Research Alerts

JULY EDITION: ISSUE #10

Your monthly roundup of the LATEST RESEARCH across the following topics.

(click a heading to jump straight to the topic)

1 STRENGTH & CONDITIONING

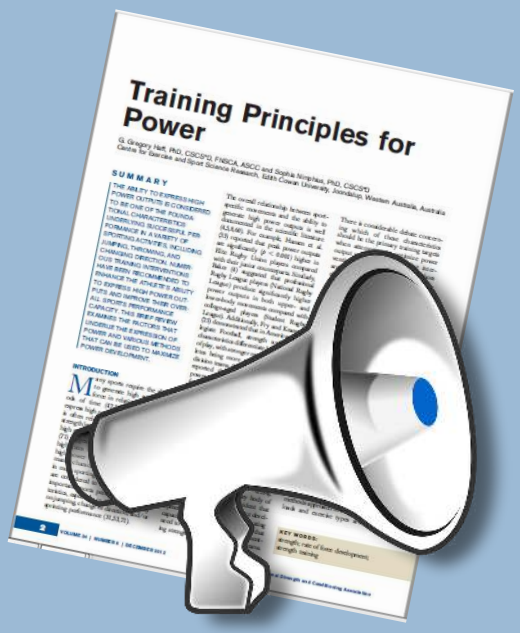
2 TECHNOLOGY & MONITORING

3 FATIGUE & RECOVERY

4 YOUTHS

5 NUTRITION

6 TEAM SPORTS



AUSTRALIAN RULES FOOTBALL

FOOTBALL (SOCCER)

RUGBY

AMERICAN FOOTBALL

CRICKET

SCIENCE for SPORT

Foreword

An introductory word from the chief editor.

Issue #10 - July 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 June 2017 will be included within the June 2017 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., August 2017 issue will be published on the 31st August 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

Strength & Conditioning

This month's top research in strength & conditioning.

FEATURE

RESISTED SLED SPRINTING INCREASES SUBSEQUENT SPRINT SPEED?

Wong MA, Dobbs IJ, Watkins CM, Barillas SR, Lin A, Archer DC, Lockie RG, Coburn JW, Brown LE. Center for Sports Performance, California State University, Fullerton. 2017.

2

ACCENTUATED ECCENTRIC LOADING: GOOD FOR STRENGTH AND POWER DEVELOPMENT?

Wagle JP, Taber CB, Cunanan AJ, Bingham GE, Carroll KM, DeWeese BH, Sato K, and Stone MH. Sports Med. 2017.

3

WHICH WEIGHTLIFTING EXERCISES ARE BEST FOR DEVELOPING FORCE ABSORBTION—CONTINUED

Comfort, P, Williams, R, Suchomel, TJ, and Lake, JP. J Strength Cond Res 31(7): 1911–1918, 2017.

SCIENCE for SPORT

RESISTED SLED SPRINTING INCREASES SUBSEQUENT SPRINT SPEED?

OBJECTIVE: The aim of this study was to see if resisted sled sprinting improved following sprint performance via the post-activation potentiation (PAP) phenomenon.

WHAT THEY DID:

20 recreationally trained, field-sport males (age: 22.3 ± 2.4yrs) performed a 30m sprint test (with splits at 5, 10, 20 and 30m) to determine baseline performances. After the baseline testing session, participants were required to make 5 returning visits under each of the conditions (2, 4, 6, 8 or 12mins of rest between sled sprinting and unloaded sprinting). On each occasion, participants were required to sprint 30m towing a sled loaded with 30% of bodyweight, then rest for whichever duration (i.e. 2, 4, 6, 8 or 12mins) before then sprinting 30m with no load attached. Individualized best times were defined as fastest 0-5m split times, regardless of rest interval.

MEASUREMENTS:

- **0-5m**
- **5-10m**
- **10-20m**
- **20-30m**

WHAT THEY FOUND:

- 0-5m sprint time was significantly lower than baseline.
- No other split times were significantly different.

Table 1. Mean ± SD of baseline and best sprint split times.

Distance	Baseline (s)	Best (s)
0-5m	1.13 ± 0.08	1.08 ± 0.08*
5-10m	0.79 ± 0.05	0.77 ± 0.04
10-20m	1.30 ± 0.09	1.33 ± 0.06
20-30m	1.26 ± 0.06	1.26 ± 0.07

*significantly less than baseline

WHAT THIS MEANS:

This study demonstrates that 0-5m sprint time can be enhanced by using resisted sled sprinting with 30% of bodyweight several minutes beforehand. However, it is unclear which rest duration (2, 4, 6, 8 or 12mins) was most effective as the researchers did not report it.

There are two key forces to consider when it comes to sprinting: 1) horizontal; and 2) vertical. Acceleration is dominated by horizontal forces, whilst top speed running is mostly dominated by vertical forces. So, considering acceleration is horizontal force dominant and that resisted sled sprinting overloads the horizontal forces required to increase sprint speed, it seems logical that resisted sled sprinting would potentiate acceleration (0-5m speed).

