

Research Alerts

FEBRUARY EDITION: ISSUE #5

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



RUGBY



FOOTBALL (SOCCER)



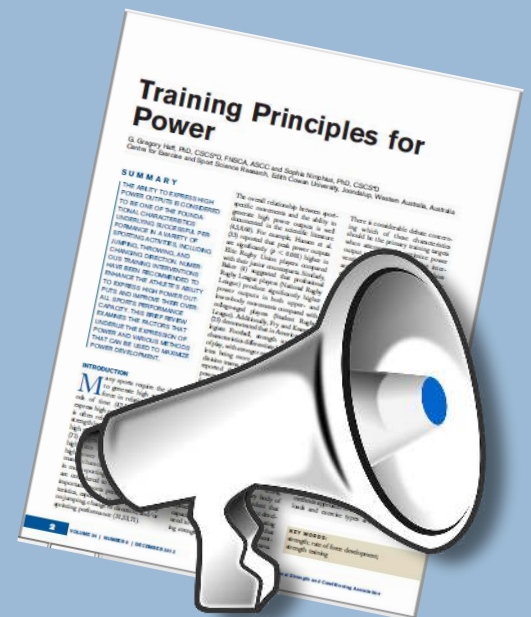
CRICKET



AMERICAN FOOTBALL



AUSTRALIAN RULES FOOTBALL



SCIENCE for
SPORT

Foreword

An introductory word from the chief editor.

Issue #5 - February 2017

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. March 2017 issue will be published on the 31st March 2017).

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 in strength & conditioning.

FEATURE

CRESCENT PYRAMID AND DROP-SET SYSTEMS DO NOT PROMOTE GREATER STRENGTH GAINS, MUSCLE HYPERTROPHY, AND CHANGES ON MUSCLE ARCHITECTURE COMPARED WITH TRADITIONAL RESISTANCE TRAINING IN WELL-TRAINED MEN

Angleri V, Ugrinowitsch C, Libardi CA. *European Journal of Applied Physiology*, pp 1–11. (2017).

2

IMPORTANCE OF HORIZONTALLY LOADED MOVEMENTS TO SPORTS PERFORMANCE

Zweifel M. *Strength and Conditioning Journal*, 2017.

3

EFFECT OF MOVEMENT VELOCITY DURING RESISTANCE TRAINING ON DYNAMIC MUSCULAR STRENGTH: A SYSTEMATIC REVIEW AND META-ANALYSIS

Davies TB, Kuang K, Orr R, Halaki M, Hackett D. *Sports Med*, 2017.



CRESCENT PYRAMID AND DROP-SET SYSTEMS DO NOT PROMOTE GREATER STRENGTH GAINS, MUSCLE HYPERTROPHY, AND CHANGES ON MUSCLE ARCHITECTURE COMPARED WITH TRADITIONAL RESISTANCE TRAINING IN WELL-TRAINED MEN

OBJECTIVE: The purpose of this study was to compare the effects of crescent pyramid (CP) and drop-set (DS) routines with a traditional (TRAD) resistance training routine on muscle strength, hypertrophy and architecture.

WHAT THEY DID:

32 males (age: 27.0 ± 3.9 years) with resistance training experience (6.4 ± 2.0 years) had one of their legs randomly allocated to one of three routines: CP (3–5 sets of 6–15 repetitions at 65–85% 1-RM), DS (3–5 sets of ~50–75% 1-RM to muscle failure) or TRAD (3–5 sets of 6–12 repetitions at 75% 1-RM). In other words, one leg performed the standard TRAD routine, whilst their other leg performed either the CP or DS routine. Each routine (CP, DS and TRAD) all had equal total training volumes (TTV).

MEASUREMENTS:

- Unilateral 1RM leg press (1RM)
- Unilateral 1RM leg extension (1RM)
- Muscle cross-sectional area (CSA)
- Pennation angle (PA)
- Fascicle length (FL)

WHAT THEY FOUND:

- All groups showed similar significant increases in muscle CSA (DS: 7.8%; CP: 7.5%; TRAD: 7.6%).
- All groups showed similar significant increases in leg press (CP = 25.9%; DS = 24.9%; TRAD = 25.9%) and leg extension (CP = 16.4%; DS = 17.1%; TRAD = 16.6%) 1RM performances.
- All groups showed similar significant increases in PA (CP = 11.0%; DS = 10.3%; TRAD = 10.6%).
- All groups also showed similar significant increases in FL (CP = 8.9%; DS = 9.1%; TRAD = 8.9%).

WHAT THIS MEANS:

These findings suggest that CP, DS and TRAD training approaches all produce similar changes in muscular hypertrophy, strength and architecture—meaning no method appears to be any better than the other. It also highlights the fact that training volume, rather than the routine, appears to be the vital ingredient for imposing muscular adaptations.

Lastly, the results of this study align with previous research which point towards the importance of training volume rather than any extravagant training method (CP or DS). *Training volume appears to be king.*

LIMITATIONS:

A couple of primary limitations to this study were: 1) CSA measures were only taken at one location, meaning any non-uniform muscle growth may have not been detected; and 2) the within-subject unilateral training design may have led to cross-education and potentially skewed the results, however, the authors make good justification for both the design rationale and the results found.

FUTURE RESEARCH:

Future research should look to investigate the use of other sets and repetition routines (e.g. cluster sets and supersets) and across various populations (e.g. untrained/beginners and elite-level athletes).

ARTICLE TITLE

IMPORTANCE OF HORIZONTALLY LOADED MOVEMENTS TO SPORTS PERFORMANCE

Strength
and
Conditioning
Journal

OBJECTIVE:

The aim of this paper was to highlight and discuss the potential importance of using horizontally loaded movements in strength training programmes for enhancing sports performance.

WHAT THEY DID:

In a discussion-type format, the author drew attention the potential shortcomings of vertically-based movements (e.g. squats, deadlifts and Olympic lifts), and by reviewing recent research, shed light on the promising importance of horizontal-based movements (e.g. hip thrusts, KB swings and hip extensions).

WHAT THEY FOUND:

The new research may be pointing towards the effectiveness of horizontal movements over vertical exercises for improving locomotive-based movements in elite athletes when typical performance plateaus are met. Simply meaning, vertical movements may be effective for “building a foundation”, but to squeeze further adaptations in jump and linear and multidirectional sprint speed, horizontal movements may be more effective.

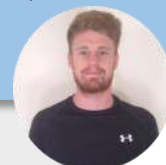
Reference:

Zweifel M. Importance of Horizontally Loaded Movements to Sports Performance. Strength and Conditioning Journal, 2017. [\[Link\]](#)

EDITORS COMMENTS:

“This appears to be a hot topic on the plates of many researchers at the minute, and perhaps rightly so. For example, numerous studies have shown strong significant relationships between horizontal force application and sprint times in elite-level athletes, but no relationship between vertical ground reaction forces.

Combine this with the fact that horizontal-based exercises appear to produce substantially higher glute and hamstring muscle activity than vertical movements, and we begin to develop the idea that horizontal movements may be more beneficial for developing certain athletic qualities (e.g. sprinting). Therefore, perhaps include the likes of hip thrusts, hip extensions, KB swings and prowler pushes into your athletes programmes.”



Owen Walker

Reference:

Davies TB, Kuang K, Orr R, Halaki M, Hackett D. Effect of Movement Velocity During Resistance Training on Dynamic Muscular Strength: A Systematic Review and Meta-Analysis. Sports Med, 2017. [\[Link\]](#)

ARTICLE TITLE

EFFECT OF MOVEMENT VELOCITY DURING RESISTANCE TRAINING ON DYNAMIC MUSCULAR STRENGTH: A SYSTEMATIC REVIEW AND META-ANALYSIS



EDITORS COMMENTS:

“Although there are some methodological issues with this review, for example, limited research and grouping lifting with maximal intended velocity with fast velocity movements (i.e. 1RM may be maximal intended velocity, but may still be slow), this study still offers some valuable information for practitioners.

