The effects of travel on team performance in the Australian national netball competition

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The effects of travel on performance during six seasons of the Australian national netball competition were analysed. Pairs of games were grouped according to the travel required to reach the opponent's court. The four groups were local (<1 h) travel (LT; n=15), north or south travel without a time-zone shift (NS; n=77), and east or west travel with either a < 2-h time-zone shift (EW_1; n=54) or a 2-h time-zone shift (EW_2; n=25). The combined change in performance was analysed by comparing the points difference (home margin - away margin) for each pair of games. In this way, each game acted as its own control. One-way ANOVA revealed no significant difference (*P*=0.68) in the points difference (mean±SD) for LT (-1.3±8.8), NS (-3.3±4.2), EW_1 (-3.8±4.9), or EW_2 (-6.8±7.2). While the large variation in points difference diminished the power of the ANOVA to detect change, effect size (ES) calculations revealed a large effect on the points difference when EW_2 was compared with LT (ES=1.0) and a moderate effect when EW_2 was compared with EW_1 (ES=0.5) and NS (ES=0.6). There was however, a significant difference between points scored at home and away for EW_2 travel only (P=0.01). These results suggest that relatively brief air travel (across only two time zones) can influence team performance.

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Introduction

Frequent air travel is common for the modern athlete. Australian netball players competing in the national competition (Commonwealth Bank Trophy) play up to half their games away from home. While it is often assumed that air travel will have a detrimental effect on team performance (ie, points scored/ allowed), scientific evidence supporting this assumption is inconsistent.

One of the principal mechanisms by which air travel has been proposed to affect team performance is the disruption of circadian rhythms (or 'jet lag')[1]. Retrospective assessment of game outcomes between sports teams from different time zones has provided mixed support for the circadian dysrhythmia hypothesis. Home winning percentages have been reported to be greater or not significantly different when the visting team had travelled from west to east, compared with east to west[2]. However, interpretation of these studies is confounded as games were not studied in a paired fashion (unlike the present study) and outcomes may have been influenced by the current form of each team. Thus, to date there is little compelling evidence to support the circadian dysrythmia hypothesis.

In addition to circadian dysrhythmia, impaired performance following travel may be attributable to sleep disturbances and/or home ground advantage[2]. Sleep disturbances may result from the physical act of flying or sleeping in unfamiliar surroundings. Desynchronisation of the sleep-wake cycle with external cues of the new environment also results in impaired sleep. It has also been suggested that, as the distance a team travels from home increases, the likelihood of supportive fans in the audience decreases[3]. Thus, if travel does affect performance, some of the effects may be due to crowd partisanism.

The goal of the present study was to asssess the influence of travel within and across time zones on netball team performance. Unlike previous research, our analysis only included pairs of games in which teams played each other both at home and away. In this way, each game acted as its own control.

Methods

Archival data from six seasons (1997-2002) of the Australian National Netball Competition were obtained and analysed. Pairs of games were only included if teams played each other both at home and away during the season. Pairs of games (n= 171) were then grouped according to the travel required to reach the opponent's court. The four groups were local (<1 h) travel (LT; n= 15), north or south travel without a time-zone shift (NS; n= 77; ~ 1000 - 2000 km), and east or west travel with either a <2-h time-zone shift (EW_1; n= 54; ~1000-2500 km) or a 2-h time-zone shift (EW_2; n= 25; ~4000 km). For EW travel, players typically arrived the day before the match. The combined change in performance with travel was assessed by comparing the points difference (home margin - away margin) for each pair of games for each of the four groups of travel. Thus, if team A defeats team B by 10 points at home, but by only five points away, then the points difference (travel cost) would be five points. In this way, each game acted as its own control.

Matched-pairs Student's t-tests (with Bonferonni correction) were used to analyse differences between home and away scores, while one-way ANOVA were used to assess differences between home and away scores for each travel condition ($P<0.05$). Where appropriate, post-hoc comparisons were employed (Student-Newman-Keuls test). Effect size (ES) was also calculated using a pooled standard deviation (0.2-0.5 = small effect; 0.5-0.8 = moderate effect; >0.8 = large effect).