Also, following up from last month's issue of the Research Alerts review on resisted sled sprinting, and given the fact heavier loads (>80%) appear to be better for potentiating subsequent performance than lighter loads (e.g. 30%), it may be logical to believe that resisted sled towing using much heavier loads (80% of bodyweight) may be more effective for improving subsequent acceleration.

LIMITATIONS:

A couple of weaknesses of this study include:

1. The researchers did not report which rest time was most effective.
2. No inclusion of a control group.
3. Participants did not appear to have any speed training experience (i.e. towing weighted sleds).
4. The researchers did not reported the standardisation of testing methods (e.g. timing gate height).

FUTURE RESEARCH:

Future research should look further into this topic, but do so using a more rigorous testing methodology.

It would also be interesting to see the potentiation difference between using lighter loads (e.g. 30% bodyweight) versus heavier loads (e.g. 80% bodyweight) and which rest interval durations are best for maximising following performance.

Wong MA, Dobbs IJ, Watkins CM, Barillas SR, Lin A, Archer DC, Lockie RG, Coburn JW, Brown LE. Acceleration Sprint Time is Potentiated Following Sled Towing. Center for Sports Performance, California State University, Fullerton. 2017. [Link]

TITLE

ACCENTUATED ECCENTRIC LOADING: GOOD FOR STRENGTH AND POWER DEVELOPMENT?

Reference:

Wagle JP, Taber CB, Cunanan AJ, Bingham GE, Carroll KM, DeWeese BH, Sato K, and Stone MH. Accentuated Eccentric Loading for Training and Performance: A Review. Sports Med. 2017. [Link]

OBJECTIVE:

The objective of this review was to examine the potential mechanisms responsible for the adaptations associated with Accentuated Eccentric Loading (AEL) and the practical applications of this training method.

WHAT THEY DID:

The authors searched through multiple academic databases (EBSCO, Google Scholar, PubMed, ScienceDirect, and SPORTDiscus) and accumulated 30 articles which met the inclusion-exclusion criteria.

WHAT THEY FOUND:

The findings from this review suggest that AEL may be a superior method for improving strength and power performance, but the acute and chronic changes responsible for doing so still remain unclear. It also suggests that future research should examine the acute responses to AEL using practical methods which would be commonly used by strength and conditioning coaches.

EDITORS COMMENTS:

"For those unsure of what AEL is, it is simply a form of training which uses an eccentric load which is heavier than the concentric load during the same exercise. You can watch this **VIDEO** to better understand this simple training method.

Although the findings from this study are not particularly sexy, simply because there are still way more questions than answers with this particular training method, it does provide some clarity. That is, AEL appears to be a very potent training method for improving strength and power.

Part of the reason for the lack of understanding with AEL, is because it's kind of awkward to perform and hence why many strategies have been used such as using: elastic bands, counterbalance weight systems, weight releaser devices, computer -driven adjustments, and manual adjustments by either the athlete or practitioner. Regardless, AEL appears to be an effective training method."

Owen Walker

TITLE

WHICH WEIGHTLIFTING EXERCISES ARE BEST FOR DEVELOPING FORCE ABSORBTION—CONTINUED

Reference:

Comfort, P, Williams, R, Suchomel, TJ, and Lake, JP. A comparison of catch phase force-time characteristics during clean derivatives from the knee. J Strength Cond Res 31(7): 1911–1918, 2017. [Link]

OBJECTIVE:

The purpose of this study was to determine and compare the load-absorption differences between the clean from the knee (CK), power clean from the knee (PCK), and the clean pull from the knee (CPK).

WHAT THEY DID:

10 male collegiate-level team sport (rugby league, rugby union, soccer) athletes (age: 27.5 ± 4.2 years; relative 1RM power clean 1.28 ± 0.18 kg·kg^{-1} of body mass) with extensive weightlifting experience (≥3 times per week, for ≥2 years) performed 3 repetitions each of the CK, PCK, and CPK with 90% of their 1RM power clean on a force platform. The load-absorption duration (ms), average force (N), and work (J) were all calculated using the force-time data from the force platform.

WHAT THEY FOUND:

The load-absorption duration for the CK (0.95 ± 0.35 seconds) was significantly longer compared with the CPK (0.44 ± 0.15 seconds; $p < 0.001$, $d = 2.53$), but not compared to the PCK (0.56 ± 0.11 seconds; $p > 0.05$, $d = 1.08$), with no differences between PCK and CPK ($p > 0.05$, $d = 0.91$). The CPK demonstrated the greatest mean force (2,039 ± 394 N), which was significantly greater than the PCK (1,771 ± 325 N; $p = 0.012$, $d = 0.83$), but not significantly different to the CK (1,830 ± 331 N; $p > 0.05$, $d = 0.60$); CK and PCK were not different ($p > 0.05$, $d = 0.18$). For load-absorption work, significantly more work was performed during the CK (655 ± 276 J) compared with the PCK (288 ± 109 J; $d = 1.75$, $p < 0.001$), but not compared with the CPK (518 ± 132 J; $d = 0.80$, $p > 0.05$). Additionally, more load absorption work was performed during the CPK compared with the PCK ($d = 1.90$, $p = 0.032$).

In summary, the catch phase associated with the CK does not provide any additional stimulus in terms of mean force or work during the load-absorption phase when compared with the CPK, with the PCK providing the least benefit of all three exercises.

