largely dependent on movement velocity, a variable which current GPS technology can measure and log every 200 ms (5 Hz) for exercise bouts in excess of two hours. Where GPS provides the velocity profile, the work done (in Joules) by the centre of mass (COM) in the horizontal plane (Whoriz), the vertical plane (Wvert), by the limbs (Wlimb) and due to air resistance (Wair) can be determined. The sum of these components is the total mechanical work done due to the locomotor demands of play and can be expressed relative to body mass to enable comparison (J/kg). Metabolic power (J/kg/s) and cost (J/kg) are determined by assigning an efficiency which is velocity dependent given the contributions from elastic sources. This method allows data obtained in the field to be directly compared (i.e. using the same units) with laboratory tests or ergometer based training. The model has been used to evaluate short sprint efforts (20 m) by elite Australian football players, where peak power outputs were in the order of 4–5 times their maximal aerobic power. This compares extremely well with previous estimations of energy exchanges in the 100 m sprint. Accelerating the COM in the horizontal plane requires significant energy contributions and should perhaps be a focus when monitoring running workloads in field sports.

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Validity of GPS housed accelerometer data in running and cutting

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Introduction: The use of wearable GPS units in team sport is growing rapidly. Housed within these units is a triaxial accelerometer capable of logging acceleration data during training and competition. These data have the potential of giving coaches and scientists an indirect measure of load experienced by athletes "in-field". Little study has focused on the validity of GPS housed accelerometers for measuring body loads in running and cutting which are basic maneuvers in many team sports. Thus the aim of this investigation was to validate accelerometer data during running and cutting tasks against a criterion measure. *Methodology*: Ten participants (5 male, 5 female) performed multiple running and cutting tasks. Acceleration data was measured from a 24-camera high speed motion analysis system (Eagle-4, Motion Analysis Corp., USA) from three markers (ankle, base of the spine and base of the neck). Acceleration was also collected from an accelerometer housed within a GPS unit (SPI Pro, GPSports Pty Ltd., Australia) which was worn at the base of the neck. A three-way general linear model ANOVA was used to determine whether the peak acceleration values recorded by each measurement tool for each task were significantly different from one another. Percentage coefficient of variation (CV) were calculated between the peak acceleration from the motion analysis system and the accelerometer. *Results*: Peak acceleration data from the accelerometer was significantly higher in both the running and cutting tasks when compared to the motion analysis data. Further, percentage CV values calculated for both accelerometer variables (vertical load and vector magnitude load) were large (>34%) and well above acceptable limits. *Conclusion*: The results of the present study suggest that GPS housed accelerometers placed at the base of the neck, as they are commonly used in field team sports, do not provide an accurate measure of load experienced during running and cutting movements. This may be attributed to the distance of the accelerometer from the impact site, the effects of impact attenuation, and vibration of the accelerometer within its harness. The data from these monitors may however have more utility if appropriate data smoothing routines are applied in post-processing of the data to negate the effect of unwanted vibration. Further investigation may also delve into the feasibility of different accelerometer placement sites and attachment methods to minimize monitor vibration while addressing accessibility, athlete comfort, and safety factors in the context of team sports use.

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The Journal of Science and Medicine in Sport: 50 years on

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Introduction: Bibliometrics is commonly used to describe the content and contributors of textual information. The aim of this study was to track change over time in the nature of research published in the flagship professional journal of Sports Medicine Australia (SMA). *Methodology*: Following a comprehensive review of the literature, a bibliometric audit tool was developed to collect information on the study designs used, data reported and authorship of research articles. Intra-rater (ICC > 0.83) and inter-rater (ICC > 0.95) reliability of the audit tool was established (test–retest). Using this tool, a longitudinal bibliometric audit was conducted of original research articles published in the Journal of Science and Medicine and Sport (and its preceding titles) from the first year of publication in 1961–2009. Journal volumes were sampled at five year epochs and at three monthly intervals, excluding supplemental material. *Results*: Over the last 49 years, there has been a six fold increase in the number of research articles published in the SMA journal. Of the nine articles published in 1961, 6 were anecdotal in nature and none used inferential statistical methods. The average article length was 4.9 pages, with tables and figures used sparingly (0.1 tables and figures per page). The mean sample size was

56 (median of zero) with no reporting of subject gender. Per paper, there was an average of 1.2 authors, 46% of whom were affiliated with an institution located outside Australia. In contrast, the typical 2009 paper was a cross-sectional survey (42% of the 57 articles published), had a mean sample of 4903 (median of 19), 62% of whom were females, and used inferential statistical methods to analyse and report quantitative data ($n = 24$) over 5.8 pages (with 0.3 tables and 0.2 figures used per page). The 2009 paper was authored by 3.8 researchers, 68% of whom were located outside Australia. *Conclusions*: Since its inception, there has been a substantial increase in the volume of research published in the SMA journal, with researchers in the main employing higher research designs and quantitative data analyses. A paper now involves three times as many authors, who are more likely to be from different countries and different institutions. It is likely that these trends will continue over the next fifty years.

