

Research Alerts

OCTOBER EDITION: ISSUE #1

Your monthly roundup of the **LATEST RESEARCH** across the following topics.
(click a heading to jump straight to the topic)

- 1 STRENGTH & CONDITIONING
- 2 TECHNOLOGY & MONITORING
- 3 FATIGUE & RECOVERY
- 4 YOUTHS
- 5 NUTRITION
- 6 TEAM SPORTS



FOOTBALL (SOCCER)



RUGBY



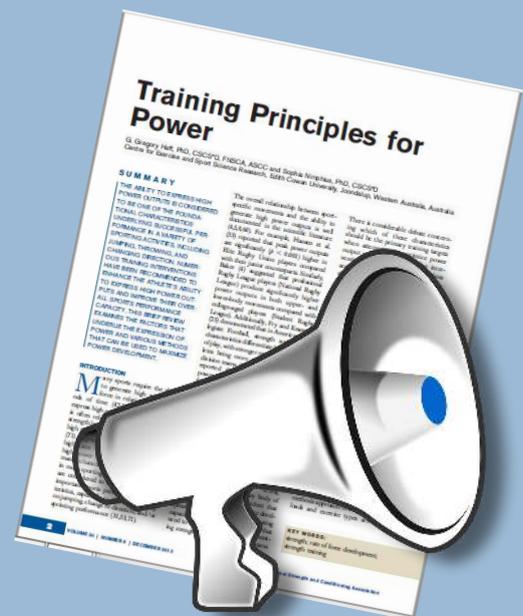
CRICKET



AUSTRALIAN RULES FOOTBALL



AMERICAN FOOTBALL



SCIENCE for
SPORT

Foreword

An introductory word from the chief editor.

Issue #1 - October 2016

Welcome to Science for Sport's monthly *Research Alerts*. These monthly issues are a gathering of the latest, and best, research published in that month from peer-reviewed journals. For example, research published within October 2016 will be included within the October 2016 issue - this ensures you're up-to-date with the most recent and talked about research. When there is not enough relevant research published in that month, studies published in the preceding month(s) will be used to supplement the topic. Each new issue will be published on the last day of the month (e.g. December 2016 issue will be published on the 31st December 2016).

With hundreds of studies published every month across the realms of sports science, the primary motivation of the *Research Alerts* is to help students, practitioners, researchers and educators alike keep up-to-date with the latest peer-reviewed research—which otherwise is a seemingly impossible task. The secondary motivation is to facilitate education within the global sports science community by critiquing the studies and displaying the information in a refreshingly digestible format.

With so much positive feedback from the Science for Sport members regarding all the content (i.e. articles, videos, jobs, research and so much more) currently delivered, we felt these *Research Alerts* were a very important addition—and one we hope will be well received.

I would also like to take this opportunity to sincerely thank all the editors for their contributions and reviewing of these documents, as for without them, these would not be so valuable. It is an absolute pleasure working alongside such fantastic practitioners and academics, and I hope to see these relationships continue to develop and prosper.

Last, but by no means least, I hope you find these *Research Alerts* very helpful in your daily practice, and I'm sure you can appreciate just how much work goes into them every month. As a matter of courtesy, though we cannot always prevent you distributing these documents with other professionals, we kindly ask and hope for you to respect our work and refrain from sharing them freely.

Yours Sincerely,

Owen Walker



Owen Walker MSc*D CSCS

Founder, author and director of Science for Sport

SCIENCE for
SPORT



Strength & Conditioning

This month's top research on strength & conditioning.

FEATURE

POSTACTIVATION POTENTIATION OF HORIZONTAL JUMP PERFORMANCE ACROSS MULTIPLE SETS OF A CONTRAST PROTOCOL

Seitz, LB, Mina, MA, and Haff, GG. J Strength Cond Res 30(10): 2733–2740, 2016.

2

COMPARING THE EFFECTIVENESS OF A SHORT-TERM VERTICAL JUMP VS. WEIGHTLIFTING PROGRAM ON ATHLETIC POWER DEVELOPMENT

Teo, SYM, Newton, MJ, Newton, RU, Dempsey, AR, and Fairchild, TJ. J Strength Cond Res 30(10): 2741–2748, 2016.

3

DOES THE FUNCTIONAL MOVEMENT SCREEN CORRELATE WITH ATHLETIC PERFORMANCE? A SYSTEMATIC REVIEW

Girard J, Quigley M, Helfst. (2016) Physical Therapy Reviews.



POSTACTIVATION POTENTIATION OF HORIZONTAL JUMP PERFORMANCE ACROSS MULTIPLE SETS OF A CONTRAST PROTOCOL

OBJECTIVE: The purpose of this study was to determine whether a post-activation potentiation (PAP) effect could be elicited across multiple sets of a contrast PAP protocol involving back squats and standing broad jumps (SBJs).

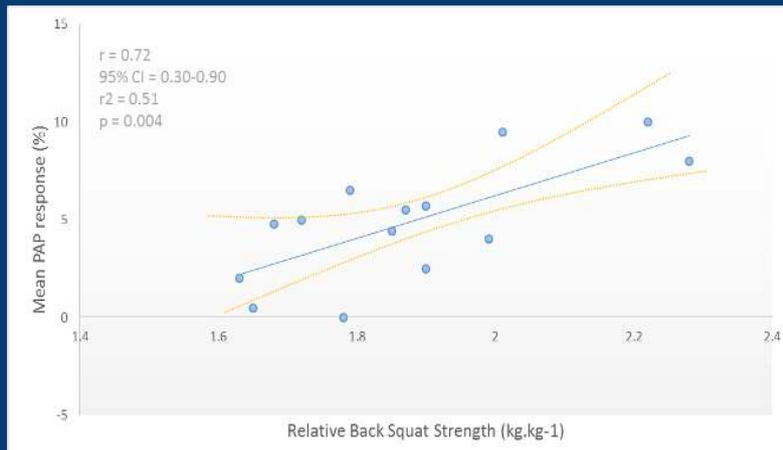
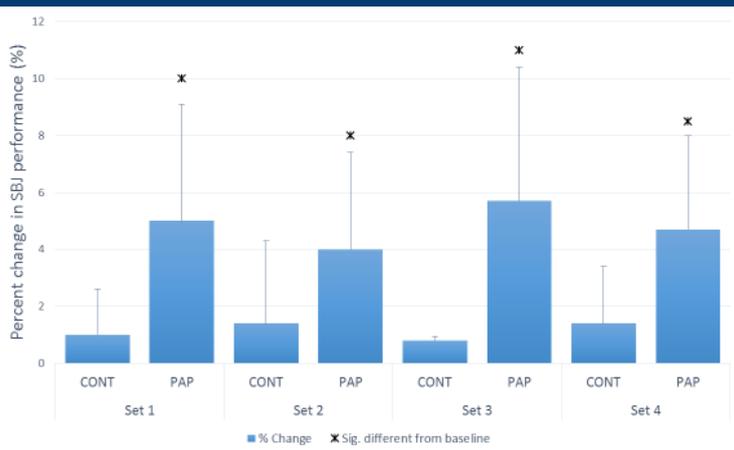
WHAT THEY DID:

Using fourteen rugby league players (18.4 ± 0.8 years) with extensive resistance training experience (3.1 ± 1.8 years), participants were required to perform either a contrast PAP protocol alternating paused box squats with bands and SBJs separated by 90-seconds, or a control protocol with SBJs only in a cross-over design.