Results

One-way ANOVA revealed no significant difference (P=0.68) in the points difference (mean±SD) for LT (-1.3±8.8), NS (-3.3±4.2), EW_1 (-3.8±4.9), or EW_2 (-6.8±7.2) (Fig 1). While the large variation in points difference diminished the power of the ANOVA to detect change, effect size (ES) calculations revealed a large effect on the points difference when EW_2 was compared with LT (ES=1.0) and a moderate effect when EW_2 was compared with EW_1 (ES=0.5) and NS (ES=0.6).

One-way ANOVA revealed no significant difference (P=0.22) in the points scored at home for the four groups of travel (Fig 2). There was however a significant difference between points scored away between the NS and EW_2 groups (P=0.01). There was also a significant difference between points scored at home and away for EW_2 only (P=0.01).

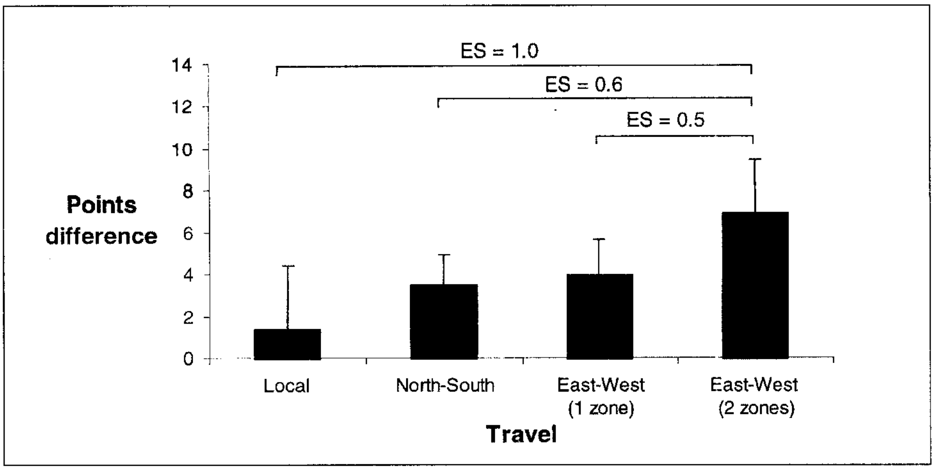

Figure 1: Mean±SE_m for points difference (home margin - away margin) for each pair of games for each of the four groups of travel. ES = effect size.

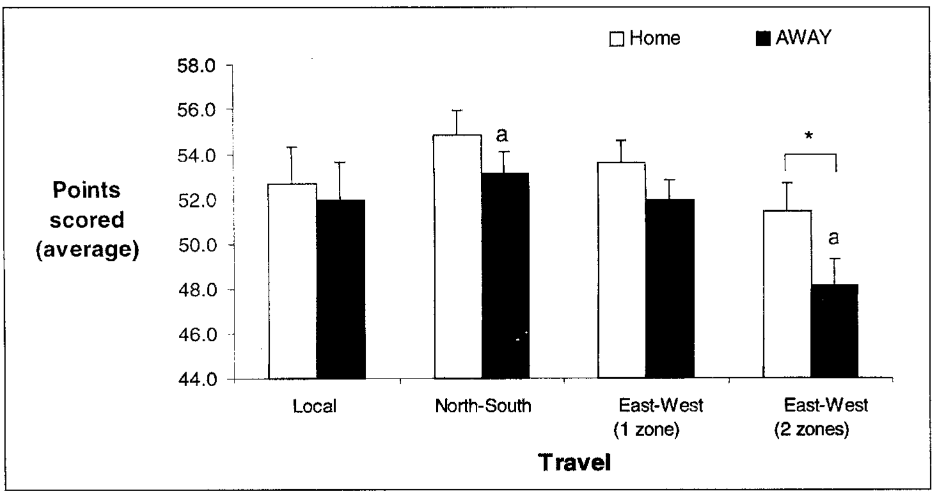

*Figure 2: Mean±SE_m for points scored at home and away for each of the four groups of travel. * significant difference ($P<0.05$) between home and away scores. Points scores with the same letter are significantly different from each other.*

Discussion

The results of the present study support anecdotal reports that team athletic performance is influenced by travel. While differences were not significant, effect size calculations showed that travel across a 2-h time zone was associated with the largest points difference (home margin–away margin). Travel across a 2-h time zone was the only condition in which there was a significant difference between points scored at home and away. These results suggest that relatively brief air travel (across only two time zones) can influence team performance.

