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REVIEW OF LITERATURE ON PHYSIOLOGICAL STATUS AND MOTOR FUNCTION OF SPORTS TRAINEES IN COACHING CENTERS

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Abstract: Sports is a Physical, psychological and physiological activity. The physical, intellectual, and physiological guiding of game enthusiasts can be crucial for sports workouts sports instruction along with the many skills of a motion and sports exercises in today's competitive world. The organizations are set up not only to provide the overall performance in movement but also to win the activity. Hence, the ability cap potential—which is now unpalatable for the abilities—is required for winning the movement. Yet, the main challenge is the heart of the game enthusiasts, with which they play and perform their spectacular inside the opponent. Psychology is a behavioral science had made to create to aid coaches in their work and improve athletes' performance. It also worries about the total wellbeing and personal adjustment to the persons whose involved in sports. Sports performance is not only depending on physical appearances but also psychological characteristics plays an important role.
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Introduction:

Competitive rowing is characterized by repetitive cyclic muscle actions and high demands on several components of physical fitness such as cardiorespiratory endurance [CRE] and muscular fitness (Akça, Citation2014; Bourgois et al., Citation2014; Mäestu et al., Citation 2005). In this context, "muscular fitness" is used as an umbrella term for "maximum strength," "local muscular endurance," and "muscular power" (Granacher et al., Citation2016). For instance, Izquierdo-Gabarren et al. (Citation2010) examined the effects of training status on measures of physical fitness in sub-elite male rowing athletes aged 21–30 years. These authors reported significantly higher maximum strength (i.e., bench-press 1-repetition maximum [RM]) and lower 2,000 m race times in elite compared with recreational athletes. Further, Olympic compared with high-school and club rowers (aged 23–35) exhibited higher maximum strength (normalized to body mass) in squat, deadlift, and bench pull exercises (McNeely et al., Citation2005). Moreover, Lawton et al. (Citation2013b) reported that lower limb maximum strength (i.e., leg-press 5-RM) and upper limb muscular endurance (i.e., seated arm pull 60-RM) were the best predictors for 2,000 m rowing ergometer performance (R^2 = 59%) in elite male rowers aged 24 years.

To enhance muscular fitness and sport-specific performance, strength training (ST) appears to be an adequate and effective means in trained and untrained individuals (Lesinski et al., Citation2016; Rhea et al., Citation 2003). For instance, the prospective cohort study of DuManoir et al. (Citation2007) examined the effects of ST in addition to regular rowing training (i.e., CRE training) on maximum strength (e.g., 1-RM leg press) and sport-specific performance (e.g., 2,000 m rowing performance) in male novice rowers aged 31 years. The authors demonstrated that ten weeks of additional ST resulted in significant increases in 1-RM leg press and improved 2,000 m rowing ergometer time (DuManoir et al., Citation2007). Further, in addition to regular rowing practice, plyometric training showed significant improvements in 500 m time trial performance compared with aerobic cycling in male high-school rowers aged 16 years (Egan-Shuttler et al., Citation2017). Of note, the effects of ST on CRE in athletes in general and rowers, in particular, are crucial for performance during competition. For rowing, this is of particular interest because training-induced adaptations of strength training in addition to regular CRE-based rowing training (i.e., concurrent training) can be mitigated compared with single-mode ST in trained individuals (Coffey & Hawley, Citation2017; García-pallarés & Izquierdo, Citation2011). Previously, Lawton et al. (Citation2011) summarized the literature on the effects of ST when integrated into regular rowing training on measures of physical fitness and sport-specific performance (Lawton et al., Citation2011). In their narrative review, Lawton et al. (Citation2011) reported positive effects of heavy-resistance strength training and strength endurance training on sport-specific performance without reporting any statistically significant proof. However, the review of Lawton et al. (Citation2011) is methodologically limited in terms of evidence level (i.e., narrative review) and the applied selection criteria (i.e., the inclusion of uncontrolled trials). To the best of our knowledge, no systematic review and/or meta-analysis have been conducted that compared the effects of ST vs. active controls in rowing athletes.