MEASUREMENTS:

- SBJ performance
- Within-group differences in performance (i.e. stronger athletes vs. weaker athletes).

WHAT THEY FOUND:



WHAT THIS MEANS:

SBJ performance in the PAP (intervention) group was significantly greater than baseline during all four sets. Contrastingly, the control group showed no significant improvement in SBJ in any of the four sets. The strongest athletes also experienced the largest potentiation effect. This study shows that SBJ performance can be improved just 90-seconds after performing heavy back squats and across multiple sets. It also highlights that stronger athletes experience a greater potentiation.

LIMITATIONS:

In addition to the small sample size ($n = 14$), given that the variable resistance added from the bands appears to be a vital contributor towards the potentiation effect, no neuromuscular mechanisms were measured to understand how the potentiation occurred in the first place (e.g. H-reflex excitability, phosphorylation or pennation angle).

FUTURE RESEARCH:

Future research should determine the neuromuscular mechanisms allowing the PAP effect to occur earlier after an accommodating resistance exercise stimulus.

ARTICLE TITLE

COMPARING THE EFFECTIVENESS OF A SHORT-TERM VERTICAL JUMP VS. WEIGHTLIFTING PROGRAM ON ATHLETIC POWER DEVELOPMENT



OBJECTIVE:

The purpose of this study was to compare changes in athletic performance, with an emphasis on power development, after either a vertical jump (VJ) or Olympic weightlifting (OWL) training programme.

WHAT THEY DID:

Twenty-six recreationally trained males (18-30 years) were randomly allocated to either a VJ or OWL training group for 6-weeks. Countermovement jump (CMJ), squat jump (SJ), depth jump (DJ), 0-20-m sprint and 5-0-5 agility test were used to assess pre- and post-intervention performances.

WHAT THEY FOUND:

Both training groups (OWL and VJ) demonstrated significant improvements in all athletic performance tests, but there were no significant differences between training programmes on any of the tests. These results suggest that OWL derivatives are just as capable at improving athletic performance as VJ training (which included weighted jumps and depth jumps).

Reference:

Teo, SYM, Newton, MJ, Newton, RU, Dempsey, AR, and Fairchild, TJ. Comparing the effectiveness of a short-term vertical jump vs. weightlifting program on athletic power development. *J Strength Cond Res* 30(10): 2741–2748, 2016.

[\[Link\]](#)

EDITORS COMMENTS:

“This is an important study as it highlights the similarities, rather than differences, between using OWL and VJ training methods. It suggests that from a performance improvement standpoint, both provide similar gains.

What must be highlighted though is these results were found in recreational athletes and with no inclusion of a control group.”



Owen Walker

Reference:

Girard J, Quigley M, Helfst. (2016) Does the functional movement screen correlate with athletic performance? A systematic review. *Physical Therapy Reviews*. [\[Link\]](#)

EDITORS COMMENTS:

“Despite the FMS not being correlated with performance, an interesting finding from this review is that the deep squat and in-line lunge appear to be related to certain aspects of athletic performance — those being: seasonal performance improvements, change of direction tasks, and various forms of unilateral and bilateral jumps.”



Owen Walker

ARTICLE TITLE

DOES THE FUNCTIONAL MOVEMENT SCREEN CORRELATE WITH ATHLETIC PERFORMANCE? A SYSTEMATIC REVIEW



OBJECTIVE:

The purpose of this systematic review was to discover if Functional Movement Screen (FMS) scores correlate with athletic performance.

WHAT THEY DID:

Conducted a search of the following databases: Medline, CINAHL, SportsDiscus, and PubMed. After the filtration process, six studies satisfied the eligibility criteria and were included in this review. The studies population age range was 20-24 years old.

WHAT THEY FOUND:

The results of this review suggest that the FMS is not a predictive indicator of athletic performance. The deep squat and in-line lunge components of the FMS might be an indicator of athletic performance for certain athletic performance measures.

Technology & Monitoring

This month's top sports science research on technology and monitoring.

FEATURE

TO JUMP OR CYCLE? MONITORING NEUROMUSCULAR FUNCTION IN RUGBY UNION PLAYERS

Roe, G., Darrall-Jones, J., Till, K., Phibbs, P., Read, D., Weakley, J., & Jones, B. (2016). *International Journal of Sports Physiology and Performance*, 1-23.

2

VALIDITY OF A WEARABLE ACCELEROMETER DEVICE TO MEASURE AVERAGE ACCELERATION VALUES DURING HIGH-SPEED RUNNING

Alexander, JP, Hopkinson, TL, Wundersitz, DWT, Serpell, BG, Mara, JK, and Ball, NB. *J Strength Cond Res* 30(11): 3007–3013, 2016.

3

RELATIONSHIP BETWEEN DAILY TRAINING LOAD AND PSYCHOMETRIC STATUS OF PROFESSIONAL SOCCER PLAYERS

Moalla W, Fessi MS, Farhat F, Nouria S, Wong DP, and Dupont G. *Research In Sports Medicine* Vol. 24, Iss. 4, 2016.



TO JUMP OR CYCLE? MONITORING NEUROMUSCULAR FUNCTION IN RUGBY UNION PLAYERS

OBJECTIVE: The aim of this study was to evaluate changes in performance of a 6-second cycle ergometer test (CET) and countermovement jump (CMJ) during a 6-week training block in professional rugby union players.

WHAT THEY DID:

Twelve professional rugby athletes aged between 18-23 years participated in this study. Measured alactic power on the 1st and 4th morning of every week during a 6-week training block. Increased training load increased from week 3 to 5.

WHAT THEY FOUND:

A moderate decrease in CMJ peak and mean power, and a small decrease in flight-time during weeks five and six that were *very likely* to *almost certainly* greater than the smallest worthwhile change (SWC) - suggesting neuromuscular fatigue.

A small decrease, possibly greater than the SWC, in CET peak power. However, changes in peak and mean CMJ power were greater than in CET peak power.