EDITORS COMMENTS:

"This study follows up very nicely from last months review on weightlifting derivatives which was completed by the same research team. Again, this study demonstrated that the pulling variation of the clean (clean pull from knee) appeared to be most effective for providing a load-absorption stimulus in comparison to the catch variations.

Not only this, but also consider the fact that the pulling variations allow for overloading the lift (i.e. loads greater than 1RM can be used), the highest force and power outputs are observed during the second pull, the catch Is associated with the majority of injuries (hand, arm, and trunk), and the pulling variations are simpler to teach and thus more time-effective, there is ever-growing reason to simply use the pulling variations only and neglect using the catch variations of the Olympic lifts.

Having said this, there will always be reasons to justify the inclusion of an exercise into a programme (e.g. power clean) so this new information should not remove these exercises from your arsenal completely, instead they should simply remain as another 'tool in the toolbox'."

Owen Walker

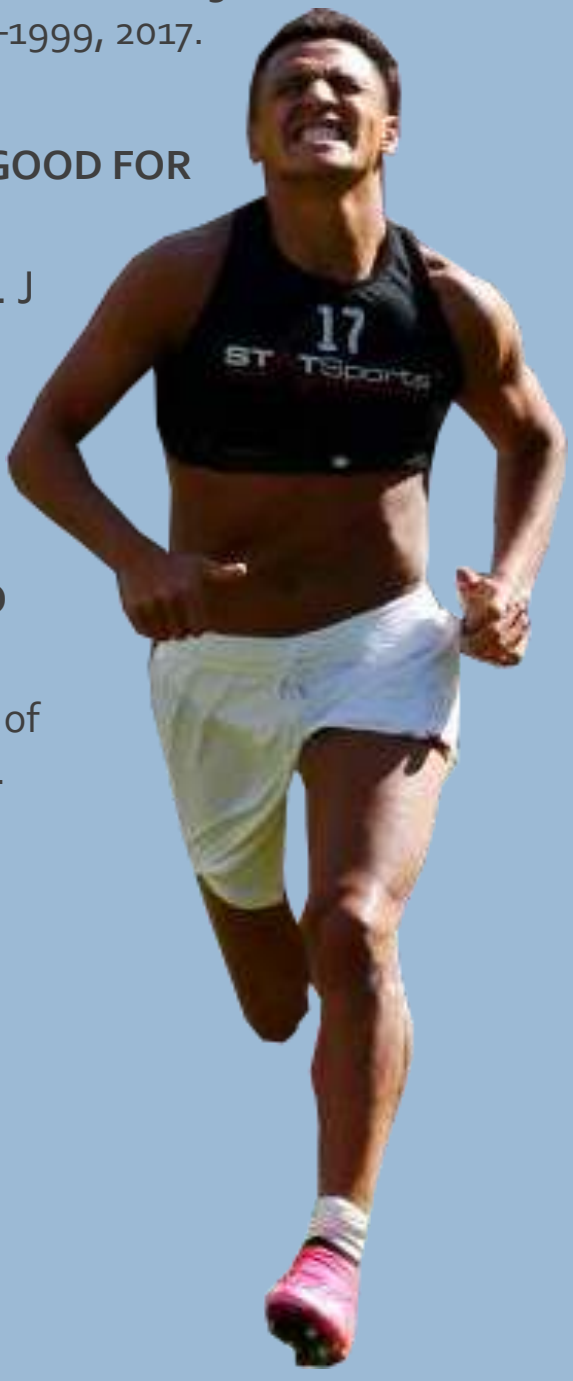
Technology & Monitoring

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

FEATURE

MEASURING SPEED: DOES GATE HEIGHT AFFECT THE RESULTS ?

Altmann, S, Spielmann, M, Engel, FA, Neumann, R, Ringhof, S, Oriwol, D, and Haertel, S. J Strength Cond Res 31(7): 1994–1999, 2017.



2

VELOCITY BASED TRAINING: IS IT ANY GOOD FOR PREDICTING 1RM?

Banyard, HG, Nosaka, K, and Haff, GG. J Strength Cond Res 31(7): 1897–1904, 2017.

3

CAN WE ACCURATELY MEASURE HAMSTRING STRENGTH USING A VIDEO CAMERA?

Lee JWY, Li C, Yung PSH, Chan KM. Journal of Exercise Science & Fitness 15. (2017). 18-21.

SCIENCE for SPORT

MEASURING SPEED: DOES GATE HEIGHT AFFECT THE RESULTS ?

OBJECTIVE: The aim of this study was to determine the validity of single-beam timing gates and whether the height of the light (i.e. beam) might affect the results.

WHAT THEY DID:

Two single-beam timing gate systems were used to measure 30-m sprint time (with splits at 5 and 10 m) in 15 healthy and physically active male participants. For the first timing gate, both system 1 and system 2 were set at a height of 0.64m and 0.25m, respectively. After that, the remaining timing gate heights were set at a height of 1.00m. A high-speed camera was used to validate the results of the timing gates. Participants were required to perform 3 trials, with the best effort being used for analysis.