Given the current best evidence, it appears movement velocity in general has no major impact on strength development, but this should still be context specific. For instance, a novice lifter should perhaps train with mod-slow velocities due to technical abilities (earn the right to lift fast), but when rate of force development is the goal, lifting as fast as possible with maximal intended velocity seems mandatory.”



Owen Walker

OBJECTIVE:

The aim of this study was to examine which exercise movement velocity (fast or moderate-slow) is better for improving dynamic muscular strength.

WHAT THEY DID:

Using a systematic review and meta-analysis type study, the authors searched five databases for related literature published between 1993 and 2016. 15 studies met the eligibility criteria with a total of 509 participants (292 males and 217 females) aged between 19–73 years.

WHAT THEY FOUND:

The results showed that fast and moderate-slow resistance training velocities produce similar gains in muscular strength, with training status and age not influencing the results.

However, fast movement velocities performed at moderate intensities (60–79% one repetition maximum) showed a non-significant trend for superior gains in dynamic muscular strength.

Technology & Monitoring

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

FEATURE

VALIDITY AND RELIABILITY OF A NOVEL IPHONE APP FOR THE MEASUREMENT OF BARBELL VELOCITY AND 1RM ON THE BENCH-PRESS EXERCISE

Balsalobre-Fernández C, Marchante D, Muñoz-López M & Jiménez SJ. (2017) Journal of Sports Sciences.

2

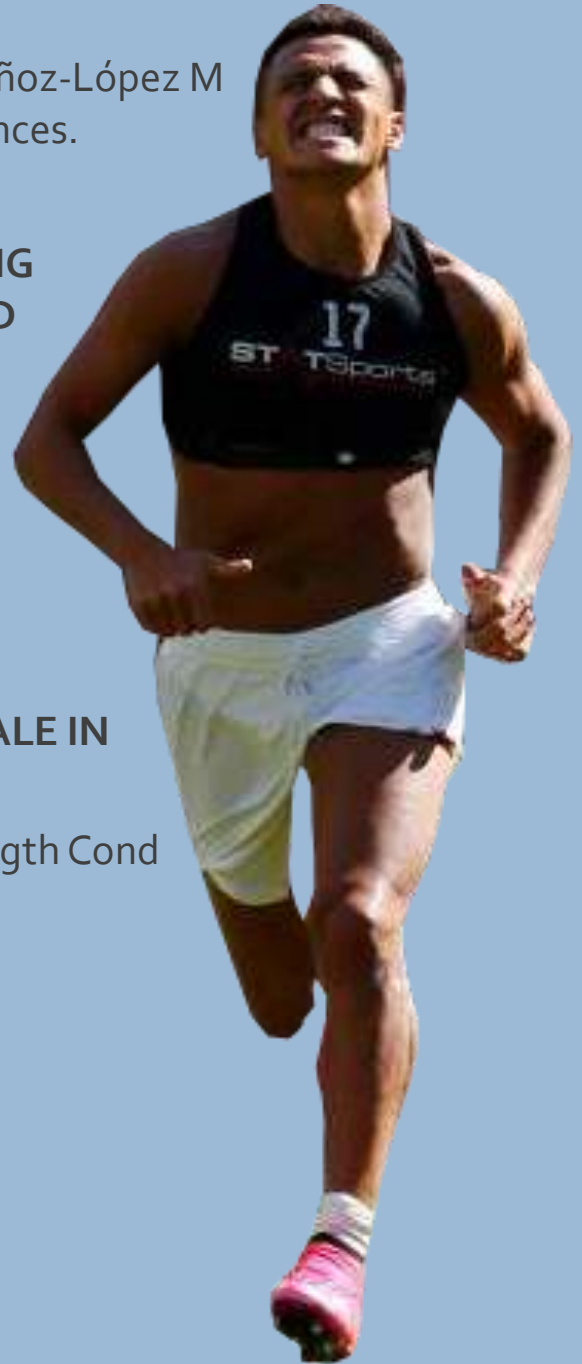
SUBJECTIVE WELL-BEING AND TRAINING LOAD PREDICT IN-SEASON INJURY AND ILLNESS RISK IN FEMALE YOUTH SOCCER PLAYERS

Watson A, Brickson S, Brooks A, Dunn W. Br J Sports Med 2017;51:194–199.

3

LOADING INTENSITY PREDICTION BY VELOCITY AND THE OMNI-RES 0–10 SCALE IN BENCH PRESS

Naclerio, F and Larumbe-Zabala, E. J Strength Cond Res 32(1): 323–329, 2017.



VALIDITY AND RELIABILITY OF A NOVEL IPHONE APP FOR THE MEASUREMENT OF BARBELL VELOCITY AND 1RM ON THE BENCH-PRESS EXERCISE

OBJECTIVE: The purpose of this study was twofold: 1) to examine the validity and reliability of an iPhone app (named: *PowerLift*) for the measurement of mean velocity on the bench-press exercise; and 2) to test the accuracy of 1RM estimation using the load–velocity relationship.

WHAT THEY DID:

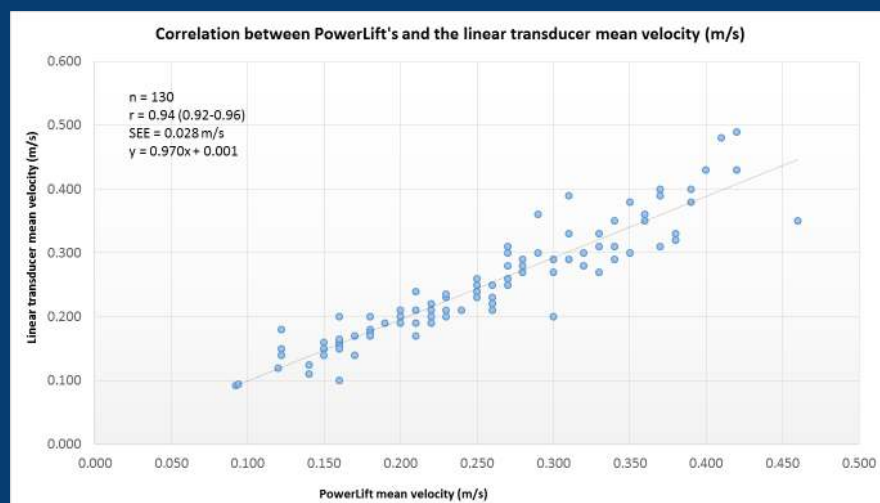
10 powerlifters (age: 26.5 ± 6.5 years; bench press $1RM \cdot kg^{-1} = 1.34 \pm 0.25$) completed an incremental bench-press test with 5 different loads ranging from 75–100% 1RM. Mean barbell velocity was registered using a linear transducer (LT) and the *PowerLift* app.

WHAT THEY FOUND:

- The results revealed a very high correlation between the *PowerLift* app and the LT ($r = 0.94$, $SEE = 0.028$ m/s) for the measurement of mean velocity.
- Results also showed very high agreement between the two devices ($ICC = 0.965$).
- Actual and estimated bench press 1RM were also highly correlated ($r = 0.98$, mean difference (SD) = 5.5 ± 9.6 kg, $p < 0.05$).

MEASUREMENTS

- Mean barbell velocity



WHAT THIS MEANS:

As the *PowerLift* app appears to be valid and reliable for measuring mean barbell velocity, this technology could potentially work its way into gym environments as an effective tool for implementing velocity based training on a budget. It may also be used to accurately develop load-velocity profiles.

However, as this technology has several large limitations (e.g. limb lengths need to be measured, it can not obtain 3D dynamics unlike accelerometer-based technology, and cannot measure force), it is unlikely to ever replace the gold-standard equipment currently used in abundance within the strength and conditioning field.

LIMITATIONS:

The researchers only measured mean velocity, and did not examine peak velocity which is often the preferred metric for exercises such as the clean and snatch. They also only assessed the reliability of this technology with one exercise (bench press), limiting its trustworthiness with other exercises such as the back squat and deadlift. Lastly, whilst it has been shown to be a reliable measure for estimating 1RM, a variance of 5.5 ± 9.6 kg could be seen as a large over/underestimation.