Meanwhile, the difference between flight time and CET peak power was small.

WHAT THIS MEANS:

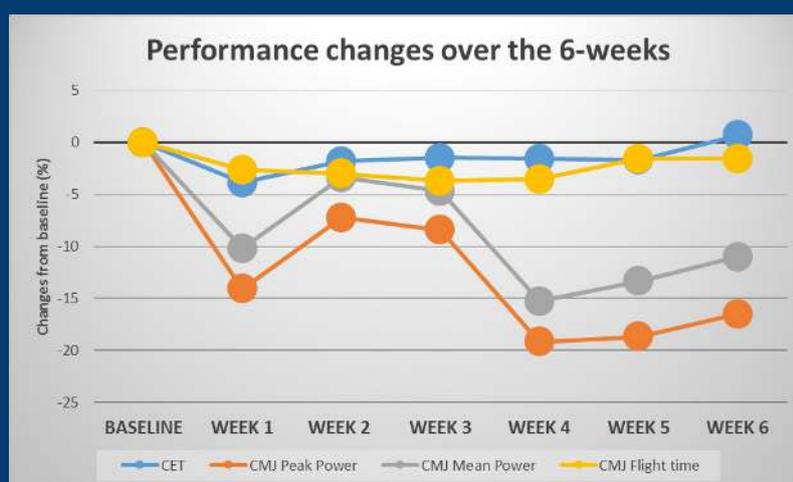
CMJ peak and mean power seem to be more sensitive to increases in training load than CET peak power in professional rugby players. Given this, the CMJ may be a preferred tool for monitoring fatigue.

LIMITATIONS:

As the authors only used session RPE, a key limitation of this study is the absence of objective measures of training load, making it impossible to examining the effect of different training modes (e.g. gym, rugby practice) on the different fatigue monitoring metrics.

MEASUREMENTS

- Peak power during a 6-second cycle ergometer test (CET)
- Countermovement jump (CMJ)
- Peak power (PP)
- Mean power (MP)
- Flight time (FT)



FUTURE RESEARCH:

Future research should aim to investigate the effects of different training modes (e.g. gym, rugby practice) on changes in the monitoring exercises (e.g. CMJ) and metrics used in this study (e.g. peak and mean power).

ARTICLE TITLE

VALIDITY OF A WEARABLE ACCELEROMETER DEVICE TO MEASURE AVERAGE ACCELERATION VALUES



OBJECTIVE:

The aim of this study was to determine the validity of an accelerometer to measure average acceleration values during high-speed running.

WHAT THEY DID:

Had thirteen subjects perform three sprint efforts over a 40-m distance (n = 39). They then measured acceleration using a typical 100-Hz triaxial accelerometer integrated within a wearable tracking device. They collected acceleration data during a 0–10m and 10–20m and used it to calculate average acceleration.

WHAT THEY FOUND:

The accelerometer could not accurately measure average acceleration values during high-speed running. The accelerometer significantly overestimated average acceleration values during both 0–10m and 10–20m. Also, it was acknowledged that body mass and the “absence of a gravity compensation” formula affect the accuracy and practicality of accelerometers.

Reference:

Alexander, JP, Hopkinson, TL, Wundersitz, DWT, Serpell, BG, Mara, JK, and Ball, NB. Validity of a wearable accelerometer device to measure average acceleration values during high-speed running. J Strength Cond Res 30(11): 3007–3013, 2016 [Link]

EDITORS COMMENTS:

“This to me is somewhat of a landmark study as it is the first of its kind to analyse average acceleration forces, and not just peak forces.

The accuracy conclusions of this study should raise the practitioners' eyebrows when considering not only the reliability of GPS modules within their devices, but also the accelerometers.”



Owen Walker

Reference:

Moalla W, Fessi MS, Farhat F, Nouira S, Wong DP, and Dupont G. Relationship between daily training load and psychometric status of professional soccer players. Research In Sports Medicine Vol. 24 , Iss. 4,2016. [Link]

ARTICLE TITLE

RELATIONSHIP BETWEEN DAILY TRAINING LOAD AND PSYCHOMETRIC STATUS OF PROFESSIONAL SOCCER PLAYERS



OBJECTIVE:

The aim of the present study was to explore the relationship between daily training load (TL) and the Hooper questionnaire which includes perceived ratings of sleep, fatigue, stress and muscle soreness.

WHAT THEY DID:

During a 16-week training period, the rating of perceived exertion (RPE) and session duration were collected after each training session, and daily TL (RPE * session duration) was calculated from 14 professional soccer players.

WHAT THEY FOUND:

Perceived sleep, stress, fatigue and muscle soreness are moderately related to the daily TL in professional soccer players. The Hooper questionnaire is both a simple and useful tool for monitoring perceived wellness and psychometric players' status of professional soccer players.

EDITORS COMMENTS:

“Given the fact that many load monitoring and readiness tools (e.g. wearables and jump mats) can be very costly and time-consuming, this study offers real practical value by demonstrating the usefulness and simplicity of alternative, cost-effective monitoring tools (e.g. the Hooper questionnaire). Practitioners without access to expensive equipment should therefore consider the use of tools such as the Hooper questionnaire.”



Owen Walker



Fatigue & Recovery

This month's top sports science research on recovery.

FEATURE

PASSIVE AND POST-EXERCISE COLD-WATER IMMERSION AUGMENTS PGC-1A AND VEGF EXPRESSION IN HUMAN SKELETAL MUSCLE

Joo CH, Allan R, Drust B, Close GL, Jeong TS, Bartlett JD, Mawhinney C, Louhelainen J, Morton JP, Gregson W. *Eur J Appl Physiol.* 2016 Oct 3.

2

MASSAGE AND POSTEXERCISE RECOVERY: THE SCIENCE IS EMERGING

Best TM, and Crawford SK. *Br J Sports Med.* 2016;0:1–2.

3

GENDER DIFFERENCES IN FATIGABILITY AND MUSCLE ACTIVITY RESPONSES TO A SHORT-CYCLE REPETITIVE TASK

Srinivasan D, Sinden KE, Mathiassen SE, Côté JN. *Eur J Appl Physiol.* 2016 Oct 14.



PASSIVE AND POST-EXERCISE COLD-WATER IMMERSION (CWI) AUGMENTS PGC-1 α AND VEGF EXPRESSION IN HUMAN SKELETAL MUSCLE

OBJECTIVE: The aims of the present study were twofold: 1) Identify if post-exercise CWI increases both PGC-1 α and VEGF mRNA expression in human skeletal muscle; and 2) determine if CWI without the prior stress of exercise was sufficient to also mediate the activation of such molecular pathways.