MEASUREMENTS

- 5m
- 10m
- 30m

WHAT THEY FOUND:

The sprint times significantly differed between both the systems and the reference (i.e. video) ($p < 0.001$). Intraclass correlation coefficients and Pearson's r values between both timing light systems and the reference system were low to moderate at 5 and 10 m and moderate to high at 30 m. From the Bland and Altman analysis, a considerably higher agreement was reported for system 1 and the reference system than for system 2. The validity of measuring 5 and 10m sprint times using single beam timing gates is questionable, however, 30m times do appear to have acceptable levels of validity – particularly when using system 2.

Comparison of the data obtained from the different testing systems (scores are the mean values of the best trials per subject for the whole sample group).

Distance (m)	References (s)	System 1 (s)	System 2 (s)
5	1.051 ± 0.035	1.139 ± 0.097	0.936 ± 0.040
10	1.783 ± 0.051	1.883 ± 0.113	1.700 ± 0.053
30	4.280 ± 0.126	4.385 ± 0.163	4.216 ± 0.130

*Reference = high-speed video analysis; system 1 = 0.64 m; system 2 = 0.25 and 1.00 m, respectively.

WHAT THIS MEANS:

The findings from this study highlight the effect different methodological approaches can have on the results of testing speed. That being, setting the gates at different heights produces different scores. As a result, data obtained using gate heights of 0.25m should not be compared with data obtained with gates set at a height of 0.64m.

This obviously possess difficulty for coaches who wish to compare their athlete scores to other athletes out of their remit. Additionally, it also complicates things for any coach who has acquired a new athlete from another team and has been given their testing scores from the previous coach. Therefore, the suggestion is: do your own testing using rigorous testing methodology and interpret other data with caution, knowing that it most likely doesn't translate to your own data. An indirect suggestion from this study may also be that you may be better off testing speed testing using video instead of timing gates.

LIMITATIONS:

A couple of key limitations to this study are:

- The high-speed camera used as a reference system only recorded at a rate of 100 fps and has not been validated as an accurate measure of sprint speed.
- Only 2 heights were measured (0.25 and 0.64m).
- Results were not compared to radar gun or multi-beam timing gates.

FUTURE RESEARCH:

Future research should duplicate this study format but also include various other heights, distances, multi-beam timing gates, radar and/or a higher speed camera.

Altmann, S, Spielmann, M, Engel, FA, Neumann, R, Ringhof, S, Oriwol, D, and Haertel, S. Validity of single-beam timing lights at different heights. J Strength Cond Res 31(7): 1994–1999, 2017. [Link]

SCIENCE for SPORT

TITLE

VELOCITY BASED TRAINING: IS IT ANY GOOD FOR PREDICTING 1RM?

OBJECTIVE:

The aim of this study was to determine the reliability and validity of the load–velocity relationship to predict 1-repetiton maximum (1RM) using the back squat.

WHAT THEY DID:

17 strength-trained males (age: 25.4 ± 3.3) who had between 1-10 years strength training experience and the ability to lift >1.5 times bodyweight during the back squat performed three 1RM assessments on three different days separated by 48-hours. Using a linear regression equation, predicted 1RMs were calculated using the mean concentric velocity from the load-velocity relationships of 3 (20, 40, 60% of 1RM), 4 (20, 40, 60, 80% of 1RM), or 5 (20, 40, 60, 80, 90% of 1RM) incremental warm-up sets.

WHAT THEY FOUND:

The actual 1RM of the participants remained stable across the three trials (ICC = 0.99; SEM = 2.9 kg; CV = 2.1%; ES = 0.11). The predicted 1RM from the 5 incremental warm-up sets (20, 40, 60, 80, 90% of 1RM) was the most reliable (ICC = 0.92; SEM = 8.6 kg; CV = 5.7%; ES = 20.02) and valid (r = 0.93; SEE = 10.6 kg; CV = 7.4%; ES = 0.71) of the 3 predicted 1RM methods. However, all predicted 1RM methods produced significantly different 1RMs in comparison to the actual 1RM ($p < 0.05$; ES = 0.71–1.04).

Individual variation for the actual 1RM was small between trials (5-25%) compared to the predicted 1RM methods (26-28%). It was also observed that the 1RM velocity was unreliable between trials (ICC = 0.42; SEM = 0.05 m/s-1; CV = 22.5%; ES = 0.14). The load-velocity relationship showed moderate validity and reliability, however, it could no accurately predict 1RM. Overall, this information suggests that the load-velocity relationship of the free-weight back squat cannot be used to accurately predict 1RM.

Reference:

Banyard, HG, Nosaka, K, and Haff, GG. Reliability and validity of the load–velocity relationship to predict the 1RM back squat. J Strength Cond Res 31 (7): 1897–1904, 2017. [Link]

EDITORS COMMENTS:

"Considering the amount of attention velocity based training is, and has been, getting , the findings from this study have caused some disruption in the industry! I'll do my best to explain these results simply and concisely.

Bottom-line: using the load-velocity profile of a free-weight back squat, including the mean concentric velocity, cannot be used to accurately predict actual 1RM. This is because of several reasons: 1) velocity at lower loads (e.g., 20 and 40% 1RM) is not stable/ consistent; 2) the SSC (**HERE**) component will alter concentric velocity; 3) the back squat has a large deceleration portion, so mean concentric velocity will underestimate concentric velocity, due to an averaging effect.

