

Quantifying physiological demands of mixed Ultimate Frisbee players and their effect on match outcome



Kerin McDonald & Peter Maulder
Centre for Sport Science and Human Performance
Wintec, Hamilton, New Zealand



Introduction

The aims of this study were to examine and compare movement patterns of 4 male and 4 female Ultimate Frisbee players during a 3-day mixed national tournament and investigate if the outcome of matches (win/loss) were the result of any specific characteristics. Ultimate Frisbee (UF) has been described as a high intensity invasion sport requiring power, speed, agility and aerobic endurance (1), however to date limited research has been published around the time motion characteristics for either gender. UF has many playing formats including single and mixed gender teams playing indoors or outdoors. Games are self-refereed with an unlimited number of substitutions allowed following a point being scored. Games are either played to a time or points cap depending on tournament rules. These factors can greatly influence the length of individual points, matches and subsequent athlete demands. Most sports, including UF have only attempted to compare genders in isolation rather than during the same match (2). It is also unclear if specific game play characteristic from either gender influence match outcome.

Methods

Eight participants (Male n = 4, female n = 4) from Hammertrons mixed UF team volunteered to take part in the current study. Participant characteristics were recorded alongside a battery of pre-testing measures (3) (table 1), providing gender comparisons and allowing individualised speed zones to be set. Five UF matches played to 13 points were analysed over a three-day mixed national tournament with data being collected via GPS at a rate of 10Hz. Playing times and distances in five speed zones were measured along with the number of accelerations. A match recording sheet cross referenced with GPS data to differentiate between on field and off field activity. Between match outcome differences, between gender differences and the interaction between match outcome and gender were determined using a two-way analysis of variance (ANOVA). Homogeneity of variance was assessed using Levene's test to ensure ANOVA testing could proceed. Statistical significance was set at an alpha level of $p \leq 0.05$. Descriptive correlations were used in accordance with Evans (1996).

Table 1 Male and Female Ultimate Frisbee Participants Information and Physical Capabilities Prior to Competition							
	Age (years)	Height (cm)	Weight (kg)	505 Agility (sec)	Yoyo Predicted VO2max (ml/kg/min)	40m sprint (sec)	Max speed (kph)
Total average	29.4	171.4	68.9	2.45	45.9	5.99	28.3
Total SD	7.3	9.4	11.8	0.15	3.1	0.35	2.0
Male average	29.0	179.1	72.7	2.37	47.8	5.73	29.8
Male SD	9.6	5.5	15.2	0.09	3.2	0.27	1.7
Female average	29.8	163.6	65.2	2.53	43.9	6.25	26.8
Female SD	5.6	4.3	7.4	0.15	1.5	0.18	0.9
SD = Standard deviation cm = centimetres; kg = kilogram; ml/kg/min = millilitres per kilogram per minute; m = meters; sec = seconds; kph = kilometres per hour							

Results

Length of games averaged 70:43 ± 14:19 minutes, with a mean on field playing time of 16:53 ± 5:46 minutes and average point duration of 1:57 ± 0:23 minutes. Both genders covered significantly more distance during games won compared to games lost. On average females spent a significantly longer duration of time running at 80-100% of their max speed, compared to males (13 ± 8 sec vs. 7 ± 4 sec respectively). When this occurred there was a statistically significant interacting with games won ($p = 0.043$). Both genders executed significantly more sprints on average during a point during games won (12.2 ± 5.0) compared to games lost (7.2 ± 2.4).