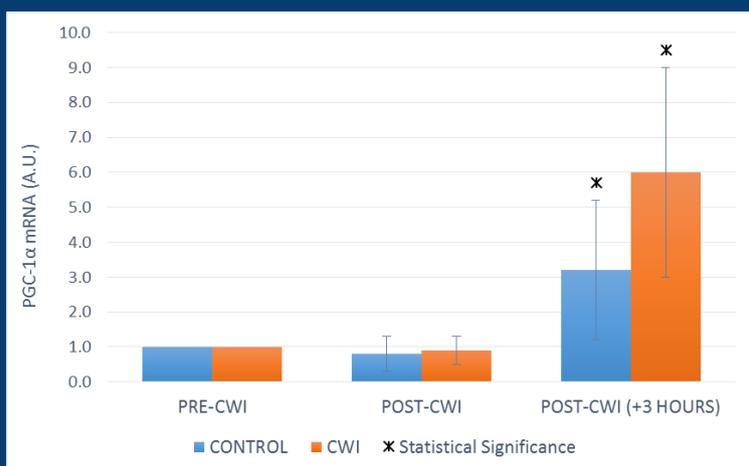
WHAT THEY DID:

Nine males completed an intermittent running protocol (8 \times 3-min bouts at 90 % VO₂max, interspersed with 3-min active recovery (1.5-min at 25 % and 1.5-min at 50 % VO₂max) before undergoing CWI (10 min at 8 °C) or seated rest (CONT) in a counterbalanced randomised order. Study 2 ten males underwent an identical CWI protocol under with no exercise.

MEASUREMENTS:

- PGC-1 α (*Peroxisome proliferator activated-receptor γ co-activator-1 α*)
- VEGF mRNA (*Vascular endothelial growth factor*)

WHAT THEY FOUND:



WHAT THIS MEANS:

This study shows that post-exercise CWI leads to greater expression of key mitochondrial (PGC-1 α) and angiogenic (VEGF) genes than exercise alone. The second part of this study demonstrated that CWI alone, without any prior exercise, is enough to mediate the activation of PGC-1 α and VEGF mRNA expression in human skeletal muscle. The propagation of these metabolic pathways may lead to more favourable endurance training adaptations.

LIMITATIONS:

Two key limitations to this study were the authors failed to measure the catecholamine response in study 1, and secondly, they also failed to use a control group within study 2.

FUTURE RESEARCH:

Future research is needed to examine how the magnitude of cooling (e.g. temperature and duration) influences the PGC-1 α mRNA expression in human skeletal muscle.

ARTICLE TITLE

MASSAGE AND POSTEXERCISE RECOVERY: THE SCIENCE IS EMERGING



Reference:

Best TM, and Crawford SK. Massage and postexercise recovery: the science is emerging Br J Sports Med. 2016;0:1–2. [\[Link\]](#)

OBJECTIVE:

The purpose of this paper was to discuss, in a brief statement, the current evidence regarding the effectiveness of post-exercise massage for improving recovery.

WHAT THEY DID:

Provide a short, but descriptive, literature review on the current science and application of post-exercise massage.

WHAT THEY FOUND:

Overall, the authors report that post-exercise massage may have several beneficial influences on recovery, from: reducing inflammatory cells and proinflammatory cytokines, increasing relaxation and potentially decreasing cortisol levels. It is likely that the training status of the athlete will influence the effectiveness of the massage, this is potentially due to individual variations in the perception of pain and soreness following training and competition.

They also report that the compressive force of the massage is likely to have an impact upon its effectiveness, and that longer massage durations of 15-30 minutes appear to be no more effective than shorter sessions of 5-12 minutes.

EDITORS COMMENTS:

“This is a useful update on the efficacy of post-exercise massage by two assert researchers within the field. However, having just done my homework of this topic, and have written an article for Science for Sport, I wouldn’t be making such bold statements as they have within the article. To clarify, several of the statements made by the authors is supported by minimal, of which poor quality, scientific research. So please take some of these statements with a pinch of salt.”



Owen Walker

Reference:

Srinivasan D, Sinden KE, Mathiassen SE, Côté JN. Gender differences in fatigability and muscle activity responses to a short-cycle repetitive task. Eur J Appl Physiol. 2016 Oct 14. [\[Link\]](#)

ARTICLE TITLE

GENDER DIFFERENCES IN FATIGABILITY AND MUSCLE ACTIVITY RESPONSES TO A SHORT-CYCLE REPETITIVE TASK



OBJECTIVE:

The purpose of this study was to investigate the extent to which women differ from men in fatigability and motor control while performing a repetitive upper-body task.

WHAT THEY DID:

113 healthy young adults (58 women, 55 men) performed a standardized repetitive pointing task. The task was terminated when the subject’s perceived exertion reached 8 out of 10 on the CR10 Borg scale. The time-to-task termination and surface electromyography signals from start to end of the task were compared between women and men, for the upper trapezius, anterior deltoid, biceps and triceps muscles.

WHAT THEY FOUND:

There were no sex differences in the time-to-task-termination, but women displayed a significant alteration in motor control patterns under conditions of fatigue. This study indicates that whilst there is no gender differences with regards to the perception of fatigue, females may experience an unfavourable change in motor control strategies at the shoulder.

EDITORS COMMENTS:

“Given females are more susceptible to developing neck–shoulder musculoskeletal disorders (MSD), this study aimed to identify a potential reason for this common issue.

Unfavourable changes in motor control strategies during fatiguing tasks may be a contributor to MSD in females, thus caution and attention to detail in technique may be important when training females under such conditions.”



Owen Walker



Youths

This month's top sports science research on youth populations.

FEATURE

EXAMINING RELATIVE AGE EFFECTS IN FUNDAMENTAL SKILL PROFICIENCY IN BRITISH CHILDREN AGED 6–11 YEARS

Birch, S, Cummings, L, Oxford, SW, and Duncan, MJ. *J Strength Cond Res* 30 (10): 2809–2815, 2016.

2

ADOLESCENTS' PERCEPTION OF THE PSYCHOSOCIAL FACTORS AFFECTING SUSTAINED ENGAGEMENT IN SPORTS AND PHYSICAL ACTIVITY

Gavin J, McBrearty M, Malo K, Abravanel M, and Moudrakovski T. *International Journal of Exercise Science* 9(4): 384-411, 2016.

3

VALIDATION OF MATURITY OFFSET IN THE FELS LONGITUDINAL STUDY

Malina RM, Choh AC, Czerwinski SA, and Chumlea C. *Pediatric Exercise Science*, 2016, 28, 439 -455.