However, previous research (**HERE**) has found that if a pause is added to eliminate the SSC and you use the mean propulsive velocity, instead of mean concentric velocity, you can accurately predict actual 1RM in the bench press, at least. However, this is not very practical, so the moral of the study is DON'T use load-velocity profiling to predict 1RM during any typical exercise because you won't get an accurate result."

Owen Walker

TITLE

CAN WE ACCURATELY MEASURE HAMSTRING STRENGTH USING A VIDEO CAMERA?

OBJECTIVE:

The aim of this study was twofold: 1) to assess the between-session reliability of a video-based hamstring strength test; and 2) to assess the concurrent validity of this test by comparing it to the gold-standard isokinetic dynamometry.

WHAT THEY DID:

In a cross-sectional designed study, 30 elite male footballers (age: 20.4 ± 1.3 years) performed an isokinetic strength test and the Nordic hamstring exercise on two separate occasions separated by 7-10 days. The video-analysis-determined Nordic break-point angles where the participant could no longer withstand the force of the fall (eccentric mode) and the number of seconds that the player could hold at 30 degrees of forward flexion angle (isometric mode). Intra-class correlation coefficients were used to determine the between-session reliability, whilst Pearson r correlations were used to determine the relationship between the video-based Nordic test and the isokinetic strength test.

WHAT THEY FOUND:

The intraclass correlation coefficient analysis revealed that the reliability of the video-based Nordic test was moderate for the eccentric mode (ICC = 0.82), but poor for the isometric mode (ICC = 0.57). There was a significant relationship between eccentric hamstring peak torque and the eccentric mode (i.e. the Nordic break-point angle; [r = 0.48 and 0.58, $p < 0.001$]), but not with the isometric mode (r = 0.02 - 0.07, $p > 0.05$).

In conclusion, the eccentric mode (using the Nordic break-point) of the video-based strength test was moderately reliable and valid method to measure the eccentric hamstring strength in elite football players.

Reference:

Lee JWY, Li C, Yung PSH, Chan KM. The reliability and validity of a video-based method for assessing hamstring strength in football players. Journal of Exercise Science & Fitness 15. (2017). 18-21. [Link]

EDITORS COMMENTS:

"The findings from this have substantial practical significance. Effectively, practitioners can use this video-based Nordic test as a method of measuring an athletes hamstring strength. This could be particularly important for coaches working with sports such as football (soccer), rugby, Australian rules football, etc as each of these sports have a high rate of hamstring injuries.

Additionally, there is also an app—available on iTunes—called "Nordics" which lets you do this exact thing.

Click **HERE** to watch the video."

Owen Walker

Fatigue & Recovery

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

FEATURE

ICE SLUSHY BEFORE AND DURING EXERCISE: BETTER THAN WATER?

Naito T and Ogaki T. Journal of Sport and Health Science 6 (2017) 111–117.

2

A SHOWER BEFORE BED: A GREAT WAY TO IMPROVE SLEEP?

Whitworth-Turner C, Di Michele R, Muir I, Gregson W & Drust B. (2017) European Journal of Sport Science.

3

DO TATTOOS AFFECT PERFORMANCE?

Luetkemeier MJ, Hanisko JM and Aho KM. Med. Sci. Sports Exerc., Vol. 49, No. 7, pp. 1432–1436, 2017.

SCIENCE for SPORT

ICE SLUSHY BEFORE AND DURING EXERCISE: BETTER THAN WATER?

OBJECTIVE: The objective of this study was to examine the effects of consuming crushed ice before and during exercise in comparison to cold water.

WHAT THEY DID:

In a counterbalanced, crossover design separated by 4-14 days, 9 recreationally-trained males (age: 23.0 ± 4.0) males ingested 1.25 g/kg (80–100 g) of either crushed ice (0.5°C) or cold water (4°C) every 5-mins for 30-mins before exercise. They were then also required to ingest 2.0 g/kg (130–160 g) of the same treatment drink at 15-mins, 30-mins, and 45-mins during a cycling to exhaustion task at 60% of VO2max until voluntary exhaustion in a hot environment (35°C and 30% relative humidity).

MEASUREMENTS:

- Body mass
- Time to exhaustion
- Heart rate
- V02
- Skin temperature
- Body temperature
- Rectal temperature
- Heat storage
- Rating of thermal sensation
- Rating of perceived exertion

WHAT THEY FOUND:

- Although body mass was lower in both groups after exercise, there was no significant difference between the two trials (crushed ice or cold water).
- For time to exhaustion, the crushed ice trial performed significantly better (50.0 ± 12.2 min) than the cold water trial (42.2 ± 10.1 min; $p = 0.02$).
- There was no significant difference in heart rate before, during, or after exercise in either trials.
- There was no significant difference in V02 during exercise in either trials.
- There was no significant difference in skin temperature before or during exercise in either trials, however, skin temperature rised significantly slower during exercise in the crushed ice trial ($p < 0.005$).
- Post-exercise rectal temperature dropped by 0.37°C ± 0.03°C in the crushed ice trial.
- There was no significant difference between trials during exercise (crushed ice: 0.23°C ± 0.07°C, 5 min; cold water: 0.22°C ± 0.07°C, 5 min).