Speed Zones

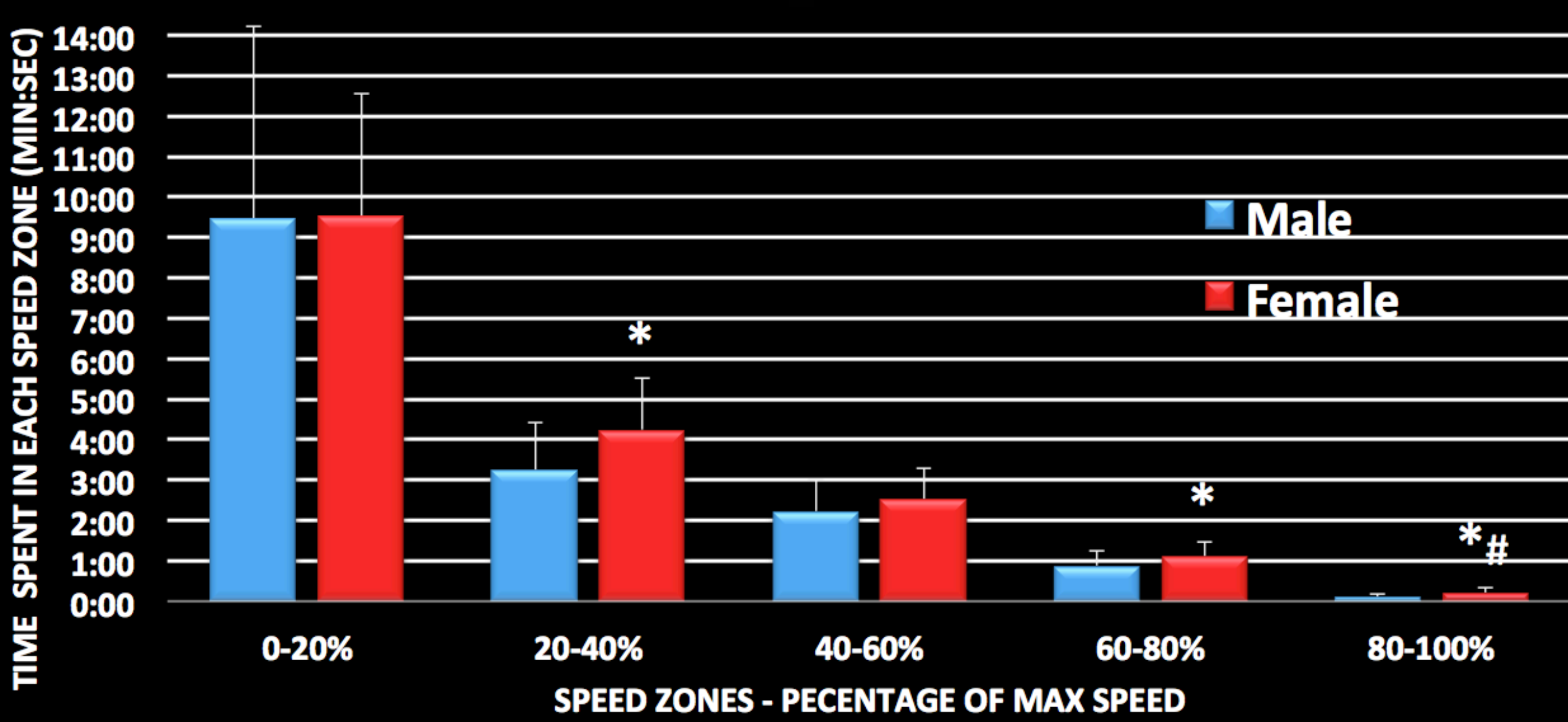


Figure 1: Time spent in each speed zone based on individual max speed.
* Significant difference ($p \leq 0.05$) to males
Significant interaction ($p \leq 0.05$) between genders and winning outcome

