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Original paper

Acute effect of exercise on kicking accuracy in elite Australian football players

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Abstract

Kicking accuracy (KA) is an important skill in Australian football but the potential influence of exercise on this skill has not been previously investigated. The purpose of this study was to determine if a 2× 2 min time trial running protocol influenced short KA in elite Australian football. Another aim was to identify if endurance, playing experience and position were related to any exercise-induced KA changes. Twenty-seven professional footballers performed a KA test by kicking at a bullseye on a target projected onto a screen. The mean error from the centre of the target was the KA score. The players were assessed on the KA test, and then performed a 2× 2 min time trial with a 3-min recovery between runs. The total distance covered was used as a measure of endurance fitness, and the test also served as an exercise bout designed to impose some physiological stress. Immediately following this test, the players walked into the laboratory and performed the KA test again. A paired *t*-test revealed that the whole group achieved a non-significant 2.7% improvement in KA. Players were divided into two distinct groups based on endurance (2× 2 min results), playing experience and position (midfielders and forwards/backs). Analysis of covariance showed that after the exercise bout, the fitter group had significantly better KA ($p = 0.010$) than the less fit group, and the more experienced players were 16% more accurate than the less experienced group ($p = 0.055$). The midfielders were 8.2% better than the forwards/backs in KA ($p = 0.32$). It was suggested that greater endurance and playing experience may facilitate KA under moderate physiological stress.

Keywords: Physical endurance; Australian football; Motor skills; Exercise tolerance; Arousal

1. Introduction

One of the objectives of Australian football is to maintain possession of the ball to create scoring opportunities. Therefore the ability to kick accurately to a team mate is an important attribute. In soccer there is evidence that temporary fatigue can impair performance, although the physiological mechanisms are not clear.[1] While there is no corresponding evidence relating to Australian football, this sport is physiologically demanding with professional level midfielders reported to cover 17 km in a game.[2] Much of this distance consists of walking or slow running but is interspersed with many high intensity efforts.[3] Therefore, it is possible that due to the intermittent nature of the game, the physiological demands impose a certain stress that may challenge a player to kick accurately under match conditions.

The effects of exertion in elite junior water polo players have been investigated by Royal et al.[4] Water polo drills were performed with diminishing recovery periods to control the level of exertion. Players were assessed on decision-making accuracy, shooting skill, accuracy and speed. As physical exertion increased, subjective measures of shooting skill decreased such as the height out of the water, but shooting accuracy and speed were maintained despite blood lactate levels of greater than 7 mmol l^{-1}. The authors concluded that the athletes may have sacrificed non-essential elements of the skill to maintain shooting accuracy and speed.

The effects of various levels of exercise exertion on a dribbling and passing test[5] and in a kicking accuracy task[6] have been studied in soccer players. The general findings were that

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the soccer kicking skills were enhanced by moderate levels of exertion compared to a rested state, but performance was impaired by highly fatiguing exercise. It was suggested that moderate levels of arousal from this condition might have been conducive to good performance of this soccer skill.[5,6] It has recently been shown that short passing ability in junior soccer players declined in the second half of a match and also in response to a 5-min bout of high intensity exercise.[7]

Sjöberg[8] tested participants with mathematical problems to assess mental performance 2 min after exercise on a cycle ergometer. It was found that a fitter group (based on maximum oxygen uptake) recovered more quickly after exercise than a less fit group and achieved superior mental performance. Since motor skill performance such as kicking for accuracy could be influenced by mental skills such as concentration, a higher level of fitness may be beneficial for kicking accuracy during exertion. Collectively the above research suggests that the effects of exercise and various levels of exertion on sports skills are not clear, and could be influenced by many factors such as performance level and fitness.

To date there has been no research on the influence of exercise or physical exertion on kicking performance in Australian football. Therefore a purpose of this study was to determine if an acute exercise bout causes a change in accuracy in short kicks in professional Australian Football League (AFL) footballers. A second purpose was to determine if any exercise-induced changes were related to fitness, playing experience or playing position.