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The effect of green tea extract and high intensity intermittent exercise on fat oxidation in overweight women

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Introduction: The acute combined effects of green tea (GT) and high intensity intermittent exercise (HIIE) upon resting, exercise, and post-exercise fat oxidation in seven overweight females was investigated. *Methods*: Twenty four hours before each trial, subjects ingested four capsules containing either GT extract (total of 187.5 mg polyphenols, 125 mg EGCG, 20 mg caffeine) or placebo (500 mg cellulose) in a double-blinded counter-balanced order. Subjects were monitored for resting metabolic rate for 30 min, then completed a 20-min HIIE cycling protocol consisting of repeated bouts of 8 s sprint cycling (60% VO_2max at 110 revolutions per minute) and 12 s recovery (20% VO_2max at 40 revolutions per minute), followed by 1 h of post-exercise recovery monitoring. *Results*: GT significantly increased fat oxidation during rest (GT: 0.065 ± 0.004 g/min, placebo: 0.042 ± 0.003 g/min, $p = 0.03$). During HIIE, greater caloric expenditure ($p = 0.04$), and significant changes in VO_2 ($p = 0.03$) and RER ($p = 0.04$), indicative of a greater fat oxidation rate, were demonstrated with GT. During the post-exercise recovery period, there was a trend for greater VO_2 ($p = 0.09$), energy expenditure ($p = 0.13$), and intervention-by-time effect in fat oxidation rate ($p = 0.08$) with GT. *Conclusions*: In conclusion, it was found that GT significantly elevated fat oxidation during rest and exercise. Non-significant trends for increased fat oxidation were also observed during the post-exercise phase.

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The effect of carbohydrate feeding during cycling on run performance within a simulated Olympic-distance triathlon

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Introduction: The purpose of the present study was to examine the effects of carbohydrate ingestion during the cycle leg of a simulated Olympic-distance triathlon (1500-m swim, 40-km cycle, 10-km run) on subsequent running performance. *Methods*: Five well-trained triathletes (4 male, 1 female) volunteered to participate (mean ± SD age: 23.6 ± 4.2 y, body mass: 63.0 ± 7.6 kg and VO_2max: 64.0 ± 9.0 ml kg^{-1} min^{-1}). Participants attended three separate testing sessions separated by at least five days. The first session involved a 1500-m swim time-trial (STT) followed approximately 30 min later by a graded cycle test to exhaustion for the evaluation of maximal aerobic power (MAP). The two subsequent sessions required participants to complete a simulated Olympic-distance triathlon involving a 1500-m pool swim to within 5% of the STT, a 40-km stationary cycle at 75% of MAP and a 10-km running time trial. Participants randomly consumed either a 14.4% carbohydrate drink containing 1.2 g min^{-1} of glucose and 0.6 g min^{-1} of fructose (CHO) or a fruit squash placebo (PLA) throughout the cycle leg of the triathlon. Fingertip blood samples were collected after every 5 km of the cycle leg and at the end of the run and were subsequently analysed for blood glucose (GLU) and lactate (LAC) concentrations. Rating of perceived exertion (RPE) and perceived stomach upset (PSU) were also measured after each 5-km cycle period and at the end of the run. Heart rate (HR) was measured throughout the cycle leg only. *Results and conclusion*: The 10-km run time was 4.2% faster following CHO (38 min 08 s ± 2 min 46 s) compared with PLA (39 min 44 s ± 3 min 13 s; $P < 0.05$). The improved run time was associated with increased GLU and LAC concentrations in the CHO compared with the PLA trial ($P < 0.05$), no difference in HR or PSU between trials ($P > 0.05$) and significantly lower RPE scores in the CHO compared with the PLA trial ($P < 0.05$). These results show that a 10-km run at the end of an Olympic-distance triathlon may be significantly improved following ingestion of a 14.4% glucose-fructose beverage at a rate of 1.8 g min^{-1} compared with a fruit squash placebo, with no additional gastro-intestinal stress. This improvement in run performance in the CHO trial may be due to muscle and liver glycogen sparing during the cycle leg, which increased carbohydrate metabolism in the latter stages of the triathlon.

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