FUTURE RESEARCH:

Future research should focus its attention towards other exercises in order to verify its reliability for additional movements. It should also examine peak velocity and the between-day, as well as the inter-rater, reliability of this technology.

ARTICLE TITLE

SUBJECTIVE WELL-BEING AND TRAINING LOAD PREDICT IN-SEASON INJURY AND ILLNESS RISK IN FEMALE YOUTH SOCCER PLAYERS



OBJECTIVE:

The purpose of this study was to determine if training load (TL) and/or well-being are useful predictors of injury and illness risk in youth soccer players.

WHAT THEY DID:

75 young females soccer players (age: 15.5 ± 1.6 years) were monitored during a 20-week season. The TL (session rate of perceived exertion multiplied by session duration) of each player was collected after every physical activity and each player was required to report measures of subjective well-being (mood, fatigue, stress, soreness, sleep quality and sleep hours). TL was expressed as daily, weekly and monthly, in addition to an acute:chronic workload ratio.

WHAT THEY FOUND:

The findings showed that a lower mood and higher acute TL were associated with an increased injury risk. On the other hand, they also found that a higher chronic TL increases the risk of illness. Collectively, these results suggest that both TL and well-being may be useful predictors of injury and illness in young female soccer players.

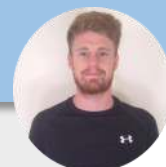
Reference:

Watson A, Brickson S, Brooks A, Dunn W. Subjective well-being and training load predict in-season injury and illness risk in female youth soccer players. *Br J Sports Med* 2017;51:194–199. [\[Link\]](#)

EDITORS COMMENTS:

"This is yet another study which supports the usefulness of TL and well-being for predicting injury and illness in athletes. However, this study has particular importance as most previous research has been conducted on male adult athletes, whereas this one focussed on a young female population.

The two primary objectives of the sports scientist are to: 1) minimise injury and illness; and 2) optimise performance. And although data can be collected for almost anything, it's recommended they concrete the injury management data (e.g. TL and wellness) first before attempting to collect further information on the likes of performance and readiness (e.g. daily neuromuscular readiness scores)."



Owen Walker

Reference:

Naclerio, F and Larumbe-Zabala, E. Loading intensity prediction by velocity and the OMNI-RES 0–10 scale in bench press. *J Strength Cond Res* 32(1): 323–329, 2017. [\[Link\]](#)

ARTICLE TITLE

LOADING INTENSITY PREDICTION BY VELOCITY AND THE OMNI-RES 0–10 SCALE IN BENCH PRESS



EDITORS COMMENTS:

If you don't have access to velocity measuring devices (e.g. PUSH bands or GymAware devices), then the OMNI-RES scale predictive equation allows coaches to also establish daily load-exertion profiles very easily and quickly—at least for the bench press.

To get the %1RM, just be sure to calculate it in the following order:

$$\text{Relative load (\%1RM)} = 7.26 * \text{RPE value} + 29.03$$



Owen Walker

OBJECTIVE:

The aim of this study was to determine if it is possible to use movement velocity and/or the perceived exertion of the bench press to estimate the relative load (i.e. % of 1RM).

WHAT THEY DID:

308 young, healthy, resistance trained athletes (242 men and 66 women) performed a progressive strength test up to their one repetition maximum (1RM). 1-3 repetitions were performed during each set, with the athlete lifting the barbell as quickly as possible on each repetition. Load-velocity and load-exertion relationships were determined for each athlete using average concentric velocity (AV) and the OMNI-RES Scale (RPE = 0-10). The AV and OMNI-RES scale were used to construct two predictive equations: Relative load (%1RM) = $107.75 - 62.97 * \text{average velocity}$; and Relative load (%1RM) = $29.03 + 7.26 * \text{OMNI-RES 0–10 scale value}$.

WHAT THEY FOUND:

The results suggest that both the AV and OMNI-RES predictive equations demonstrate an accuracy of 84 and 93% for predicting an athlete's %1RM during the bench press, respectively. Overall, the OMNI-RES scale – which uses RPE – appears to have greater accuracy and is arguably easier to implement, perhaps making it a more useful and very practical tool for coaches.



Fatigue & Recovery

This month's top sports science research on fatigue and recovery.

FEATURE

EFFECTS OF ROLLER MASSAGER ON MUSCLE RECOVERY AFTER EXERCISE-INDUCED MUSCLE DAMAGE

Casanova N, Reis JF, Vaz JR, Machado R, Mendes B, Button DC, Pezarat-Correia P & Freitas SR (2017) *Journal of Sports Sciences*.

2

SHORT-DURATION THERAPEUTIC MASSAGE REDUCES POSTURAL UPPER TRAPEZIUS MUSCLE ACTIVITY

Domingo AR, Diek M, Goble KM, Maluf KS, Goble DJ and Baweja HS. *NeuroReport* 2017, 28:108–110.

3

EFFECTS OF ELASTIC TAPING, NON-ELASTIC TAPING AND STATIC STRETCHING ON RECOVERY AFTER INTENSIVE ECCENTRIC EXERCISE

Boobphachart D, Manimmanakorn N, Manimmanakorn A, Thuwakum W & Hamlin MJ. (2017) *Research in Sports Medicine*.



EFFECTS OF **ROLLER MASSAGER** ON **MUSCLE RECOVERY** AFTER EXERCISE-INDUCED MUSCLE DAMAGE

OBJECTIVE: The aim of this study was to examine the effects of foam rolling (FR) on ankle plantar flexor muscle recovery after exercise-induced muscle damage (EIMD).

WHAT THEY DID:

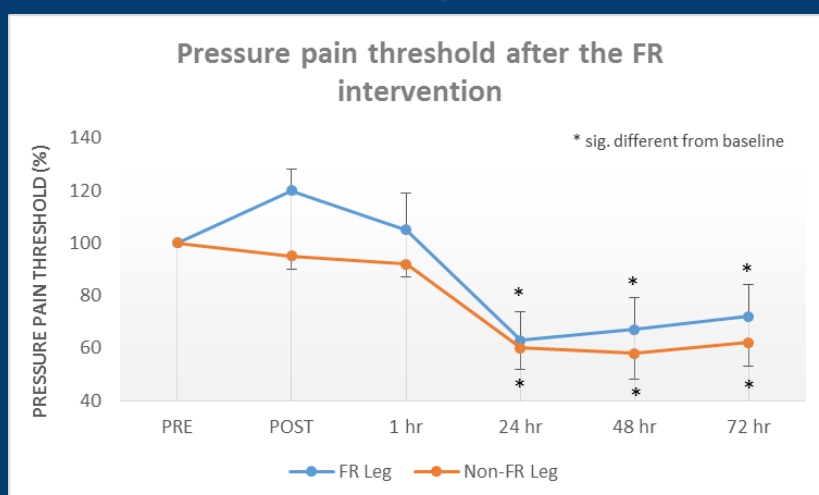
10 participants (age: 24.9 ± 5.4 years) took part in this randomised crossover design study which consisted of two experiments. Experiment 1 examined functional and morphological variables before, immediately after, and at 1, 24, 48, and 72 h after the EIMD stimulus. Experiment 2 examined medial gastrocnemius deoxyhaemoglobin concentration kinetics before and 48 h after EIMD. The FR protocol consisted of 6×45 s; 20-s rest between sets.

MEASUREMENTS:

- Maximal voluntary isometric contraction (MVIC)
- Sustained submaximal force (30% 1RM)
- Maximal range of motion
- Resistance to stretch
- Pressure pain threshold
- Deoxyhaemoglobin concentration

WHAT THEY FOUND:

- FR had no significant effect on any of the functional, morphological or oxygenation variables measured.
- FR appeared to significantly reduce the pressure pain threshold at 24, 48 and 72-hours after the EIMD stimulus in both the foam rolled leg and the non-foam rolled leg.



WHAT THIS MEANS:

Although foam rolling appeared to have no effect on functional, morphological or oxygenation recovery, the findings from this study are somewhat consistent with previous research which has found that foam rolling appears to reduce the perception of muscle soreness following exercise.