2. Methods

Twenty-seven professional footballers from the playing list of one AFL club with a mean ± standard deviation height, weight and AFL game experience of 187.0 ± 7.1 cm, 88.3 ± 8.1 kg and 43.3 ± 48.3 games, respectively volunteered to participate in this study. All players were free of injury and illness at the time of testing and provided consent as part of their club training program. The study was approved by the University Human Research Ethics Committee.

Players were split into three groups for testing and commenced the session with 10 practice kicks at a target which consisted of a 35 cm radius bullseye projected onto a screen on an indoor wall. This was followed by the kicking accuracy (KA) test which began in a rested state. Over the next 15 min the players performed a warm-up consisting of some dynamic exercises to the muscles of the lower extremity and 4–6 × 20 m progressively faster runs in preparation for the time trial. The time trial consisted of 2 × 2 min-timed runs with a 3 min recovery between repetitions. The objective was to achieve the greatest possible total running distance. This test served two purposes. First it was intended to induce some exertion or physiological stress to determine if it would influence KA. The second purpose of this time trial was to act as a measure of endurance fitness with the total distance of the two runs retained as the measure. Within 2 min of the completion of the time trial, the players again performed the KA test (Fig. 1).

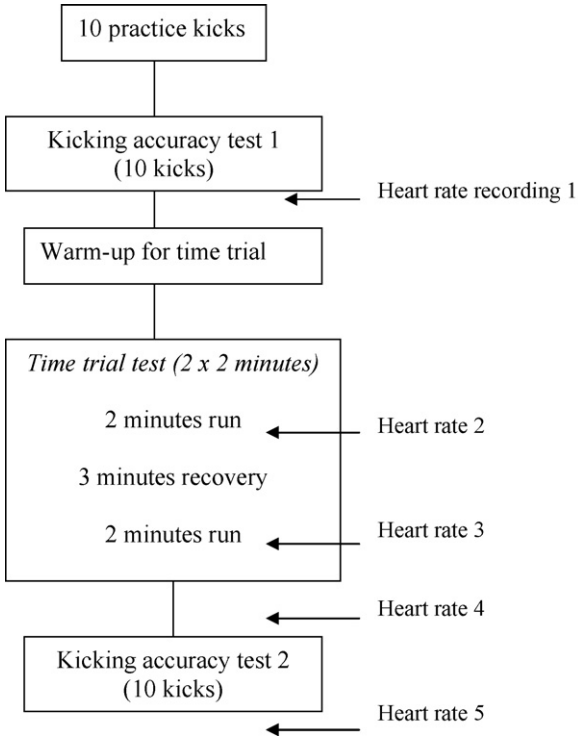

Fig. 1. Schematic representation of the study design.

The kicking accuracy test required each player to kick a regulation competition ball from a point that was 16 m from the target, immediately collect the ball and jog to the end of the group line in preparation for the next kick. The test was finished when all players had performed 10 kicks in total. All kicks were performed with the preferred foot. Players were required to run hard for 3 m to a cone and then steady to kick over another 5 m. Each player used his own ball for consistency between pre- and post-run tests. It typically took 18 s for the group to perform one kick each, which meant that the test was completed in about 3 min. Immediately following the first test, heart rate (HR) was recorded via a HR monitor (Polar Electro S610I watch and T31 transmitter, Finland) (HR1) while the player walked to the outside grass oval.

Players ran on a grass oval and the distance run was recorded to the nearest 5 m with marked cones at the end of each 2 min period. Heart rates were recorded immediately

Table 1
Descriptive results (means ± S.D.) for the whole group ($n = 27$)

KA pre (cm)	85.7 ± 23.8
KA post (cm)	83.4 ± 21.8
HR1 (bpm)	128 ± 13
HR2 (bpm)	180 ± 9
HR3 (bpm)	182 ± 9
HR4 (bpm)	146 ± 13
HR5 (bpm)	174 ± 9
2 × 2 min time trial run (m)	1286.7 ± 62.5

KA is kicking accuracy, HR is heart rate.