The present results are consistent with previous reports suggesting that travel has a detrimental effect on team-sport performance[1,4]. For example, Jehue et al[1] reported a significant decrease in winning percentage when National Football League teams travelled away from home. Similarly, Rowbottom and Pickering[4] reported a significant increase in points difference (home margin - away margin) for EW travel (-24.5±8.1 points; $P<0.05$) and NS travel (-36.1±10.4 points; $P<0.05$), but not for LT (-12.2±6.7 points; $P>0.05$) in the Australian Football League. Thus, it appears that in a variety of team sports, travel has a detrimental effect on performance.

It has been suggested that the most likely explanation for the effects of travel on team-sport performance is additive circadian dysrythmia[5]. That is, although the physical and cognitive disturbances resulting from travelling relatively short distances (crossing one to two time zones) are likely to be small, when such minor impairments are aggregated among all team members, the effects may be more pronounced. The present results provide mixed support for the circadian dysrythmia hypothesis. Evidence contradicting the circadian dysrythmia hypothesis was provided by the observation that that there was no significant difference in the points difference between NS travel and EW_1 travel. This is consistent with the results of Rowbottom and Pickering[4] who also reported no significant difference in the points difference for EW and NS travel. The circadian dysrythmia hypothesis was also contradicted by the the results of Jehue et al[1] who reported that the decline in winning percentage when playing away from home was typically greater against teams in the same time zone compared with other time zones.

Some support for the circadian dysrythmia hypothesis was provided by the observation that the magnitude of the points difference was greatest for EW_2 travel. Furthermore, average points scored were significantly fewer for home versus away games for EW_2 travel only ($P<0.05$). Unfortunately, we are unable to compare this observation with Rowbottom and Pickering[4] as all EW travel was included in one group. However, our results contrast with those of Jehue et al[1] who reported that change in winning percentage was not affected by distance travelled. However, as they only reported winning percentage, it is impossible to know if there were distance-related changes in points difference or points scored. Further research is therefore required to investigate the distance-related changes in performance observed in this study. Furthermore, while it could be claimed that these results provide some support for the circadian dysrythmia hypothesis, it is equally likely that EW_2 travel is more fatiguing due to the longer travel duration. To provide a truer test of the circadian dysryhthmia hypothesis, travel within the same time zone should be of similar duration to travel across time zones.

In addition to the circadian dysrythmia hypothesis, there are a number of other explanations for the reported effects of travel on team-sport performance. It is possible that the process of travel, along with the associated stress, restricted motion, altered diet and unfamiliar sleeping surroundings, is largely responsible for the impaired team performance following air travel. This was suported by our observation that there was no significant difference in performance impairment between NS and EW_1 travel (which were of similar average duration). Furthermore, if it is the process of travel that is detrimental, then one would expect performance decrement to be greater the longer the flight (as was the case with EW_2 travel in the present study). Although very difficult to assess, it has also been suggested that the effects of air travel on team performance may be largely due to 'home ground' advantage[6]. In particular, it appears that the home crowd may be able to influence officials subconsciously to favour the home team[6]. Furthermore, it has been suggested that home advantage may increase as the distance a visiting team has to travel increases, due to the likelihood of fewer supportive fans in the audience[3].

In summary, the results of the present study suggest that travel affects team athletic performance and that this effect increases with distance travelled. While the lack of significant difference in the points difference between NS travel and EW travel contradicts the circadian dysrythmia hypothesis, the observation that the magnitude of the points difference was greatest for EW_2 travel provides some support for the circadian dysrythmia hypothesis. However, other possible factors contributing to the larger differences associated with EW_2 travel include 'home-ground' advantage and the process of travel itself.

References

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