LIMITATIONS:

One key limitation to this is the lack of the participants familiarisation with MVIC testing. It is well-known that familiarity with this testing is needed to obtain reliable results, yet the authors of this study only provided one familiarisation session. This may explain why a reduction in MVIC was only seen 1hr after the EIMD and not any other timeframes (24, 48 and 72hrs post-EIMD).

FUTURE RESEARCH:

Although pain science is a very complex and elusive topic at present, considering FR appears to reduce the perception of pain and has been consistently shown to do so within the research, future studies should attempt to identify how this recovery modality reduces the perception of pain.

ARTICLE TITLE

SHORT-DURATION THERAPEUTIC MASSAGE REDUCES POSTURAL UPPER TRAPEZIUS MUSCLE ACTIVITY



OBJECTIVE:

The purpose of this study was to examine the effect of a classical (Swedish) massage on the postural muscle activity of the upper trapezius.

WHAT THEY DID:

17 young adults (9 women and 8 males) aged between 18-36 years took part in the experiment consisting of two trials: 1) 5-minutes massage; and 2) 5-minutes quite sitting (control). Participants were randomly assigned to one of the two experimental trials (massage or control) held 24-hours apart in a counterbalanced approach. Before and after each trial, three 10-seconds surface electromyography (EMG) recordings of quiet-sitting postural muscle activity and three 10-seconds EMG recordings at maximal voluntary contraction (MVC) were recorded.

WHAT THEY FOUND:

The findings showed a significant reduction in muscle activity following the massage condition (19%), compared with a non-significant reduction following quite sitting (1%). The results suggest that short-duration massage using moderate pressure leads to a significant reduction in upper trapezius muscle activity.

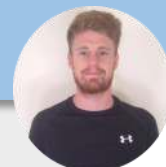
Reference:

Domingo AR, Diek M, Goble KM, Maluf KS, Goble DJ and Baweja HS. Short-duration therapeutic massage reduces postural upper trapezius muscle activity. NeuroReport 2017, 28:108–110. [\[Link\]](#)

EDITORS COMMENTS:

“These findings agree with previous research which has also found that massage can reduce the excitability of muscles.

As sitting requires low-level contraction of upper traps to maintain the head in an upright position, many people often complain of chronic neck pain. As such, massage appears to be an effective tool for lowering muscle activity and also reducing the perception of pain in the upper traps.”



Owen Walker

Reference:

Boobphachart D, Manimmanakorn N, Manimmanakorn A, Thuwakum W & Hamlin MJ. (2017) Effects of elastic taping, non-elastic taping and static stretching on recovery after intensive eccentric exercise, Research in Sports Medicine. [\[Link\]](#)

ARTICLE TITLE

EFFECTS OF ELASTIC TAPING, NON-ELASTIC TAPING AND STATIC STRETCHING ON RECOVERY AFTER INTENSIVE ECCENTRIC EXERCISE



OBJECTIVE:

The aim of this study was to compare the effect of elastic tape (Kinesio tape) to a placebo tape and static stretching on several markers of recovery (strength, power, muscle volume, joint range of motion, creatine kinase, muscle soreness and rate of perceived exertion [RPE]).

WHAT THEY DID:

51 untrained healthy females (age: 41.7 ± 8.6 years) were randomly allocated into one of three groups (n = 17/group): Kinesio tape, placebo tape and stretching group. The taping conditions were applied directly to the quadriceps following strenuous exercise. Measures of isometric and isokinetic knee extensor strength, jump height, thigh circumference, joint range of motion, delayed onset of muscle soreness [DOMS], pain pressure threshold, creatine kinase and RPE were taken immediately prior to and 24, 48 and 72 hours after an eccentric exercise protocol designed to induced muscle soreness.

WHAT THEY FOUND:

The Kinesio tape group demonstrated significantly less muscle soreness and greater isometric strength 72-hours post-exercise compared to both the placebo and the stretching groups. However, little effect was observed between groups for changes in explosive power, pressure pain threshold, thigh circumference, creatine kinase, RPE, and joint range of motion.

The findings suggest that Kinesio taping can reduce muscle soreness and increase muscle strength recovery after exercise.

EDITORS COMMENTS:

“Like many things, the conversation regarding the efficacy of applying Kinesio tape following exercise to promote recovery is still very controversial.

Although the findings from this study are supported by previous research, it’s important to understand that there is a paucity of this research, and that the quality of these studies are also often very poor.

As a result, I would suggest that although this recovery aid looks promising, it is very much too early to make a definitive decision regarding its effectiveness—but watch this space.”



Owen Walker



Youths

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

FEATURE

COMPELLING OVERUSE INJURY INCIDENCE IN YOUTH MULTISPORT ATHLETES

Rejeb A, Johnson A, Vaeyens R, Horobeanu C, Farooq A & Witvrouw E. (2017) *European Journal of Sport Science*.

2

OPTIMISING BONE HEALTH IN THE YOUNG MALE ATHLETE

Tenforde AS, Nattiv A, Ackerman K, Barrack MT and Fredericson M. *Br J Sports Med* 2016;0:1-2.

3

AGE-ORDERED SHIRT NUMBERING REDUCES THE SELECTION BIAS ASSOCIATED WITH THE RELATIVE AGE EFFECT

Mann DL & van Ginneken PJMA (2017) *Journal of Sports Sciences*, 35:8, 784-790.



COMPELLING OVERUSE INJURY INCIDENCE IN YOUTH MULTISPORT ATHLETES

OBJECTIVE: The purpose of this study was twofold: 1) to examine the injury incidence in highly training adolescent athletes; and 2) to examine the association between training and competition hours (i.e. exposure) and injury risk.

WHAT THEY DID:

166 male adolescent athletes (age: 12–18 years) from different sports (track and field [$n = 84$], squash [$n = 18$], table tennis [$n = 20$], fencing [$n = 20$], gymnastics [$n = 13$], swimming [$n = 4$], golf [$n = 3$] and shooting [$n = 4$]) were included in this prospective study. Injury data were prospectively collected during the seasons from 2009 to 2014.

MEASUREMENTS:

- Overall injury incidence
- Incidence of time-loss injuries
- Incidence of growth-related injuries
- Incidence of severe injuries

**All measures were examined per 1000hrs of exposure.*

WHAT THEY FOUND:

- Per 1000hrs of exposure, the overall injury incidence was 5.5, the incidence of time-loss injuries was 4.8, the incidence of growth conditions was 1.2 and incidence of serious injuries was 0.6.
- The prevalence of overuse injuries was 50%, whilst growth-related conditions represented 20% of all injuries.
- 67% involved the lower extremities, with both the foot and ankle being the most predominantly injured body parts – accounting for 22% of all injuries.
- Knee injuries were mostly from overuse (50%), whereas foot and ankle injuries resulted predominantly from an acute mechanism.
- Minor and moderate injuries accounted for 87%.
- Muscle, tendon and osteochondrosis injuries accounted for 52% of all injuries.
- Squash had the highest injury incidence (8.5 injuries per athlete), whilst fencing had the lowest (3.99 injuries per athlete).
- Higher exposure was associated with greater overuse relative risk (RR = 1.03, 95% CI: 1.01–1.014, $p < .001$).

WHAT THIS MEANS:

Perhaps the most important finding from this study was the high prevalence of overuse injuries. That being, 50% of all injuries were the result of overuse, suggesting that they may have been avoidable. Alarming, these results are inline with previous research which found overuse injuries rates ranging from 46–54%, signifying the importance and demand for effective injury prevention strategies.

Although the results from this investigation and the previous studies are highly subjective to their own population, it is vital you, as the practitioner, consider the efficacy of your own injury prevention strategies in order to minimise time loss and improve athlete wellbeing.

LIMITATIONS:

There are a couple of weaknesses with this study: 1) the authors reported difficulty collecting some of the injury data which can of course lead to inaccuracies within the findings and conclusions; 2) the limited sport sample (7 sports), of which are not highly-participated sports on a global scale.

FUTURE RESEARCH:

Though this research does provide some very useful information for exercise and medical practitioners alike, future research should aim to replicate this research using more globally popular sports such as: soccer, rugby, cricket, tennis etc.