EXAMINING RELATIVE AGE EFFECTS IN FUNDAMENTAL SKILL PROFICIENCY IN BRITISH CHILDREN AGED 6–11 YEARS

OBJECTIVE: To determine any differences in fundamental movement skill (FMS) proficiency within children placed in age groups according to the school year.

WHAT THEY DID:

539 school children (258 boys and 281 girls) aged 6–11 years (mean age \pm SD = 7.7 \pm 1.7 years) were assessed performing six FMS (sprint, side gallop, balance, jump, catch, and throw). The authors then examined differences in these FMS between gender groups and children born in different quarters of the year after controlling for age and body mass index (BMI).

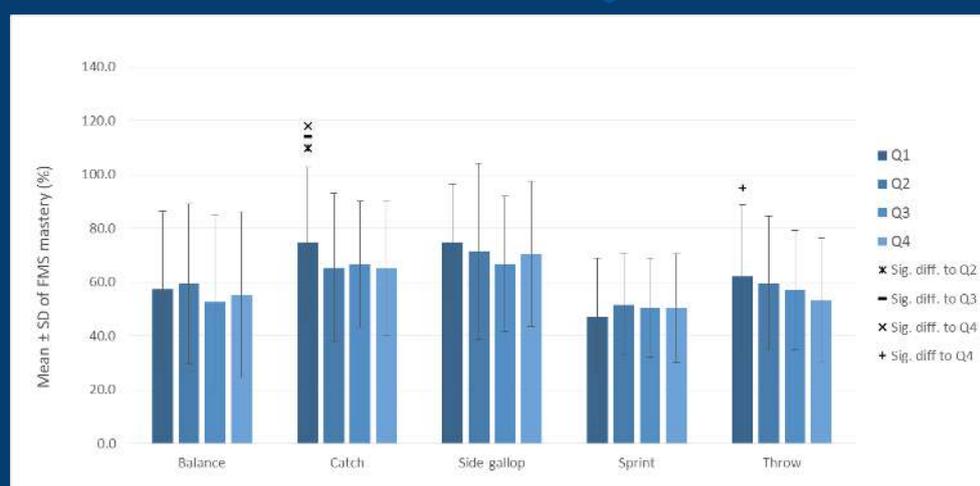
MEASUREMENTS:

- Balance
- Catch
- Side-gallop
- Sprint
- Throw

WHAT THEY FOUND:

Those born in the 1st quarter (Q1) of the selection year possessed significantly better catching abilities than those born in Q2, Q3 and Q4.

It also shows that those born in Q1 possessed significantly better throwing abilities than those born in Q4.



WHAT THIS MEANS:

Children born within the 1st quarter of the selection year may be better at performing object-control tasks (catching and throwing) than those born in the later quarters.

LIMITATIONS:

The authors did not measure or account for any maturational effects, meaning the results may have been influenced by variations in biological age. They also failed to consider any extracurricular sporting activities any of the children may have been participating in.

FUTURE RESEARCH:

Future research should attempt to control for past or present participation in extracurricular sporting activities. Doing so may provide a further insight into the underlying reasons for the relative age effect.

ARTICLE TITLE

ADOLESCENTS' PERCEPTION OF THE PSYCHOSOCIAL FACTORS AFFECTING SUSTAINED ENGAGEMENT IN SPORTS AND PHYSICAL ACTIVITY



OBJECTIVE:

The purpose of this study was to explore adolescents' perceptions of psychosocial influences which effect their prolonged involvement in sports and physical activity (PA).

WHAT THEY DID:

16 adolescents (8 boys, 8 girls; mean age 15.9 years), who had been physically active for at least the last 8 years, and sixteen adults identified as their 'parents' or 'guardians' participated in semi-structured interviews. Personal, behavioural and environmental factors were all investigated.

WHAT THEY FOUND:

The *personal* characteristics of those who remain physically active appear to be: 1) passion for the activity; 2) positive self-concept shaped by prolonged involvement with the activity; 3) intrinsic and extrinsic motivation; and, 4) continuous desire for improvement and engaging in competitive relations with self and others.

Behavioural characteristics were: 1) opportunities to engage in social interactions; 2) having fun in practice; 3) building confidence and experiencing a sense of accomplishment and efficiency; 4) relieving stress; 5) improving stamina; 6) learning life skills; 7) building character; 8) enhancing self-discipline; and, 9) augmenting mental focus.

Environmental influences arose from different sources (school and community; parents and family; friends and peers), which are also qualitatively distinct in terms of the role they play in adolescents' sustained engagement in sports and PA.

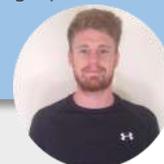
Reference:

Gavin J, McBrearty M, Malo K, Abravanel M, and Moudrakovski T. Adolescents' Perception of the Psychosocial Factors affecting Sustained Engagement in Sports and Physical Activity. *International Journal of Exercise Science* 9(4): 384-411, 2016. [\[Link\]](#)

EDITORS COMMENTS:

"Firstly, the authors make it clear that due to the qualitative nature of these results, practitioners should apply the conclusions into their own context. (i.e. determine how it fits your environment).

What this study does well, is identify the extensive list of influential factors, and also discusses just how complex the interaction is. The message to take from this study is the childrens' personal perception for sustained engagement, and how many factors need to be considered when developing a plan for PA retention."



Owen Walker

Reference:

Malina RM, Choh AC, Czerwinski SA, and Chumlea C. Validation of Maturity Offset in the Fels Longitudinal Study. *Pediatric Exercise Science*, 2016, 28, 439 -455. [\[Link\]](#)

ARTICLE TITLE

VALIDATION OF MATURITY OFFSET IN THE FELS LONGITUDINAL STUDY



OBJECTIVE:

The purpose of this study was to validate the predicted maturity offset and derived age at peak height velocity (PHV) in a cohort of American girls and boys followed serially from childhood through adolescence.

WHAT THEY DID:

Using the anthropometric data from the Fels Longitudinal Study, the authors predicted the maturity offset and age at PHV in girls and boys between the ages of 8-18 years. With the predictions made, they then tested the validity of the predictive equations by comparing it to the actual maturity offset and age of PHV.

WHAT THEY FOUND:

The results suggest that the predicted age at PHV is dependent upon the age of the child when the prediction is made, in addition to individual differences in actual age at PHV. Predictions of age at PHV appear to be more accurate near the time of actual PHV in average maturing boys, and among some average and late maturing girls within a narrow chronological age range. As a result, though these calculations can still be used, practitioners should do so with caution, recognising the limitations of the predicted values.

EDITORS COMMENTS:

"This new study adds to likewise investigations by Dr. Robert Malina who reported virtually identical results with regards to the validity of the predictive equations in other youth populations around the World.

