Programmes should be tailored to the individual. The goals of the individual should be analysed and the choices of exercises, intensities, and set, repetition, and rest period combinations, as well as variations needed in training, should be made to further those goals. Techniques of using these variables to enhance athletic performance are discussed at length elsewhere (for example, see Baechle 1984; Bompa 1983; Garhammer 1987; Roman 1986; Starr 1978; Stone & O'Bryant 1987;

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Takano 1987, 1988). It is sufficient to mention here that these experts and others (National Strength and Conditioning Association 1989) recommend that athletes use multijoint free weight exercises such as various full and partial snatching movements, cleaning movements, jerking and pressing movements, squatting movements, and lunging movements, because they demand movement patterns, and the neuromuscular coordination and speeds which relate well to real life sport requirements.

REFERENCES

1. Bangsbo J. The physiology of soccer: with special reference to intense intermittent exercise. Acta Physiol Scand 1994; 15 Suppl. 619: 1-156
2. Whitehead EN. Conditioning of sports. Yorkshire: E P Publishing Co. Ltd, 1975: 40-2
3. Ekblom B. Applied physiology of soccer. Sports Med 1986 Jan-Feb; 3 (1): 50-60
4. Mohr M, Krustrup P, Bangsbo J. Match performance of high standard soccer players with special reference to development of fatigue. J Sports Sci 2003 Jul; 21 (7): 519-28
5. Withers RT, Maricic Z, Wasilewski S, et al. Match analysis of Australian professional soccer players. J Hum Mov Stud 1982; 8: 159-76.
6. . Van Gool D, Van Gerven D, Boutmans J. The physiological load imposed in soccer players during real match-play. In: Reilly T, Lees A, Davids K, et al., e football. London: E&FN Spon, 1988: 51-9.
7. Bangsbo J, Nørregaard L, Thorsøe F. Activity profile of competition soccer. Can J Sports Sci 1991 Jun; 16
8. . Rienzi E, Drust B, Reilly T, et al. Investigation of anthropometric and work-rate profiles of elite South American international soccer players. J Sports Med Phys Fitness 2000 Jun; 40 (2): 162-9
9. Reilly T, Thomas V. A motion analysis of work-rate in different positional roles in professional football match-play. J Hum Mov Stud 1976; 2: 87-97
10. . Helgerud J, Engen LC, Wisløff U, et al. Aerobic endurance training improves soccer performance. Med Sci Sports Exerc2001 Nov; 33 (11): 1925-31
11. Mayhew SR, Wenger HA. Time motion analysis of professional height. soccer. J Hum Mov Stud 1985; 11: 49-52
12. Agnevik G, editor. Fotboll. Idrottsfysiologi, Rapport no. 7. Stockholm: Trygg-Hansa, 1970
13. Buhrle M, Schmidtbleicher D. Der einfluss von maximalkrafttraining auf die bewegungsschnelligkeit. Leistungssport 1977; 7: 3-10
14. Hoff J, Almasbakk B. The effects of maximum strength training on throwing velocity and muscle strength in female teamhandball players. J Strength Cond Res 1995; 9 (4): 255-8
15. Schmidtbleicher D. Training for power event. In: Komi PV, editor. Strength and power in sport. London: Blackwell Scientific Publications, 1992: 381-95
16. Wisløff U, Castagna C, Helgerud J, et al. Maximal squat strength is strongly correlated to sprint performance in elite soccer players. Br J Sports Med 2004 Jun; 38 (3): 285-8
17. Arnason A, Sigurdsson SB, Gudmundsson A, et al. Physical fitness, injuries, and team performance in soccer. Med Sci Sports Exerc 2004 Feb; 36 (2): 278-85
18. Lehnhart RA, Lehnhart HR, Young R, et al. Monitoring injuries on a college soccer team: the effect of strength training. J Strength Cond Res 1996; 10 (2): 115-9
19. Helgerud J, Hoff J, Wisløff U. Gender differences in strength and endurance of elite soccer players. In: Spinks W, Reilly T, Murphy A, editors. Science and football IV. Sydney: Taylor and Francis, 2002: 382
20. Davis JA, Brewer J. Applied physiology of female soccer players. Sports Med 1993 Sep; 16 (3): 180-9

21. Balsom P. Evaluation of physical performance. In: Ekblom B, editor. Football (soccer). London: Blackwell Scientific, 1994: 102-23
22. Cureton KJ, Collins MA, Hill DW, McElhannon Jr FM. Muscle hypertrophy in men and women. Medicine and Science in Sports and Exercise 20 (4): 338-344, 1988
23. Komi PV, Karlsson J. Skeletal muscle fibre types, enzyme activities and physical performance in young males and females. Acta Physiology Scandinavia 103: 210-218, 1978
24. Laubach L. Comparative strength of men and women: a review of the literature. Aviation, Space and Environmental Medicine 47 (5): 534-542, 1976
25. Hosler WW, Morrow JR. Arm and leg strength compared between young women and men after allowing for differences in body size and composition. Ergonomics 5 (4): 309-313, 1982
26. Hudson J. Physical parameters used for female exclusion from law enforcement and athletics. In Oglesby CA (Ed.) Women and sport: from myth to reality, pp. 19-57, Lea and Febiger, Philadelphia, 1978
27. Stobbe TJ. The development of a practical strength testing program for industry. Unpublished dissertation, Departments of Industrial and Operations Engineering and Industrial Health Service, University of Michigan, Ann Arbor, 1982
28. Wilmore JH. Alterations in strength, body composition and anthropometric measurements consequent to a 1O-week weight training program. Medicine and Science in Sports 6 (2): 133- 138, 1974

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