Time and Distance

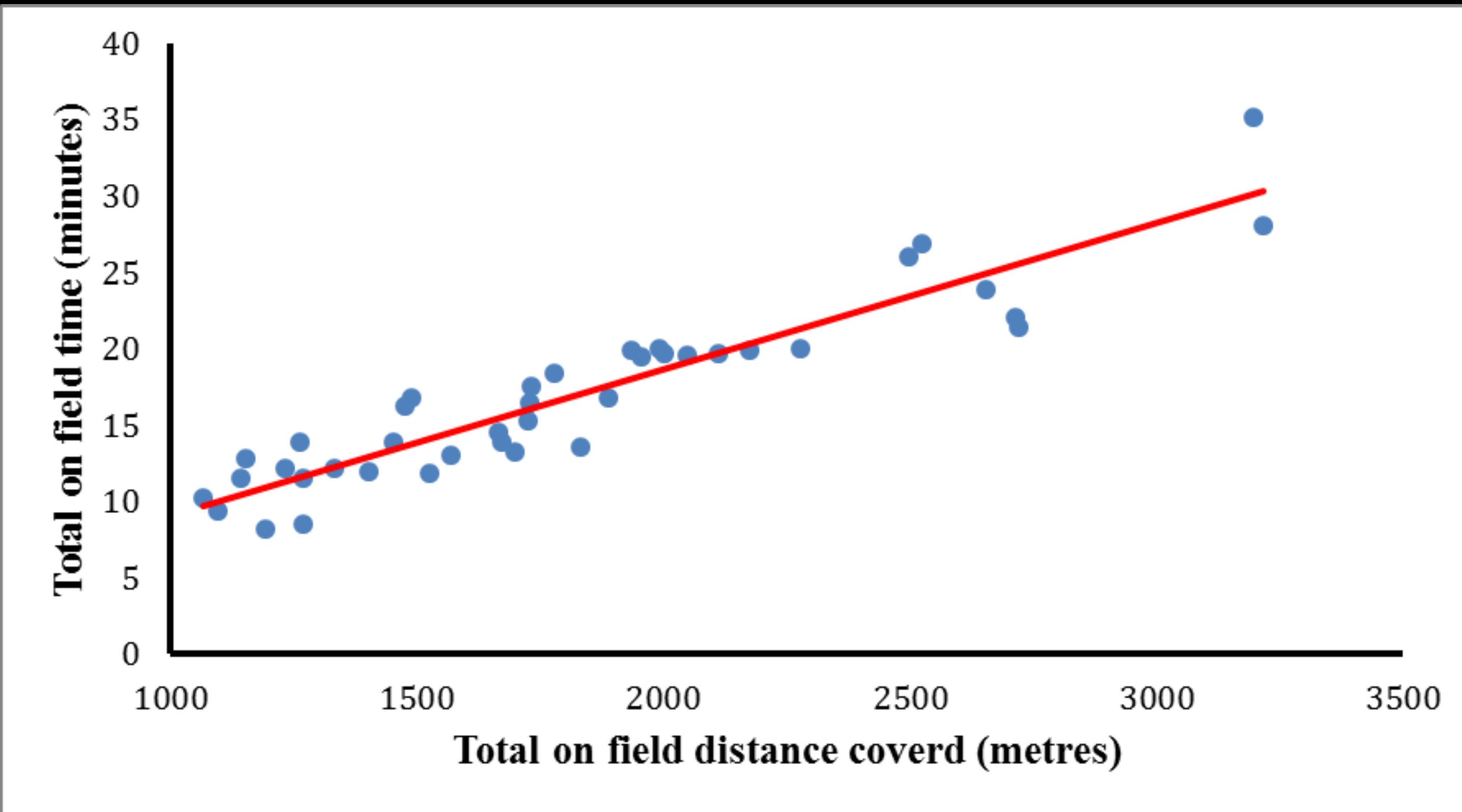


Figure 2: Correlation ($r = 0.93$) between total on field distance covered in metres and total on field time in minutes

Discussion

While UF has been anecdotally associated with high intensity running (4), results from this study have shown the majority of on-field play is actually spent in lower speed zones with only 1.8km covered during a game, accounting for 59% of total distance covered. An extra 1.4 km is being covered per game by players coming on and off the field, plus any movement along the sideline. While sideline support is a large part of UF it may be recommended that players attempt to minimise off field activity to reduce total distance covered and minimise fatigue that has been evident during a tournament (5). Further findings suggest match outcome may be determined by having female players spend greater durations of time within higher speed zones and that it is advantageous for both genders to complete a greater number sprints during points. Teams may consider establishing plays that utilise female players to undertake high intensity sprints for better field position and scoring opportunities. As a very strong correlation exists between time on field and distance covered (figure 2), it is recommended that coaches track individual playing times to assist with player rotations based on fitness levels. Future research should focus on the collection of a greater pool of data and utilising approaches that help to standardise values based on percentages of game duration. Other factors such as pass completions, turnovers and gender possession rates may also help to identify characteristics associated with match outcome.

References

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