ARTICLE TITLE

OPTIMISING BONE HEALTH IN THE YOUNG MALE ATHLETE



OBJECTIVE:

The aim of this paper was to highlight the current concern with a group of young male athletes who may have unrecognised low bone density and impaired skeletal health, predisposing them to an increased fracture risk.

WHAT THEY FOUND:

Based on the current limited evidence and expert opinion, there appears to be a sub-group of young male athletes (endurance athletes) who have a higher risk of experiencing a bone fracture. The authors primarily focused on endurance runners and highlighted the following as significant risk factors: low body mass (<85% expected weight), belief that low body mass improves running performance, stress fracture history, average weekly running volume of >30 miles, and consuming fewer than one serving of calcium-containing food per day.

WHAT THEY RECOMMEND:

The following has been recommended as action points: 1) encourage multisport participation, with the inclusion of land-based multidirectional high-impact sports (e.g. football, basketball and tennis); 2) optimise nutrition, including caloric intake, calcium and vitamin D; 3) perform annual screening (DXA, injury history, vitamin D levels, free and total testosterone levels, blood content, metabolic panel and malabsorption syndrome screening); 4) try to manage impaired bone health via non-pharmacological treatments (e.g. nutrition and physical activity).

Reference:

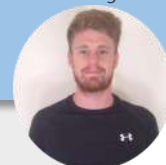
Tenforde AS, Nattiv A, Ackerman K, Barrack MT and Fredericson M. Optimising bone health in the young male athlete. *Br J Sports Med* 2016;0:1–2. [\[Link\]](#)

EDITORS COMMENTS:

"This paper draws attention to an important topic, which for the most part, appears to go unnoticed.

Although this paper predominantly focuses on endurance runners, if you have read the past few issues of the *Research Alerts*, you would have noticed that other young endurance sport athletes (e.g. swimmers and cyclists) also appear to possess low bone mineral density, geometry and are at a higher risk of experiencing a stress fracture.

This again supports the importance of avoiding early sport specialisation, and instead may promote ingenuity from practitioners to develop a well-rounded package of sports athletes could play in order to optimise short- and long-term health, wellbeing and performance.



Owen Walker

Reference:

Mann DL & van Ginneken PJMA (2017) Age-ordered shirt numbering reduces the selection bias associated with the relative age effect, *Journal of Sports Sciences*, 35:8, 784-790. [\[Link\]](#)

EDITORS COMMENTS:

"Although the impact of the relative age effect has been well-known for some time now, virtually nothing has been done to overcome this common issue. Perhaps this is due to some logistical complexities with implementing the current ideas suggested to overcome this issue, but regardless, more effort and action is needed.

This study provides a fantastic and very easy to implement method of eliminating the maturation selection bias. As a result, sports scientists should work closely with scouts to implement such methods of talent identification.



Owen Walker

ARTICLE TITLE

AGE-ORDERED SHIRT NUMBERING REDUCES THE SELECTION BIAS ASSOCIATED WITH THE RELATIVE AGE EFFECT



OBJECTIVE:

The purpose of this study was to determine whether the maturation selection bias associated with the relative age effect could be reduced when scouts (i.e. talent identifiers) were given information about the age of the players they are selecting from.

WHAT THEY DID:

25 talent scouts from an elite football club (PSV Football Club) watched video footage of junior games and ranked players on the basis of their potential. Scouts were allocated to one of three groups and provided with contrasting information about the age of the players: (G1) no age information, (G2) players' birthdates, or (G3) knowledge that the numbers on the playing shirts correspond to the relative age of the players (e.g. #1 oldest player and #8 youngest player).

WHAT THEY FOUND:

The researchers found a significant selection bias for the scouts with no-age information (G1), and for the scouts who knew the birthdates of the players (G2). Interestingly however, there was no selection bias when the scouts knew the shirt numbers corresponded to the relative age of the players (G3). This suggests that the maturation selection bias can be eliminated when the scouts know the shirt numbers correspond to the relative age of the players.

Nutrition

This month's top research on nutrition.

FEATURE

MICRONUTRIENT INTAKES IN 553 DUTCH ELITE AND SUB-ELITE ATHLETES: PREVALENCE OF LOW AND HIGH INTAKES IN USERS AND NON-USERS OF NUTRITIONAL SUPPLEMENTS

Wardenaar F, Brinkmans N and Ceelen I et al.
(2017) *Nutrients*, 9(2), 142.

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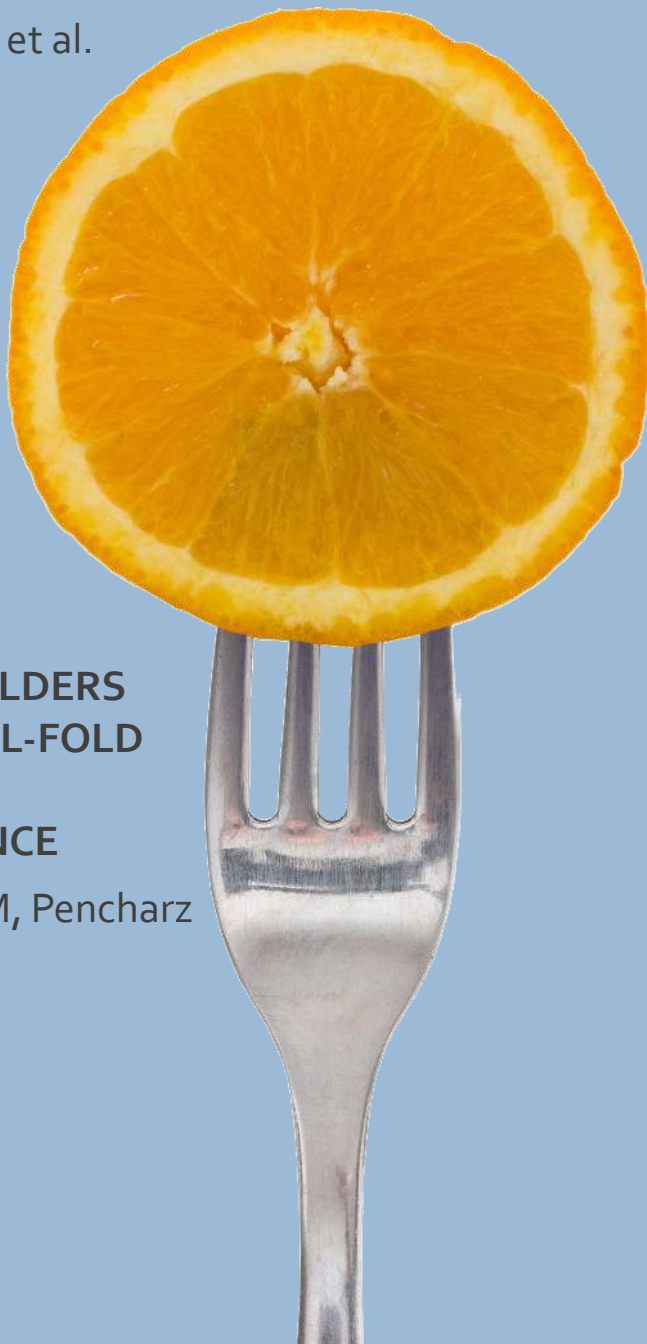
OBESITY ENERGETICS: BODY WEIGHT REGULATION AND THE EFFECTS OF DIET COMPOSITION

Hall K and Guo J
(2017) *Gastroenterology*.

3

INDICATOR AMINO ACID-DERIVED ESTIMATE OF DIETARY PROTEIN REQUIREMENT FOR MALE BODYBUILDERS ON A NONTRAINING DAY IS SEVERAL-FOLD GREATER THAN THE CURRENT RECOMMENDED DIETARY ALLOWANCE

Bandegan A, Courtney-Martin G, Rafii M, Pencharz P, Lemon P (2017) *J Nutr*.