WHAT THIS MEANS:

The findings from this study suggest that consuming crushed ice (i.e. ice slurry) before and during exercise effectively increases endurance performance compared to cold water. In other words, ice slurries may be a more effective tool for minimising thermal strain and improving athletic performance in hot environments than simply drinking cold water.

The results from this study are in line with previous studies which have demonstrated that cooling the body during exercise using things such as crushed ice (**HERE**), cooling collars (**HERE**), and water spray bottles (**HERE**) can improve performance. The take home message appears to be that when exercising in hot conditions, using mid-exercise cooling methods appears to be an effective tool for improving/sustaining performance.

LIMITATIONS:

Several key limitations of this study are:

1. Impact of a placebo. As participants could not be blinded that they were consuming ice slurries versus water, there may have been a placebo effect associated with performance.
2. Small sample size ($n = 9$) and non-elite participants (not representative of the population who would use this cooling method).
3. Time to exhaustion protocol instead of a time trial. Time to exhaustion tests are not very ecologically valid (not representative of typical performance environments) [e.g. 90-minute event].

FUTURE RESEARCH:

Future research should continue to investigate the ergogenic effect of ice slurries on performance and do so in elite-level athletes and during a mixture of sports (e.g. professional rugby).

It should also investigate the effects of ice slurries on more ecological tests such as time trials (e.g. 30-mins) or set distances (e.g. 5000m).

Naito T and Ogaki T. Comparison of the effects of cold water and ice ingestion on endurance cycling capacity in the heat. Journal of Sport and Health Science. 2017. 111–117. [Link]

SCIENCE for SPORT

TITLE

A SHOWER BEFORE BED: A GREAT WAY TO IMPROVE SLEEP?

OBJECTIVE:

The purpose of this study was to determine if a hot (approx. 40°C), 10-minute shower before lights out in bed would improve how quickly the participants fell asleep (i.e. sleep latency).

WHAT THEY DID:

11 young full-time male soccer players (age: 18 ± 1 years) were monitored during a typical in-season training week (approx. 5 × Training sessions, 1 × Match and 1 × Recovery session per week). In a randomised counterbalanced crossover design, participants conducted 3 nights of typical habitual sleep (i.e. post-session shower) and 3 nights consisting of a 10-min (approx. 40°C) shower before bedtime. A bedside sleep monitor was used to collect sleep information and an iButton skin thermistors were used to measure skin temperature, both proximally and distally, including the distal to proximal gradient.

WHAT THEY FOUND:

The pre-bedtime shower significantly elevated distal skin temperature 1.1°C ($p = 0.04$), and this increase in temperature was sustained for the first 30-minutes following lights out ($p < 0.01$). There was also a significant effect for the distal to proximal gradient within the first 30-minutes of lights out between the two conditions ($p < 0.01$). Sleep efficiency improved by +2% ($p < 0.01$) and sleep latency also improved by 7-minutes in the pre-bedtime shower condition ($p < 0.01$).

Overall, these results suggest that a pre-bedtime warm shower can alter thermoregulatory changes which may cause faster sleep latency and, ultimately, improve sleep efficiency in elite athletes.

Reference:

Whitworth-Turner C, Di Michele R, Muir I, Gregson W & Drust B. (2017): A shower before bedtime may improve the sleep onset latency of youth soccer players, European Journal of Sport Science. [Link]

EDITORS COMMENTS:

"This study aimed to manipulate skin temperature to determine whether doing so would improve the sleep of young footballers. The results showed there was a small reduction in sleep latency, and an increase in sleep efficiency – both are positives for improving overall sleep. Although this is only one study with a small sample size, similar results have been found in other research as well (**HERE R**aymann 07). Likewise, another study demonstrated that a hot bath before bedtime can substantially improve sleep latency (**HERE** - Sung), perhaps more so than a hot shower.

Given this, it might be suggested that practitioners/coaches recommend their athletes to shower or bath before going to sleep each evening. Although there is no evidence to support this, it may also be recommended that the duration and temperature the shower/bath may be increased during heavy training/competition periods to further improve sleep quality, which would act as a method of periodisation."

Owen Walker

TITLE

DO TATTOOS AFFECT PERFORMANCE?

OBJECTIVE:

The aim of this study was to determine if tattooed skin affects sweat rate and sodium (Na+) concentration compared to non-tattooed skin.

WHAT THEY DID:

10 healthy men (age: 21 ± 1 year) with a unilateral tattoo covering a circular area at least 5.2 cm^2 participated in this study. To stimulate sweat by iontophoresis, agar gel disks impregnated with 0.5% pilocarpine nitrate were used. Sweat collection disks composed of Tygon® tubing wound into a spiral were used to draw the sweat into the tubing by capillary action. The disks were weighed before and after sweat collection to determine sweat rate, whilst flame photometry was used to measure the Na+ sweat concentration.