Review of literature:

An athlete's success relies heavily on the combination of ability, tactical, technical, physical fitness, and psychological individualities (Smith, 2003; Granacher et al., 2016). Physical fitness is vital in determining an athlete's competitive abilities (Kariyawasam et al., 2019). Physical fitness is influenced by various factors, including genetics and the environment. A lot of genetics and environmental factors have an impact on human physical performance. Extremely hot or cold climates strain the exercising individual, striving to stabilize their internal body temperature (Cech, 2011). Furthermore, some characteristics that affect fitness, including body size and muscle fiber composition, are influenced by inheritance. Inherited variables may influence physical activities (Bouchard and Perusse, 1994). According to assessments from heritability investigations on sport-related factors, speed-power, endurance and strength capacities all have a genetic cause (Coelho et al., 2016; Pickering et al., 2019; Guilherme et al., 2021), which could be explained in part by the genetics of muscle fiber specialization (Hamada et al., 2000; Lewis et al., 2015). Professional youth soccer players' physical features vary depending on their maturity level (Murtagh et al., 2018), and strength being even more important in mature professional youth players than in immature elite youth soccer players (Murtagh et al., 2018). Furthermore, it is uncertain if genetic changes may reflect differences in strength and speed among professional players and various phases of development actively involved (Murtagh et al., 2018). Case-control studies in primarily older players have made up most of the past genetics research in soccer (Egorova et al., 2014; Gineviciene et al., 2014). However, in contrast to cross-sectional genotype and phenotype association research, such investigations are of partial significance to the utilized practitioner, even if they do not reveal the link concerning bodily functional abilities and individual heritable variants. Further, there are few genotype and phenotype studies on athletes (Micheli et al., 2011; Pimenta et al., 2013; Coelho et al., 2016), it is uncertain whether the influence genetic diversity has on elite soccer players' strength, speed, power and quickness. To the researcher, no study has been done on the interaction between neuromuscular training and heredity.

Neuromuscular training (NT) is a strength and fitness training method that combines sport-specific and fundamental movements, including resistance, balance, core strength, dynamic stability, agility exercises, and plyometrics, to improve skills and health-related fitness (Myer et al., 2011). Furthermore, NT aims to enhance speed, reaction speed, agility, coordination, and endurance among athletes (Matin et al., 2014). NT, which has grown in popularity in recent years, are used to prevent injuries and improve the performance of athletes by regaining leg power, strength, and balance after an injury (Hewett et al., 2005; Batrakoulis et al., 2018; Canli, 2019).

The NT improves nerve-muscle control while increasing the stability of functioning joints (Yoo et al., 2010; Gonçalves et al., 2020; Mahdieh et al., 2020). Furthermore, NT has been proven to influence the sensitivity and reactivity of the central nervous system and improves the power of athletes by targeting motor units and coordinating motor units and increasing muscle activation. These enhancements resulted in skillful movements and significantly improved agility, balance, muscular strength, muscular power, and cardiorespiratory endurance among individuals (Fort-Vanmeerhaeghe et al., 2016). The NT also focuses on promoting functional joint stability by improving athletes' neuromuscular control and has been proven to significantly enhance their VO_2 max (Schneider et al., 2006). Numerous studies have focused on plyometrics, strength, and NT on general and soccer-specific performance in youth (Michailidis et al., 2013; Fort-Vanmeerhaeghe et al., 2016; Dhawale, 2020). Neuromuscular training aims to improve neuromuscular control and increase functional joint stability. It is anticipated that addition balance training in these programs will enhance the coactivation of the muscles around joints, increasing joint stiffness and active joint stability. Furthermore, it could change biomechanical injury risk factors, such as raised knee valgus during landing exercises in female high school basketball players (McLeod et al., 2009). The NMTP aims to improve athletes' ability to manage their center of mass during dynamic activities (Myer et al., 2006). NMTP significantly improved measures of athletic performance in female athletes, particularly female basketball players, as well as biomechanical factors.

Most studies have examined the effects of INT on adolescent motor performance, and the results are extremely positive. For instance (Faigenbaum et al., 2011; Sugimoto et al., 2014; Faigenbaum et al., 2015) found significant improvements in several motor performance indicators following 8–10 weeks of INT (Sugimoto et al., 2014). demonstrated that high adherence to INT significantly increases the isokinetic strength of the hip abductors in 15-year-old female volleyball players, while (Faigenbaum et al., 2014) found significant gains in neuromuscular fitness and aerobic endurance measures following 8 weeks of INT in 7-year-old children.

It has been suggested that throwing athletes could benefit from increased neuromuscular control through neuromuscular training (Freeston et al., 2015). Neuromuscular training has been considered an effective treatment method to enhance the neurophysiological entity of the joints for coordinated functioning (Zech et al., 2009; Bscher et al., 2010). Neuromuscular training, defined as training that enhances unconscious motor responses by stimulating sensory signals and central mechanisms, leads to dynamic joint stability (Zech et al., 2009). This training improved dynamic joint stability and fine motor control by strengthening the synchronisation and synergy of the muscle activity pattern in cricket players (Lephart and Henry, 1996; Myers and Lephart, 2000; Guido Jr and Stemm, 2007).