MICRONUTRIENT INTAKES IN 553 DUTCH ELITE AND SUB-ELITE ATHLETES: PREVALENCE OF LOW AND HIGH INTAKES IN USERS AND NON-USERS OF NUTRITIONAL SUPPLEMENTS

OBJECTIVE: To evaluate the adequacy of micronutrient intake of Dutch elite and sub-elite athletes, and to assess the effect of nutritional supplement use on micronutrient intake.

WHAT THEY DID:

Micronutrient intakes of 553 Dutch sub-elite athletes from a variety of sports were assessed using web-based 24hr dietary recalls with accompanying nutritional supplement questionnaires. Dietary intake was estimated by combining information from these recalls and questionnaires. Two trained dietitians checked all results.

MEASUREMENTS:

- Micronutrient intake (mg or µg) per gender and category
- Total energy (MJ)
- Median intake (g) of the most relevant nutrition food groups in relation to micronutrient intake

WHAT THEY FOUND:

- Vitamin D intake was insufficient in all athletes.
- Vitamin B1, B2, and vitamin A intakes were low, especially in athletes who don't take dietary supplements.
- Vitamin B3, vitamin C and selenium intakes were also low, but this was less pronounced.
- Iron intake was below the estimated average requirement in some female athletes, but this appeared to be compensated for when dietary supplements were taken into account.
- Micronutrient intake above the upper level was only observed in those using dietary supplements, especially in the case of vitamin B3.
- In general, the use of dietary supplements improved micronutrient intake levels, but this did not always completely compensate for intakes below the average requirement.

WHAT THIS MEANS:

As micronutrient intake correlates with overall energy intake, it is often assumed that athletes automatically meet their micronutrient needs as a result of their high energy intake. This study shows that this is not necessarily the case, especially when athletes make poor dietary choices. Athletes should make better dietary choices resulting in a higher micronutrient intake (such as eating a wide variety of foods and meeting minimum fruit and vegetable serving requirements) and consider using a daily low-dosed multivitamin supplement containing 50%–100% of the Recommended Intake (RI).

LIMITATIONS:

- Blood testing (more accurate measure of micronutrient adequacy) was not used to assess concentrations of micronutrients.
- Self-report data collection methods are prone to misreporting and therefore may not completely reflect true dietary intake.

FUTURE RESEARCH:

Future research should assess micronutrient adequacy in athletes from other countries to assess whether dietary quality differs from country to country. Future research should also examine whether particular types of athletes (e.g. endurance athletes) are at higher risk of certain micronutrient deficiencies compared to other types of athletes. Finally, future research should more closely compare adequacy of individual micronutrients between genders due to the sometimes differing dietary choices between men and women.

ARTICLE TITLE

OBESITY ENERGETICS: BODY WEIGHT REGULATION AND THE EFFECTS OF DIET COMPOSITION



OBJECTIVE:

To examine our current understanding of the components of human energy balance and the counterbalancing physiological processes that act to resist weight loss. Furthermore, to address the question of whether all diet calories are created equal regarding the effects of carbohydrate, fat and protein on energy balance, body weight and composition.

WHAT THEY DID:

The authors conducted a review of body weight regulation and a meta-analysis of calorie-matched and protein-matched controlled feeding studies (where all food was provided to participants) comparing low-carbohydrate to low-fat diets.

WHAT THEY FOUND:

Based on 32 studies with dietary carbohydrate ranging from 1-83% and dietary fat ranging from 4-84% of total calories, lower fat diets increased total daily energy expenditure slightly more than low-carbohydrate diets by an average of 26 kcal per day. Additionally, low-fat diets led to slightly more fat loss than low-carbohydrate diets, by an average of 16 grams per day.

Note: while these results are statistically significant, they are not clinically significant.

Reference:

Hall K and Guo J (2017) Obesity Energetics: Body Weight Regulation and the Effects of Diet Composition. *Gastroenterology*. [\[Link\]](#)

EDITORS COMMENTS:

"This review is important because contrary to popular opinion, it shows that when protein and calories are equated, the ratio of carbohydrate to fat in an individual's diet does not determine body composition outcomes.

Therefore, the percentages of carbohydrate and fat in one's diet should be determined by personal preference, as this will improve dietary adherence, which is the most important factor in any diet."



Tim Rowland

Reference:

Bandegan A, Courtney-Martin G, Rafii M, Pencharz P, Lemon P (2017) Indicator Amino Acid-Derived Estimate of Dietary Protein Requirement for Male Bodybuilders on a Nontraining Day Is Several-Fold Greater than the Current Recommended Dietary Allowance. *J Nutr*. [\[Link\]](#)

EDITORS COMMENTS:

"The biggest takeaway from this study is that the RDA (recommended dietary allowance) of 0.8g protein/kg per day is way too low to optimise muscle growth in bodybuilders (or those performing regular resistance training), and is a massive 2.6-fold lower than the optimal intake based off the findings from this study.

Furthermore, it is possible that an even higher protein intake is needed to optimise muscle growth on training days when rates of muscle protein synthesis are higher. Based off the findings from this study and others, a sound strategy to optimise muscle growth is to consume 4-6 meals per day with each meal containing 30-40g protein."



Tim Rowland

ARTICLE TITLE

INDICATOR AMINO ACID-DERIVED ESTIMATE OF DIETARY PROTEIN REQUIREMENT FOR MALE BODYBUILDERS ON A NONTRAINING DAY IS SEVERAL-FOLD GREATER THAN THE CURRENT RECOMMENDED DIETARY ALLOWANCE



OBJECTIVE:

To quantify the daily dietary protein requirement of young, experienced male bodybuilders with the use of the indicator amino acid oxidation (IAAO) technique (a new method used to estimate protein needs).

WHAT THEY DID:

The authors assessed the dietary protein requirement of healthy young male bodybuilders (with > 3 years training experience) on a non-training day by measuring the oxidation of ingested L-phenylalanine to CO₂ in response to graded intakes of protein (otherwise known as the IAAO technique). Eight men (average age 22.5yrs, weight 83.9kg, body fat 13.0%) were studied at rest on a non-training day on several occasions (4-8 times) each with protein intakes ranging from 0.1-3.5g/kg per day, for a total of 42 experiments.

WHAT THEY FOUND:

This study found that the estimated average protein requirement was 1.7g/kg per day. Additionally, the upper 95% confidence interval was 2.2g/kg per day (this is the amount to consume if you want to be more certain that you are consuming enough protein). It is important to note that the IAAO technique estimates the protein requirement to optimise whole-body protein synthesis, which is slightly more than what's needed to optimise muscle protein synthesis.

Team Sports

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

FEATURE

FATIGUE AND RECOVERY IN RUGBY: A REVIEW

Tavares F, Smith TB and Driller M. Sports Med. 2017.

2

HIGHER DROP IN SPEED DURING A REPEATED SPRINT TEST IN SOCCER PLAYERS REPORTING FORMER HAMSTRING STRAIN INJURY

Røksund OD, Kristoffersen M, Bogen BE, Wisnes A, Engeseth MS, Nilsen A-K, Iversen VV, Mæland S and Gundersen H (2017) Front. Physiol. 8:25.

3

DO FAST BOWLERS FATIGUE IN CRICKET: A PARADOX BETWEEN PLAYER ANECDOTES AND QUANTITATIVE EVIDENCE?

Maunder, E., Kilding, A.E. and Cairns, S.P., 2016. International Journal of Sports Physiology and Performance, pp.1-25.