Collectively, these studies indicate — with a degree of certainty — that the predictive equations are not perfect reflections of actual growth and maturation, and should therefore be used with a side of caution."



Owen Walker



Nutrition

This month's top research on nutrition.

FEATURE

CHRONIC INGESTION OF A LOW DOSE OF CAFFEINE INDUCES TOLERANCE TO THE PERFORMANCE BENEFITS OF CAFFEINE

Beaumont R, Cordery P, Funnell M, Mears S, James L and Watson P. (2016). *Journal of Sports Sciences*.

2

VITAMIN D₃ SUPPLEMENTATION IN HEALTHY ADULTS: A COMPARISON BETWEEN CAPSULE AND ORAL SPRAY SOLUTION AS A METHOD OF DELIVERY IN A WINTERTIME

Todd JJ, McSorley EM, Pourshahidi LK, Madigan SM, Laird E, Healy M and Magee PJ. *British Journal of Nutrition* (2016), 116, 1402–1408.

3

POST-EXERCISE REHYDRATION: EFFECT OF CONSUMPTION OF BEER WITH VARYING ALCOHOL CONTENT ON FLUID BALANCE AFTER MILD DEHYDRATION

Wijnen AHC, Steennis J, Catoire M, Wardenaar FC and Mensink M. (2016) *Front. Nutr.* 3:45.



CHRONIC INGESTION OF A LOW DOSE OF CAFFEINE INDUCES TOLERANCE TO THE PERFORMANCE BENEFITS OF CAFFEINE

OBJECTIVE: The aim of this study was to examine the effect of a 4-week period of controlled caffeine supplementation on endurance performance.

WHAT THEY DID:

Eighteen low-habitual caffeine consumers ($<75 \text{ mg} \cdot \text{day}^{-1}$) were randomly assigned to ingest caffeine ($1.5\text{--}3.0 \text{ mg} \cdot \text{kg}^{-1} \text{ day}^{-1}$; titrated) or placebo for 28 days. The participants were recreationally active men (age: 21 ± 2 years).

MEASUREMENTS:

- Total external work (kJ) during a cycle test.
- Serum caffeine ($\mu\text{g} \cdot \text{mL}^{-1}$), cortisol ($\text{ng} \cdot \text{mL}^{-1}$), prolactin ($\text{ng} \cdot \text{mL}^{-1}$) and glucose concentrations ($\text{mmol} \cdot \text{L}^{-1}$)
- Heart rate
- RPE (Borg 6-20)
- Respiratory exchange ratio
- Carbohydrate oxidation
- Fat oxidation
- VO_2 ($\text{L} \cdot \text{min}^{-1}$)

WHAT THEY FOUND:

- Chronic caffeine supplementation resulted in a $7.3 \pm 6.3\%$ decrease in total external work produced.
- Chronic caffeine supplementation increased serum concentrations, but did not influence caffeine metabolism.
- Chronic caffeine supplementation did not influence serum cortisol, prolactin or glucose concentrations.
- Chronic caffeine supplementation did not influence heart rate, RPE, respiratory exchange ratio or the rate of carbohydrate or fat oxidation.

WHAT THIS MEANS:

The results of this study indicate that chronic supplementation with low caffeine doses ($1.5\text{--}3.0 \text{ mg} \cdot \text{kg}^{-1} \text{ day}^{-1}$; titrated) developed tolerance to the performance enhancing effect of a subsequent acute caffeine dose. In other words, chronic caffeine supplementation may hinder the typical ergogenic effects of caffeine.

LIMITATIONS:

Genotype has been shown to impact both habitual caffeine consumption and the ergogenic effects of caffeine. However, the authors failed to perform any form of genotype determination and categorisation.

FUTURE RESEARCH:

Future studies should examine the effects in well-trained and elite-level athletes. It should also investigate the use of higher doses, and examine when the tolerance begins to occur (e.g. 7-, 14- or 21-days).

ARTICLE TITLE

VITAMIN D₃ SUPPLEMENTATION IN HEALTHY ADULTS: A COMPARISON BETWEEN CAPSULE AND ORAL SPRAY SOLUTION AS A METHOD OF DELIVERY IN A WINTERTIME



OBJECTIVE:

The aim of this study was to compare the efficacy of two forms of vitamin D₃ supplements – liquid capsules and oral spray solution – at increasing total 25(OH)D concentrations during wintertime in healthy adults.

WHAT THEY DID:

Twenty-two, healthy adults (males = 10 and females = 12) living at a latitude of 55°N in the Winter (Oct-Mar) participated in a protocol which comprised of two 4-week interventions that were separated by a 10-week washout period. Oral spray administration consisted of one 3000 IU of vitamin D₃ spray per day. Oral capsule administration consisted of three 1000 IU vitamin D₃ per day. Both sequences were completed for 4-weeks each in a cross-over design separated by the 10-week washout period.

WHAT THEY FOUND:

The results of this study demonstrate that oral spray vitamin D₃ is just as effective as capsule supplementation at increasing total 25(OH)D concentrations in the healthy, adult population.

Reference:

Todd JJ, McSorley EM, Pourshahidi LK, Madigan SM, Laird E, Healy M and Magee PJ. Vitamin D₃ supplementation in healthy adults: a comparison between capsule and oral spray solution as a method of delivery in a wintertime. *British Journal of Nutrition* (2016), 116, 1402–1408. [\[Link\]](#)

EDITORS COMMENTS:

“As winter is around the corner here in the UK, we felt this was an important topic. Also, given the current vitamin D insufficiency and deficiency endemic, research on this topic has really ramped up in recent years.

There could be several benefits to using oral spray supplementation from: faster rate of absorption, better alternative for those with gastrointestinal malabsorption and it eliminates swallowing for babies, young children and the elderly.”



Tim Rowland

Reference:

Wijnen AHC, Steennis J, Catoire M, Wardenaar FC and Mensink M (2016) Post-Exercise Rehydration: Effect of Consumption of Beer with Varying Alcohol Content on Fluid Balance after Mild Dehydration. *Front. Nutr.* 3:45. [\[Link\]](#)

ARTICLE TITLE

POST-EXERCISE REHYDRATION: EFFECT OF CONSUMPTION OF BEER WITH VARYING ALCOHOL CONTENT ON FLUID BALANCE AFTER MILD DEHYDRATION



EDITORS COMMENTS:

“The findings of this study concur with other research which has shown that full-strength beer has a tendency to increase urine output when dehydrated.

Its also worth noting that fluid replacement of 100% body mass loss was not enough to achieve rehydration, so aim for 150% to account for post-exercise fluid loss.”