WHAT THEY FOUND:

The results demonstrated that tattooed skin sweated significantly less than non-tattooed skin (0.18 ± 0.15 vs. 0.35 ± 0.25 $mg \cdot cm^{-2} \cdot min^{-1}$; $p = 0.001$), with an effect size of –0.79. The tattooed skin also demonstrated significantly higher mean sweat Na+ concentration than the non-tattooed skin (69.1 ± 28.9 vs 42.6 ± 15.2 $mmol \cdot L^{-1}$; $p = 0.02$). Lastly, 90% of the participants experienced higher sweat Na+ concentration from tattooed skin than non-tattooed skin, with an effect size of 1.01.

Reference:

Luetkemeier MJ, Hanisko JM and Aho KM. Skin Tattoos Alter Sweat Rate and Na+ Concentration. Med. Sci. Sports Exerc., Vol. 49, No. 7, pp. 1432–1436, 2017. [Link]

EDITORS COMMENTS:

"Put simply, this study found that tattooed skin produced less sweat (53%) and higher concentrations of Na+ (64%) than non-tattooed skin. It's also important to note that these effects were not influenced by the age of the tattoo.

This is the first study of its kind to investigate this topic, and whilst the results don't look good for athletes with, or those deciding to get, tattoos, it is still too early to know whether these may actually hinder performance. So at this stage, you probably shouldn't be telling your athletes not to get tattoos, but it may be worth warning them of the potential implications which are still not fully understood.

Additionally, things such as how much of the athlete's skin is covered by tattoos is likely going to have a big affect (e.g. a full-body tattoo versus a small tattoo on their arm)."

Owen Walker

Youths

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

FEATURE

WHICH SPORTS ARE BEST FOR IMPROVING VIGILANCE?

Ballester R, Huertas F, Molina E, Sanabria D. Journal of Sport and Health Science (2017).

2

MATURATION SELECTION BIAS: DOES THE QUICKEST ALWAYS WIN?

McCunn, R, Weston, M, Hill, JKA, Johnston, RD, and Gibson, NV. J Strength Cond Res 31 (7): 1795–1801, 2017.

3

BONE DEVELOPMENT: IS BASKETBALL MORE EFFECTIVE THAN SOCCER?

Jallai T, Maasalu K, Kums T, Ereline J, Gapeyeva H, Paasuke M. Sport Sci Health. 2017.

SCIENCE for SPORT

WHICH SPORTS ARE BEST FOR IMPROVING VIGILANCE?

OBJECTIVE: The objective of this study was to examine the relationship between different types of sports (externally-paced vs. self-paced sports) and vigilance performance in children, while also taking into account their cardiovascular fitness levels.

WHAT THEY DID:

60 children (age: 11.0 ± 0.2 years) were separated into three groups based on their sport participation (football players, n = 20; track and field athletes, n = 20; non-athletic controls, n = 20). On two separated occasions, the participants completed the Psychomotor Vigilance Task (PVT) to evaluate their vigilance performance under 2 conditions of velocity demands (normal vs. speed), and the Leger Multi-stage fitness test to estimate their cardiovascular fitness level.

MEASUREMENTS:

- Psychomotor Vigilance Task (PVT)
- Leger Multi-stage fitness test

WHAT THEY FOUND:

- Football players demonstrated significantly better performances in the PVT than track and field athletes and controls.
- There were no significant differences in PVT performances between track and field athletes and non-athletes.
- The cardiovascular fitness of both the football and track and field athletes was significantly higher than the non-athlete group.

WHAT THIS MEANS:

The key findings from this study suggest that there is a positive relationship between vigilance performance and the type of sport the athlete plays, with externally-paced (i.e. unpredictable) sports potentially being the most effective for improving vigilance.

As such, it looks like unpredictable sports such as football are useful for improving vigilance, whilst predictable sports (e.g. running and swimming) have little to no effect. This would essentially suggest that unpredictable sports have a unique ability to develop cognitive skills which may transfer into other sports and essential life skills (e.g. driving a car).

This information could have profound implications for youth sport by ensuring our youths are developing the essential cognitive skills required for later life. Therefore, should we also be considering this important factor alongside bone health, cardiovascular development and the many others?

LIMITATIONS:

There were some key weaknesses to this study:

1. The PVT is only a simple reaction-based so it doesn't account for various reactive stimuli. As such, performance in this test may not carry over particularly well to sporting scenarios or driving a car and may, in fact, just be a measure of reaction.
2. No information was recorded for any non-organised physical activity the children may participate in on a regular basis (e.g. playing tag in the playground everyday).

FUTURE RESEARCH:

This topic has the potential to be profound, considering it may transfer to everyday tasks in which lives are lost due to lack of vigilance (e.g. driving a car). Given this, research should continue to identify which sports and games are best for developing vigilance, and if there are any relationships between vigilance in later life and sports/ games played as a child.

Ballester R, Huertas F, Molina E, Sanabria D, Sport participation and vigilance in children: Influence of different sport expertise, Journal of Sport and Health Science (2017). [Link]

SCIENCE for SPORT

TITLE

MATURATION SELECTION BIAS: DOES THE QUICKEST ALWAYS WIN?

