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# Contextual effects on activity profiles of domestic field hockey during competition and training



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### ARTICLE INFO

#### Article history:

Available online 16 February 2015

#### PsycINFO classification:

3700

#### Keywords:

Time-motion analysis

GPS

Team sports

Acceleration

High speed running

### ABSTRACT

Game context is widely accepted to influence performance but most data available is 'categorical' and addresses performance rather than activity. This study assessed direct effects of opposition and team ranking in field hockey to establish influences on activity. One hundred and eight ( $n = 108$ ) female field hockey players (age 16–39 years) participated, giving 186 competition and 48 training analyses. Team average distance (mean  $\pm$  SD) observed in a mid-ranked team during competition ranged from  $5949 \pm 611$  to  $7719 \pm 257$  m demonstrating an opposition rank effect (Pearson's  $r = .71$ ; adjusted  $R^2 = .42$ ). However, multiple linear regression analysis demonstrated a stronger relationship in lower ranked teams (Pearson's  $r = .99$ ; adjusted  $R^2 = .97$  through 3–9). In contrast, no team rank effect was observed during randomly monitored competition where team average distance ranged from  $5177 \pm 444$  to  $7316 \pm 241$  m (Pearson's  $r = .15$  and adjusted  $R^2 = .12$ ). In training, however, a team rank effect was observed in distance-related performance indicators where team average distance during small-sided games ranged from  $5877 \pm 188$  to  $3551 \pm 193$  m drill (per 70 min) with Pearson's  $r = .95$  and adjusted  $R^2 = .87$ . The presence of contextual effects has significant practical implications for team sports where the training load assumed from competition may be overestimated.

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## 1. Introduction

Performance analysts and coaches use a wide range of statistics to assess individual and team performances in both training and competition (Hughes & Bartlett, 2002). These performance indicators (including physiological, technical and tactical outcome) show that, during competition, performance is dynamic and influenced by conditions that are both time and context dependent (Brady, 1998; Hughes & Bartlett, 2002; McGarry, Anderson, Wallace, Hughes, & Franks, 2002).

Recent studies suggest that circumstances, such as the quality of opposition and match status, can influence competitive performance (Lago, 2009; Sampaio, Lago, & Drinkwater, 2010; Taylor, Mellalieu, James, & Shearer, 2008). Potential relationships have been identified that link the perceived quality of opposition and possession strategies in soccer (Lago, 2009), the course of a tennis match (O'Donoghue, 2009), volleyball performance (Marcelino, Mesquita, & Sampaio, 2010) and the number and outcome of game actions in netball (O'Donoghue et al., 2008). However, a consistent influence has not been demonstrated, largely due to differences in analysis procedures. Indeed, the opposition is not usually considered directly in relation to their final ranking and usually teams are categorized as 'successful' or 'unsuccessful' through their ranking at a particular competition (Grant, Williams, & Hocking, 1999) or grouped together by symmetric division of their end-of-season league classification (Marcelino, Mesquita, Castro, & Sampaio, 2008; O'Donoghue et al., 2008; Taylor et al., 2008).

Furthermore, the available literature has tended to examine such effects only in competition and generally disregarded the effects of physical or technical ability on performance during training. Training effects are important for planning training prescription because individual or small group performance differences can influence the team's ability to achieve prescribed intensities during drills that involve simulated game activities or technical skills. Field hockey was chosen as the sport to be investigated because its organizational structure can lead to players of wide ranging playing experience and technical ability competing and/or training together. The aim of the present study was, therefore, to assess the *direct* effects of opposition and team ranking on common physical performance indicators used to establish intensity of field hockey competition (e.g., total distance covered or number of high intensity running efforts) and, secondly, to establish whether team ranking influences exercise intensity during training.

## 2. Methods

The University of Glasgow, College of Medical and Life Sciences research ethics committee approved all procedures.

### 2.1. Experimental approach to the problem

In the present study, the physiological demands of field hockey were investigated using GPS and inertial sensor technology during competition and training over a competitive national league season. The data are presented in raw format to allow some comparison with the previous literature but is also expressed relative to the notional 70 min duration of play that occurs in field hockey competition (referred to as 'Drill (*per* 70 min)' [ $(70/\text{drill duration}) * \text{variable}$ ]). This analysis is intended to allow easier comparison of the relative intensity of training and competition activities.

### 2.2. Participants

One hundred and eight ( $n = 108$ ) outfield female field hockey players (age 16–39 years) participated in the study and wore GPS units during competition and training. Athletes were all members of the Scottish National League One Hockey teams (the top grade competition in Scottish field hockey). All participants had completed a pre-season training programme, were in the competitive phase of their season and free from injury at the time of the study.

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