Integrative neuromuscular training (INT) is a program that aims to improve health and skill-related aspects of physical fitness (Faigenbaum et al., 2011; Myer et al., 2011) that has been trending in recent years (Faigenbaum et al., 2011; Myer et al., 2012; Faigenbaum et al., 2014). The INT prioritizes muscular power, motor skill performance, and muscular strength (Myer et al., 2011; Fort-Vanmeerhaeghe et al., 2016). In addition, the program includes resistance training, plyometric exercises, and dynamic stability (Myer et al., 2011; Myer et al., 2012; Faigenbaum et al., 2015), which improves the athletes' vertical jump. Most importantly, INT may act as injury prevention due to the strengthening, stretching, plyometrics, and balance exercises included in these training programs (Hewett et al., 2005).

Previous studies have demonstrated that NT alters neuromuscular risk variables, resulting in a significant increase in athletic performance and physical fitness. However, there is no systematic study of the NT program on skills and health-related fitness components (Michailidis et al., 2013; Gonçalves et al., 2020; Sinđić et al., 2021). Therefore, this aims to perform a comprehensive evaluation and synthesis of the scientific literature on the impact of NT on athletes' physical fitness. Furthermore, this review is the first study to use a structured approach to the literature and to evaluate NT programs and fitness components in player performance.

An athlete's success relies heavily on the combination of ability, tactical, technical, physical fitness, and psychological individualities (Smith, 2003; Granacher et al., 2016). Physical fitness is vital in determining an athlete's competitive abilities (Kariyawasam et al., 2019). Physical fitness is influenced by various factors, including genetics and the environment. A lot of genetics and environmental factors have an impact on human physical performance. Extremely hot or cold climates strain the exercising individual, striving to stabilize their internal body temperature (Cech, 2011). Furthermore, some characteristics that affect fitness, including body size and muscle fiber composition, are influenced by inheritance. Inherited variables may influence physical activities (Bouchard and Perusse, 1994). According to assessments from heritability investigations on sport-related factors, speed-power, endurance and strength capacities all have a genetic cause (Coelho et al., 2016; Pickering et al., 2019; Guilherme et al., 2021), which could be explained in part by the genetics of muscle fiber specialization (Hamada et al., 2000; Lewis et al., 2015). Professional youth soccer players' physical features vary depending on their maturity level (Murtagh et al., 2018), and strength being even more important in mature professional youth players than in immature elite youth soccer players (Murtagh et al., 2018). Furthermore, it is uncertain if genetic changes may reflect differences in strength and speed among professional players and various phases of development actively involved (Murtagh et al., 2018). Case-control studies in primarily older players have made up most of the past genetics research in soccer (Egorova et al., 2014; Gineviciene et al., 2014). However, in contrast to cross-sectional genotype and phenotype association research, such investigations are of partial significance to the utilized practitioner, even if they do not reveal the link concerning bodily functional abilities and individual heritable variants. Further, there are few genotype and phenotype studies on athletes (Micheli et al., 2011; Pimenta et al., 2013; Coelho et al., 2016), it is uncertain whether the influence genetic diversity has on elite soccer players' strength, speed, power and quickness. To the researcher, no study has been done on the interaction between neuromuscular training and heredity.

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Effect of neuromuscular training on balance

Nine studies assessed balance-related outcomes: young male soccer players; (Borghuis et al., 2013; Sahin et al., 2014; Kowalczyk et al., 2019), basketball players; (Neto et al., 2006; Pfile et al., 2016; Ondra et al., 2017), football players; (Pasanen et al., 2009), tennis players; (Barber-Westin et al., 2010; Barber-Westin et al., 2015), and volleyball players; (Trajković and Bogataj, 2020). The dynamic balance was examined in a quiet unipedal posture and positively influenced postural stability for dominant and non-dominant limbs (Ondra et al., 2017). Static and dynamic balance resulted in fewer Balance Error Scoring System (BESS) errors in the trained group at the posttest compared with their pretest and the control group ($p = 0.003$) and in Star Excursion Balance Test (SEBT) compared with the controlled group after the posttest ($p < 0.05$) (McLeod et al., 2009). Three studies assessed how football, tennis, and soccer players balance on similar surfaces. During the follow-up, significant changes in static and dynamic balance were observed in the intervention group compared to the control group players (Neto et al., 2006; Barber-Westin et al., 2010; Sahin et al., 2014). In one study, the single-leg triple crossover had significant improvement after the intervention, but in the single-leg hop, improvement was only (29%) and showed no significant effect (Barber-Westin et al., 2015).

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