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The Use of Action Games in the Selection of Athletes for Athletics Training

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Annotation. At present, studies investigating the effectiveness of game-based training are limited, with many of the suggested advantages and disadvantages of game-based training based on anecdotal evidence. Of the studies that have been performed, most have reported that game-based training offers a specific method of conditioning for team sport competition, but game-based training may not simulate the high-intensity, repeated-sprint demands of international competition, Game-based training has been reported to offer a safe, effective method of conditioning for team-sport athletes that results in comparable (and, in some cases, greater) improvements in physical fitness and performance than traditional conditioning activities. While technical instruction training has been associated with a higher volume of skill executions (i.e., more 'touches'), game-based training has been associated with greater cognitive effort - an important condition for skill learning. Indeed, studies investigating skill learning have reported comparable (and, in some cases, greater) improvements in skill execution and decision-making following game-based training than training involving repetitious technical instruction. Collectively, these findings demonstrate the value of game-based training for improving skill and physical fitness in team sport athletes. Further studies investigating the long-term skill and physical benefits of game-based training are warranted.

Key words: Contextual Interference, Small-Sided Games, Teaching Games for Understanding

High-intensity, intermittent team sports such as water polo, football and hockey require athletes to have well developed speed, muscular strength and power, agility, and maximal aerobic power. [1] However, while well-developed physiological capacities are important for team sports, athletes are also required to have well-developed technical skill and decisionmaking ability. In addition, athletes are often required to demonstrate these qualities under high levels of pressure and fatigue. Studies of team-sport athletes have consistently shown higher skilled players to have superior speed, muscular power, and maximal aerobic power than their lower skilled counterparts. [2-4] Similarly, in the team-sport environment, significant expert-novice differences have been demonstrated in pattern recognition [5], decision-making [6], dualtask performance [7, 8], and anticipation [9]. Given the importance of these physiological and skill qualities to team-sport performance, coaches have great interest in finding the most effective methods of developing these attributes in their athletes. Game-based training is increasingly being used to improve the skill and physical fitness of team-sport athletes. [10-13] The use of games in training is based on the premise that the greatest improvements in performance occur when the physiological demands and movements patterns replicate the demands of the sport. [14] However, studies investigating the effectiveness of game-based training are limited, with many of the suggested advantages and disadvantages of game-based training based on anecdotal evidence. [15-19] The purpose of this paper is to briefly review the relevant literature relating to game-based training, and summarise the advantages and disadvantages of this approach to training.

The greatest improvements in fitness and performance occur when training simulates the physiological and technical demands of competition. [14] Game-based training is increasingly

being used as a means of improving the skill and physical fitness levels of team sport athletes [20-24] as it allows the simulation of movement patterns of team sports, while maintaining a competitive environment where athletes must perform under pressure and while fatigued. [19] Perhaps more importantly, game-based training offers an additional challenge to team-sport athletes that would not normally be present in non-skill related conditioning activities. Several studies have investigated the physiological demands of game-based training [24] and compared these demands to competition (Table 1). [25, 26] In a study of rugby league players, Gabbett [25] found similar heart rate (152 beats.min-1 vs. 155 beats.min-1) and blood lactate concentrations (5.2 mmol.l-1 vs. 5.2 mmol.l-1) during competition and training (that consisted entirely of small-sided games). Sassi et al. [23] compared the heart rate and blood lactate responses to game-based training and interval running without the ball in elite soccer players, and reported that game-based training offered a physiological training stimulus that was similar (and, in some cases, exceeded) interval running without the ball. Hoff et al. [27] investigated the heart rate responses of first division players to soccer-specific training and reported exercise intensities of 91.3% and 84.5% of maximal heart rate and maximal oxygen uptake, respectively. Although game-based training has been shown to provide a specific training stimulus that generally replicates the overall demands of team-sport competition, recent evidence suggests that it may not always meet the high-intensity, repeated-sprint demands of competition. [26, 28] In a study of elite female soccer players, Gabbett and Mulvey [26] reported no differences in the relative amount of time spent standing, walking, jogging, striding, and sprinting between small-sided games and international competition. However, a closer examination of the repeated-sprint demands (defined as a minimum of 3 sprints separated by less than 21 seconds recovery) showed that players completed significantly fewer repeatedsprint bouts in game-based training (1.0 bout per player) than in international competition (4.8 bouts per player), and fewer bouts per minute of match-play (game based training = 1 bout per 38.2 min; international competition = 1 bout per 19.4 min). Collectively, the available evidence from the research to date suggests that game-based training offers a specific method of conditioning the overall demands of team-sport competition, but may not replicate the high-intensity, repeated-sprint demands of competition. Practical Applications The majority of evidence has demonstrated that game-based training can be used to simulate the overall demands of competition. However, game-based training may not simulate the high-intensity, repeated-sprint demands of competition. From a practical perspective, these findings may suggest that game-based training should be supplemented with more traditional conditioning that simulates the high-intensity, repeated-sprint demands of competition. Alternatively, coaches can modify the content and nature of game-based training (e.g., by modifying pitch dimensions and rules, player numbers, and number of balls) to increase the physiological demands of the training stimulus. In addition, the use of one-on-one "markups" (in which defenders continually mark the same attacking player) are likely to increase the repeated-sprint demands of training, by forcing players to sprint in defence, rapidly recover, and then mount an effective counterattack. PHYSIOLOGICAL TRAINING ADAPTATIONS Reilly and White [20] compared the effectiveness of 6 weeks of aerobic interval training and game-based training on improvements in muscular power, agility, skill, anaerobic capacity, and maximal aerobic power in professional academy soccer players. There were no significant differences between groups for any of the performance tests following training, leading the authors to conclude that game-based training offered an acceptable substitute for aerobic interval training to maintain fitness during the competitive season. Gamble [22] reported significant improvements in aerobic fitness following a 9-week pre-season training period that consisted entirely of game-based training in elite rugby union players. More recently, studies have compared game-based training and traditional conditioning activities on physical fitness and playing performance in team-sport

athletes. [29, 30] Impellizzeri et al. [30] investigated the effects of game-based training and aerobic interval training on maximum oxygen consumption, lactate threshold, running economy at lactate threshold, soccer-specific endurance (measured via Ekblom's circuit test), and indices of physical performance during soccer matches (total distance covered, and time spent standing, walking and running) in junior soccer players. The authors reported no significant differences between groups for any of the measured variables, including the soccer-specific tests. Gabbett [29] compared game-based training and traditional conditioning activities for improving speed, agility, muscular power, and maximal aerobic power in rugby league players. Game-based training induced a significant improvement in 10m, 20m, and 40m speed, muscular power, and maximal aerobic power, whereas traditional conditioning activities improved 10m speed and maximal aerobic power only. Both groups won six of eight matches played during the training period, but on average the game-based training group scored more points in attack and had a greater points-differential than the traditional conditioning activities group. Collectively, these findings demonstrate that game-based training offers an effective method of conditioning for team sport athletes that result in comparable (and, in some cases, greater) improvements in physical fitness and performance than traditional conditioning activities.

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