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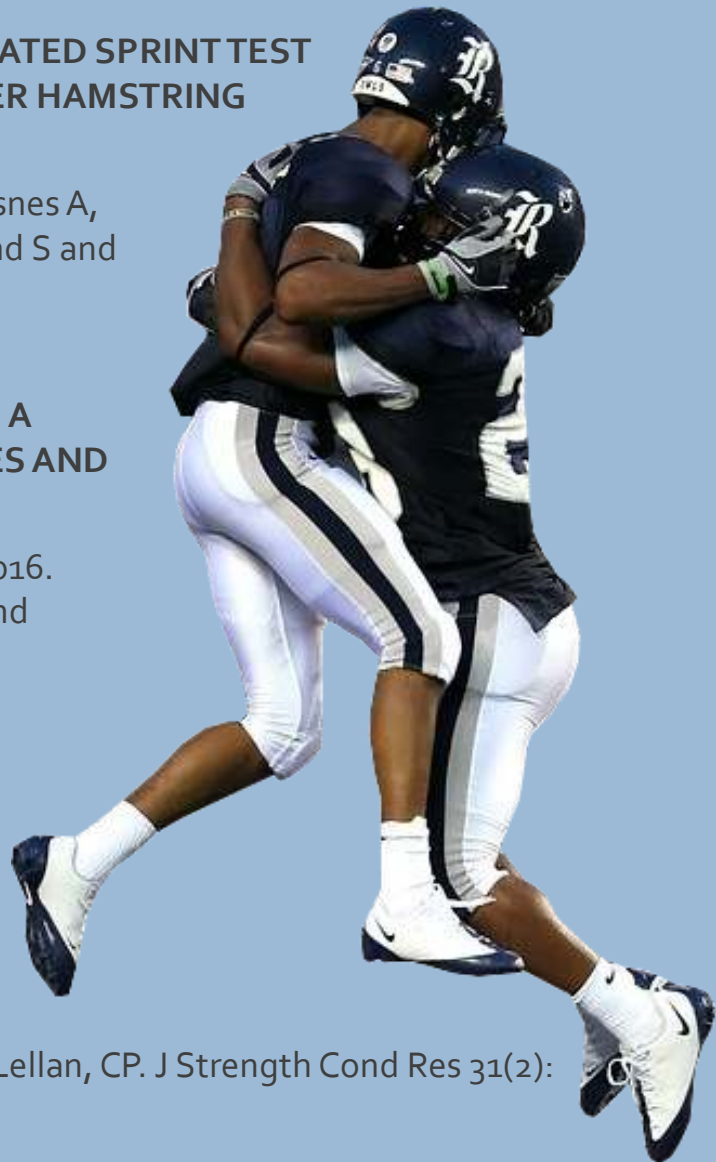
QUANTIFICATION OF ACCELEROMETER DERIVED IMPACTS ASSOCIATED WITH COMPETITIVE GAMES IN NATIONAL COLLEGIATE ATHLETIC ASSOCIATION DIVISION I COLLEGE FOOTBALL PLAYERS

Wellman, AD, Coad, SC, Goulet, GC, and McLellan, CP. J Strength Cond Res 31(2): 330-338, 2017.

5

ASYMMETRY DURING PRESEASON FUNCTIONAL MOVEMENT SCREEN TESTING IS ASSOCIATED WITH INJURY DURING A JUNIOR AUSTRALIAN FOOTBALL SEASON

Chalmers S, Fuller JT, Debenedictis TA, Townsley S, Lynagh M, Glesson C, Zacharia A, Thomson S, Magaray M. (2017) Journal of Science and Medicine in Sport.



SCIENCE for
SPORT



FATIGUE AND RECOVERY IN RUGBY: A REVIEW



OBJECTIVE: The aim of the study was to investigate the efficacy of different recovery modalities for optimising recovery from Rugby practice or competition.

WHAT WE DID:

We summarised the scientific literature regarding recovery modalities in rugby union and league published prior to August 2016. 14 studies passed the inclusion criteria standards and were included for analysis.

Competition level: 4 studies included elite, 4 included well-trained and 5 included club- or collegiate-level rugby athletes. Modalities: 7 studies used cold water immersion, 5 used contrast water therapy, 6 used compression garments, 1 used cryotherapy, 4 used active recovery, 1 used electromyostimulation and 2 articles used a combination of two or more recovery modalities.

MEASUREMENTS:

- Cold water immersion
- Contrast water therapy
- Compression garments
- Cryotherapy
- Active recovery
- Electromyostimulation
- Combination of 2 or more modalities

WHAT WE FOUND:

- Studies investigating the effect of recovery modalities in a Rugby population are scarce and limited to a low number of recovery modalities.
- In an acute window (e.g. 48 h post-match) cold modalities seem to have a beneficial effect on creatine kinase clearance, neuromuscular performance and delayed onset of muscle soreness.
- However, chronic exposure to cold modalities may interfere in the anabolic pathways, limiting adaptations in muscle size.
- Compression garments provide enhanced recovery from delayed onset of muscle soreness.
- A typical short-duration active recovery protocol (e.g. 7 min) is unlikely to provide additional benefits for recovery.

WHAT THIS MEANS:

Given the acute effects of cold modalities for enhancing recovery, we recommend them to be implemented during periods where the recovery time is limited and/or there is a need to produce high power outputs (e.g. game day, neural type of training).

If there is a potential for blunting muscle size adaptations resulting from cold modalities, athletes looking for increases in muscle mass should limit the use of such modalities.

Compression garments are an inexpensive and non-invasive modality that can be easily implemented during exercise and 15–24 h post-training and competition as a recovery strategy by rugby athletes.

LIMITATIONS:

- Research is limited to a little number of recovery modalities. Moreover, some studies used a combination of various recovery strategies which do not allow for a clear understanding of the specific individual recovery modalities.
- Limited studies investigating the physiological mechanistic responses of different recovery modalities.
- The timeframes to measure the efficacy of different recovery modalities should set around normal post-match/training (e.g. 12, 24, 36 and 48 hours post).
- Lack of studies investigating the effect of recovery modalities on upper body performance.

FUTURE RESEARCH:

Future research should attempt to compare the acute benefits vs. the chronic effects of exposure to cold recovery modalities on muscle size and performance.

In addition, future research should also investigate the efficacy of other recovery modalities and explore in a greater physiological depth the mechanisms that may lead to an enhanced recovery.

ARTICLE TITLE

HIGHER DROP IN SPEED DURING A REPEATED SPRINT TEST IN SOCCER PLAYERS REPORTING FORMER HAMSTRING STRAIN INJURY



OBJECTIVE:

To evaluate and compare the physical characteristics of football players with and without a previous history of hamstring strain. The aim was to utilise a variety of traditional performance assessments to suggest areas where insufficient rehabilitation may be common.

WHAT THEY DID:

75 semi-professional and professional football players were assessed across a performance testing battery consisting of: 40 m maximal sprint test, a repeated sprint test (8 × 20 m), a countermovement jump, a maximal oxygen consumption (VO₂max) test, strength tests and flexibility tests. 16% (n = 12) of the participants reported a history of hamstring injury within the past 2 years.

WHAT THEY FOUND:

The researchers found, that from the testing protocol, only the speed decrement, in a repeated sprint assessment, correlated with previous history of hamstring strain. Speed decrement was calculated by subtracting the mean time of the final two sprints from the mean time of the initial two sprints. The researchers concluded that this may be an important consideration during the rehabilitation process and that traditional measures of strength, speed, mobility and conditioning may not demonstrate a complete picture of rehabilitation status.

Reference:

Røksund OD, Kristoffersen M, Bogen BE, Wisnes A, Engeseth MS, Nilsen A-K, Iversen VV, Mæland S and Gundersen H (2017) Higher Drop in Speed during a Repeated Sprint Test in Soccer Players Reporting Former Hamstring Strain Injury. *Front. Physiol.* 8:25. [\[Link\]](#)

EDITORS COMMENTS:

"Given this test may be capable of identifying those with previous hamstring injury, it may be worthwhile including this test into the return-to-play assessment criteria for footballers.

One of the limitations was that the strength assessment was a 5RM Squat protocol. Perhaps the inclusion of a high repetition, eccentric or isometric hamstring protocol, to assess the reduction in strength due to fatigue and it's correlation to previous hamstring strain would be something to include in future."



Greg King

Reference:

Maunder, E., Kilding, A.E. and Cairns, S.P., 2016. Do Fast Bowlers Fatigue in Cricket: A Paradox Between Player Anecdotes and Quantitative Evidence? *International Journal of Sports Physiology and Performance*, pp.1-25. [\[Link\]](#)

EDITORS COMMENTS:

"Trying to quantify and measure fatigue within fast bowlers has long been a topic of discussion amongst both researchers and practitioners. Although a limited number of studies exist on this topic, the authors highlight the conflicting information between the current literature and anecdotal evidence. There does not appear to be a consensus between the perceptions of experts and the objective research on what mechanisms are responsible for fatigue during and following a spell of fast bowling. Consequently, future researchers and practitioners may benefit greatly from this detailed analysis.