Tim Rowland

OBJECTIVE:

The purpose of this study was to assess the effect of beer with varying alcohol content on net fluid balance (NFB) after exercise-induced dehydration.

WHAT THEY DID:

Eleven healthy males (age 24.5 ± 4.7 years) were instructed to cycle for 45 minutes at 60% of their maximal power output (W_{max}) until mild dehydration (1.0% body mass loss) on five separate occasions. After exercise, participants were then given 100% of their body mass loss in the form of 1 of the 5 beverages each time they performed the experimental trial. Beverages were: non-alcoholic beer (0%), low-alcoholic beer (2%), full-strength alcoholic beer (5%), isotonic sports drink and water. Urine output at 0, 1, 2, 3, and 5 hours after rehydration, body mass change, and fluid intake were used to calculate NFB.

WHAT THEY FOUND:

There was no difference in NFB between the different beverages. There was an initial difference between full-strength beer and isotonic sports drink, but this was only short-lived. The authors also noted that fluid replacement of 100% body mass loss was not sufficient to achieve rehydration up to 5-hours after exercise.

Team Sports

This month's top sports science research in team sports.

FEATURE

MATCH PLAY DEMANDS OF 11 VERSUS 11 PROFESSIONAL FOOTBALL USING GLOBAL POSITIONING SYSTEM TRACKING: VARIATIONS ACROSS COMMON PLAYING FORMATIONS

Tierney PJ, Young A, Clarke ND and Duncan MJ. *Human Movement Science* 2016; 49: 1–8.

2

RELATIONSHIP BETWEEN MAXIMUM AEROBIC SPEED PERFORMANCE AND DISTANCE COVERED IN RUGBY UNION GAMES

Swaby, R, Jones, PA, and Comfort, P. *J Strength Cond Res* 30(10): 2788–2793, 2016.

3

THE ASSOCIATION BETWEEN LOWER LIMB BIOMECHANICS AND BALL RELEASE SPEED IN CRICKET FAST BOWLERS

Middleton KJ, Mills PM, Elliott BC, Alderson JA. *Sports Biomech.* 2016 Sep;15(3):357-69.

4

DISCRIMINATING TALENT IDENTIFIED JUNIOR AUSTRALIAN FOOTBALLERS USING A FUNDAMENTAL GROSS ATHLETIC MOVEMENT ASSESSMENT

Woods CT, Banyard HG, McKeown I, Fransen J and Robertson S. *Journal of Sports Science and Medicine* (2016) 15, 548-553.

5

SUICIDE MORTALITY AMONG RETIRED NATIONAL FOOTBALL LEAGUE PLAYERS WHO PLAYED 5 OR MORE SEASONS

Everett J. Lehman, Misty J. Hein and Christine M. Gersic. *Am J Sports Med.* 2016.



MATCH PLAY DEMANDS OF 11 VERSUS 11 PROFESSIONAL FOOTBALL USING GLOBAL POSITIONING SYSTEM TRACKING: VARIATIONS ACROSS COMMON PLAYING FORMATIONS



OBJECTIVE: To evaluate the match play demands across various formations of 11v11 (4-4-2; 4-3-3; 3-5-2; 3-4-3; 4-2-3-1) in professional football using GPS tracking with respect to each playing position.

WHAT THEY DID:

Monitored the physical outputs of 43 Elite level U21 and U18 football matches across a competitive season.

MEASUREMENTS:

- Total distance (TD)
- High metabolic load distance (HMLD)
- High Speed Running (HSR)
- Accelerations (Acc)
- Decelerations (Dec)

WHAT THEY FOUND:

- All metrics varied across all formations, these variations were far greater when analysing positional group data.
- The 3-5-2 formation was the most physically demanding of all formations detailed in the current study irrespective of playing position, and elicited higher TD, HSR and HMLD than all other formations, and above average Acc and Dec.
- The 4-2-3-1 formation elicited the greatest number of Acc and Dec.
- Wide Midfielders covered the furthest TD, HMLD and greatest number of Dec.
- Forwards covered the furthest HSR and the greatest number of Acc.

WHAT THIS MEANS:

It is apparent that when playing in different positions and across various formations, differing physical demands are imposed. A detailed knowledge of these differences better equips practitioners to evaluate physical outputs, and then periodise training with respect to the individuals role within a teams structure.

LIMITATIONS:

Small sample size of games for each playing formation means standard of opposition may have had an effect on physical outputs. Furthermore, differences between physical demands of U18 and U21 games aren't accounted for. Finally, discussing formations without consideration of the chosen patterns of play adopted within that system may equate to an oversimplification.

FUTURE RESEARCH:

- First Team matches.
- Document physical differences between games which are won, lost and drawn for each formation.

ARTICLE TITLE

RELATIONSHIP BETWEEN MAXIMUM AEROBIC SPEED PERFORMANCE AND DISTANCE COVERED IN RUGBY UNION GAMES



OBJECTIVE:

The aim of the study was to identify whether there was a relationship between aerobic fitness, using maximal aerobic speed (MAS), and the distance covered in rugby union games.

WHAT THEY DID:

Fourteen professional rugby union players participated in this study. The players were required to perform three MAS tests before the start of the competitive season to determine reliability and performances. The first six competitive games were then used to identify relationships between MAS performance and total distance travelled during each game. Differences between player positions (back and forwards) were also analysed.

WHAT THEY FOUND:

The authors found a strong relationship between MAS and total distance covered in a game. They also reported that backs covered significantly larger total distances and also performed significantly better on the MAS test. These results suggest that fitter rugby players are able to perform greater total distances, illustrating the importance of developing high levels of aerobic fitness.

Reference:

Swaby, R, Jones, PA, and Comfort, P. Relationship between maximum aerobic speed performance and distance covered in rugby union games. *J Strength Cond Res* 30(10): 2788– 2793, 2016. [\[Link\]](#)

EDITORS COMMENTS:

“Though this study highlights a seemingly obvious conclusion, it’s important to acknowledge the different physical demands of various positions.

For example, whilst backs may cover more distance during a game, the forwards are likely to experience more high-impact, blunt-force traumas (rucks, scrums, mauls and tackles).”



Francisco Tavares

Reference:

Middleton KJ, Mills PM, Elliott BC, Alderson JA. The association between lower limb biomechanics and ball release speed in cricket fast bowlers: a comparison of high-performance and amateur competitors. *Sports Biomech*. 2016 Sep;15(3):357-69. [\[Link\]](#)

EDITORS COMMENTS:

“Overall, this study highlights the relationship between COM deceleration during the delivery stride and ball release velocity. Consequently, practitioners should ensure the inclusion of rapid force attenuation exercises, in the form of reactive loaded landings/jumps (i.e. altitude landings, split jerks) or specific deceleration drills to develop lower-limb eccentric strength for fast bowlers — essential for ball release speed.”