It should however be noted that the anecdotal evidence used in this study is limited. The use of one-to-one interviews across a variety of playing levels combined with qualitative data analysis may provide more insight into the individual perceptions of fatigue within fast bowlers when compared to the quantitative data."



Will Vickery

ARTICLE TITLE

DO FAST BOWLERS FATIGUE IN CRICKET: A PARADOX BETWEEN PLAYER ANECDOTES AND QUANTITATIVE EVIDENCE?



OBJECTIVE:

The review aimed to highlight the quantitative measures of fatigue (bowling technique, bowling accuracy, bowling speed, run-up speed as well as physical, physiological, perceptual responses) currently used by researchers and substantiate these against the subjective measures reported by players and coaches.

WHAT THEY DID:

Provided a review in two parts. Firstly, subjective reports of fatigue amongst fast bowlers were sourced using anecdotes from experts (international cricket players and team physiotherapists). Following this, a critical review of the current objective measures of fatigue amongst fast bowlers during match-play and match simulations was performed.

WHAT THEY FOUND:

Based on the objective measures reviewed, there appears to be little evidence to suggest fatigue impacts on the performance of elite cricket fast bowlers, particularly within the shorter formats of the game. Only measures of perceptual fatigue (rating of perceived exertion) appear to respond to fast bowling performance. This opposes the anecdotal evidence reported which experts suggest that fatigued players are likely to exhibit a decrease in bowling speed along with symptoms of tiredness, muscle soreness and mental fatigue.

ARTICLE TITLE

QUANTIFICATION OF ACCELEROMETER DERIVED IMPACTS ASSOCIATED WITH COMPETITIVE GAMES IN NATIONAL COLLEGIATE ATHLETIC ASSOCIATION DIVISION I COLLEGE FOOTBALL PLAYERS



OBJECTIVE:

The study described the positional impact profiles of NCAA division I football players using global positioning system (GPS) and integrated accelerometry (IA).

WHAT THEY DID:

The study analysed GPS and IA data sets of 33 athletes from 12 regular season games. This data was collected using commercially available GPS units (SPI HPU; GPSports, Canberra, Australia) which operated at a sampling frequency of 15Hz and 100Hz for GPS and IA data respectively. The impact classification system used in the study was based on manufacturer recommendations (GPSports).

WHAT THEY FOUND:

Notable findings of offensive position groups were that the wide receiver (WR) underwent greater zone 1 (5.0 -6.0 G) and zone 2 (6.1 – 6.5 G) impacts than all other offensive position groups. Meanwhile the running back (RB) position was exposed to significantly more severe (> 10.0 G) impacts. Defensively, the defensive tackle (DT) position group completed more zone 3 (6.6 – 7.0 G), zone 4 (7.1 – 8.0 G), and zone 5 (8.7 – 10.0 G) impacts than all other defensive position groups whilst the defensive back (DB) and linebacker (LB) positions underwent more zone 1 impacts.

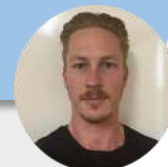
Reference:

Wellman, AD, Coad, SC, Goulet, GC, and McLellan, CP. Quantification of accelerometer derived impacts associated with competitive games in National Collegiate Athletic Association division I college football players. *J Strength Cond Res* 31(2): 330–338, 2017. [\[Link\]](#)

EDITORS COMMENTS:

"This study provides a novel analysis of the impacts associated with division I football that can be used as a scope to provide position-specific training prescription. The quantification of impacts in competition may help coaches prescribe training to ensure athletes have built an appropriate level of impact tolerance in order to prepare them for the frequency and magnitude of impacts in competition.

However, it is important to consider the style of play the head coach adopts as this may greatly influence the frequency and magnitude of impacts each position is exposed to. It should also be noted that the intensity of common movements in AmF including accelerations, decelerations, jumping, landing and change of direction may alter the number and magnitude of impacts undertaken by athletes as different manufacturers have different methods of quantifying impacts and loads."



Toby Edwards

Reference:

Chalmers S, Fuller JT, Debenedictis TA, Townsley S, Lynagh M, Glesson C, Zacharia A, Thomson S, Magaray M. (2017) Asymmetry during preseason Functional Movement Screen testing is associated with injury during a junior Australian football season. *Journal of Science and Medicine in Sport*. [\[Link\]](#)

EDITORS COMMENTS:

"This is one of the first large cohort FMS studies to focus on a targeted sport in this case junior elite AFL players.

Whilst no relationship between the often reported "critical" threshold score of 14 and injury was seen in this group, this may be explained by the low median composite score of 13.5, which in turn may increase the likelihood of false positives recorded.

Even though the clinical relevance and sensitivity of the FMS screen is often questioned, this research suggests that the FMS may offer a cheap and relatively easy-to-implement injury risk assessment. However, "critical" values and/or scoring metrics (e.g. number of asymmetries) used to identify this risk may need to be population specific (e.g. Australian rules or basketball)."



Dean Norris

ARTICLE TITLE

ASYMMETRY DURING PRESEASON FUNCTIONAL MOVEMENT SCREEN (FMS) TESTING IN ASSOCIATED WITH INJURY DURING A JUNIOR AUSTRALIAN FOOTBALL SEASON



OBJECTIVE:

The aim of the study was to examine the association between pre-season FMS scores and injuries sustained during one regular season competition in elite adolescent Australian Football players.

WHAT THEY DID:

A total of 237 elite junior Australian Rules football players completed FMS testing during the late preseason phase of competition. Injury status of these individuals were monitored throughout the season with the definition of injury being 'trauma which caused a player to miss a competitive match'. Cox proportional hazard regression models were used to identify the relationship between injury and FMS variables (score, asymmetries and pain). Model accuracy was assessed using a 2X2 contingency table to identify correct classification of availability and reported as sensitivity (True positive %) and specificity (True negative %). Effect sizes were quantified via hazard ratios.

WHAT THEY FOUND:

The median composite FMS score was 13.5 ± 2.3 . Once retrospectively accounting for injuries obtained in the model a score < 14 was found not to be associated with prospective injury risk (hazard ratio = 1.1., $p = 0.8$). A presence of ≥ 1 asymmetrical sub-test was associated with a moderate increase in injury risk (hazard ratio = 2.2 [1.0-4.8], $p = 0.047$, sensitivity = 78.4%, specificity = 41%). Post hoc analysis revealed that the presence of ≥ 2 asymmetries was associated with greater risk of prospective injury (Hazard ratio = 3.7 [1.6-8.6], $p = 0.003$, sensitivity = 66.7%, specificity 71.9%).

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. He also has a master's degree in strength and conditioning and is a NSCA certified strength and conditioning coach.

STRENGTH & CONDITIONING



Will Vickery PhD BSc (Hons)

Will is a Lecturer of Sport Coaching at the University of Northumbria: Newcastle Upon Tyne. Prior to this he has worked with Cricket NSW and Cricket Australia in an array of roles ranging from a sport scientist, development coach and a strength and conditioning coach.

CRICKET



Dean Norris MSc PhD Candidate

Dean is currently working as the strength and power scientist at the GWS Giants. He has bachelor in Exercise and Sport Science and Masters in High Performance Sport. Dean is also completing his PhD assessing the influence of strength qualities on recovery of neuromuscular function.

AUSTRALIAN FOOTBALL



Tim Rowland MSc ASCA L2

Tim is the Head Strength and Conditioning Coach at Asquith Rugby League Football 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



Greg King MSc L2 ASCA

Greg is currently the High Performance Manager at Adelaide United Football Club (A-League). He has previously worked in the AFL with Port Adelaide Football Club as a strength and conditioning coach, and has completed a Master of Exercise Science (Strength and Conditioning) at Edith Cowan University and is also a qualified ASCA Level 2 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