Samuel Callaghan

ARTICLE TITLE

THE ASSOCIATION BETWEEN LOWER LIMB BIOMECHANICS AND BALL RELEASE SPEED IN CRICKET FAST BOWLERS: A COMPARISON OF HIGH-PERFORMANCE AND AMATEUR COMPETITORS



OBJECTIVE:

The purpose of this study was to investigate the relationship between lower limb biomechanics and ball release speed for high-performance (HP) and amateur (AM) fast bowlers.

WHAT THEY DID:

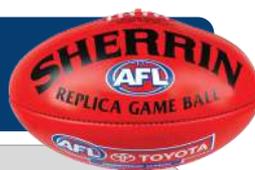
Thirty male fast bowlers, 15 HP and 15 AM performed 30 deliveries at match intensity within the laboratory setting. Joint kinematics and kinetics were recorded throughout the entire delivery stride as well as ball release velocities.

WHAT THEY FOUND:

The HP group bowled significantly faster than the AM group as expected. This was attributed to a higher COM velocity at back foot contact, leading to greater deceleration during the delivery stride as represented by higher braking and vertical GRF. Hip positive power was significantly higher in the high performance group, which may be a consequence of reduced knee flexion at front foot contact.

ARTICLE TITLE

DISCRIMINATING TALENT IDENTIFIED JUNIOR AUSTRALIAN FOOTBALLERS USING A FUNDAMENTAL GROSS ATHLETIC MOVEMENT ASSESSMENT



OBJECTIVE:

This study aimed to discriminate talent identified and non-talent identified U18 Australian football (AF) players based on their performance on a fundamental gross athletic movement assessment.

WHAT THEY DID:

Fifty under-18 AF players were selected for this study and then categorised into two groups based on selection level; talent identified (n = 25; state academy representatives) and non-talent identified (n = 25; state-based competition representatives). Players performed a gross athletic movement assessment consisting of an overhead squat (OH), double lunge (left and right legs), single leg Romanian deadlift (RDL— left and right legs), and a push up. Movements were scored across three assessment points using a three-point scale (resulting in a possible score of nine for each movement).

WHAT THEY FOUND:

The results highlighted that 4/6 movements demonstrated significant differences between the two groups (OH, double lunge [both legs], RDL right leg). The authors also observed that the OH demonstrated the largest group discrimination.

Reference:

Woods CT, Banyard HG, McKeown I, Fransen J and Robertson S. Discriminating Talent Identified Junior Australian Footballers Using a Fundamental Gross Athletic Movement Assessment. *Journal of Sports Science and Medicine* (2016) 15, 548-553. [\[Link\]](#)

EDITORS COMMENTS:

"Definitely an interesting study, and one that not only requires further exploration, but also reflects previous work which identified movement quality differences between academy and senior AF players.

However, I can't help but think that these differences in what is effectively "common strength training movements" is simply due to gym training age - but this was not reported."



Lachlan Wilmot

Reference:

Everett J. Lehman, Misty J. Hein and Christine M. Gersic. Suicide Mortality Among Retired National Football League Players Who Played 5 or More Seasons. *Am J Sports Med.* 2016. [\[Link\]](#)

ARTICLE TITLE

SUICIDE MORTALITY AMONG RETIRED NATIONAL FOOTBALL LEAGUE PLAYERS WHO PLAYED 5 OR MORE SEASONS



OBJECTIVE:

The purpose of this paper was to compare the suicide mortality of a cohort of NFL players to what would be expected in the general population of the United States.

WHAT THEY DID:

3439 NFL players with at least 5 credited playing seasons between 1959 and 1988 was assembled. Standardized mortality ratios (SMRs), the ratio of observed deaths to expected deaths, and 95% CIs were computed for the cohort; 95% CIs that excluded unity were considered statistically significant. Standardized rate ratios were also calculated to compare mortality results between players stratified into speed and non-speed position types.

WHAT THEY FOUND:

There appears to be no indication of elevated suicide risk in NFL players who have played 5 or more credited seasons. As this cohort had played >5 seasons in the NFL, the results of this study may not apply to NFL players who played <5 years or to college or high school players.

EDITORS COMMENTS:

"There is on-going debate between playing American football and suicide risk as it is often believed that the repeated high-impact trauma may lead to neurodegenerative and/or psychiatric disorders.

Although this relationship, existent or not, is still uncertain, this study does at least make a sound attempt to clarify this complex, but very important, discussion."



Toby Edwards



Editors

The column editors for the Science for Sport monthly Research Alerts.



Owen Walker MSc*D CSCS

Owen is the founder, author and director of Science for Sport. He was formerly the Head of Academy Sports Science and Strength & Conditioning at Cardiff City Football Club, and an interim Sports Scientist for the Welsh FA U17s. He also has a master's degree in strength and conditioning and is a NSCA certified strength and conditioning coach.

STRENGTH & CONDITIONING



Samuel Callaghan PhD Candidate

Sam is a PhD Candidate at Edith Cowan University, investigating the influence of strength training upon the biomechanics and performance of cricket fast bowlers. Sam is currently a strength and conditioning coach at the Western Australian Cricket Association.

CRICKET



Lachlan Wilmot BSc MSc (pending)

Lachlan is the Head Strength & Power Coach at the GWS Giants and has been for the past 6 years. He is also completing his MSc at Australian Catholic University.

AUSTRALIAN FOOTBALL



Tim Rowlands MSc ASCA L2

Tim is the Colts Head Strength and Conditioning Coach at Northern Suburbs Rugby Club, and currently assists at the Australian Rugby Sevens. He has a Bachelor of Physiotherapy (1st Class Honours), Master of High Performance Sport and ASCA Level 2.

NUTRITION



Toby Edwards PhD Candidate

Toby is PhD candidate at the University of Notre Dame, Australia. His research focus is on quantifying training load and fatigue in collegiate American Football. Toby has bachelor in exercise and sport science with honours and is an ASCA accredited strength and conditioning coach.

AMERICAN FOOTBALL



Liam Mason BSc CSCS

Liam is currently the Senior Athletic Performance Coach at Blackburn Rovers Football Club for the U23's. He also has a bachelor's degree in sport and exercise science and is a NSCA certified strength and conditioning coach.

FOOTBALL



Francisco Tavares MSc CSCS PhD Candidate

Francisco is a PhD candidate at the Waikato University. He is also the Head of S&C at the Portuguese Rugby Union, a S&C Coach at the Chiefs Super Rugby in New Zealand and a guest lecturer for various universities in Portugal and Waikato University.

RUGBY