Reference:

McCunn, R, Weston, M, Hill, JKA, Johnston, RD, and Gibson, NV. Influence of physical maturity status on sprinting speed among youth soccer players. J Strength Cond Res 31(7): 1795–1801, 2017. [Link]

OBJECTIVE:

The aim of this study was threefold: 1) to determine the influence of the relative age effect (RAE) on academy selection; 2) to investigate if physical maturity is the causal factor for the RAE; and 3) if sprinting speed is influenced by physical maturity.

WHAT THEY DID:

The annual fitness testing data collected over an 8-year period with a total of 306 Scottish Premiership club academy players (age: 12.5 ± 1.7 years [range: 9.7–16.6 years]; stature: 156.9 ± 12.9 cm; mass: 46.5 ± 12.5 kg) from U11-U17's was analysed using measures of mass, stature, maturity offset and 0–15 m sprint.

WHAT THEY FOUND:

The analytical results demonstrated a clear bias towards the recruitment of players born in quartile 1 (older players) compared with quartile 4 (younger players). With all squads combined (U11-U17's), the RAE was very likely small for maturity offset and stature, and likely small for mass (5.1 kg; 90% CI, 1.7–8.4 kg). The relationship between physical maturity and sprinting speed ranged from trivial for U11's to very likely large for U15's.

In conclusion, the RAE appeared to have an influence on academy selection. Physical maturity appeared to have some impact on academy selection, particularly within the U14-U15 age categories. Lastly, physical maturity appeared to affect sprinting speed, with the greatest influence being observed in the U14-U15 age categories.

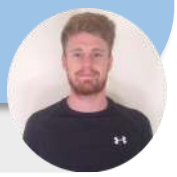
EDITORS COMMENTS:

"This study adds more 'colour to the picture' from last month's Research Alerts issue that RAE impacts talent selection and that physical maturity (i.e., the maturation-bias hypothesis) is the primary reason for this selection bias. But what this study also did, was try to answer what physical qualities are responsible for this maturation selection bias.

The results showed that stature, mass, and sprinting speed all appear to have an impact on selection bias. So if you're older, you're more likely to be taller and heavier, and perhaps also quicker, therefore, you may be more likely to be chosen, particularly at U14 and U15 level.

Although this effect appears to diminish at U17's, what is the impact on overall development (e.g., technical, tactical and physical) of releasing athletes from academy settings at U14's, for example, because they're not 'good enough', when in actual fact it is purely because they're not older, bigger, and faster?

In many environments, talent identification needs logical re-design."



Owen Walker

TITLE

BONE DEVELOPMENT: IS BASKETBALL MORE EFFECTIVE THAN SOCCER?

Reference:

Jallai T, Maasalu K, Kums T, Ereline J, Gapeyeva H, Paasuke M. Comparison of bone mineral density in adolescent male soccer and basketball players. Sport Sci Health. 2017. [Link]

OBJECTIVE:

The objective of this study was to analyse and compare the bone mineral density (BMD) of adolescent male basketball (BB) and soccer (S) players.

WHAT THEY DID:

27 adolescent national youth league level athletes (Basketball = 12 [age: 16.3 ± 0.7 years, stature: 186.8 ± 6.6 cm, body mass: 80.9 ± 11.9 kg]; Soccer = 15 [age: 16.0 ± 0.3 years, stature: 178.5 ± 8.1 cm, body mass: 66.3 ± 6.8 kg) from Estonia participated in this study. All participants had a history of 7.9 ± 2.9 years of training, with training loads of 9.2 ± 1.8 h per week. Body composition and BMD were determined by dual X-ray absorptiometry (DXA).

WHAT THEY FOUND:

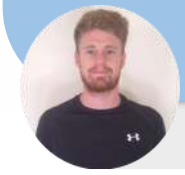
Firstly, it was observed that the basketball players were significantly taller, heavier and had greater lean body mass compared to the soccer players despite no significant difference in age, body fat %, sports participation, and weekly training load.

Secondly, the results also highlighted that basketball players had significantly ($p < 0.05$) greater BMD values in total body, lumbar spine, right arm, left arm, right leg, right femur, right femoral neck, and right femoral shaft compared to soccer players. The biggest between-groups difference ($p < 0.001$) existed in upper extremities (25–28%). Lean body mass was the main determinant for all BMD variables.

EDITORS COMMENTS:

"If you didn't pickup the gist of this study, it basically shows that both basketball and soccer are effective means for accruing bone tissue, with basketball appearing to be the more superior one of the two. However, you should note that this is was only in a small sample size (total 27 athletes).

This information supports previous research which was reviewed in our January 2017 issue (#4). What I believe to be particularly important is ensuring we consider the bone development of our athletes by considering the sport they play. For example, if you have non-impact sport athletes (swimmers, cyclists, rowers etc.), I would strongly suggest you encourage them to play impact-bearing sport to ensure they are accruing sufficient amounts of bone tissue, even if it's just recreationally in their free time. This is particularly important for female athletes who are susceptible to osteoporosis in later life."



Owen Walker

Nutrition

This month's top research on nutrition.

FEATURE

CARBOHYDRATE PERIODIZATION IN ELITE ENDURANCE ATHLETES

Gejl K, Thams L and Hansen M et al. (2017) Medicine & Science in Sports & Exercise, 1.

2

PROTEIN INTAKES: HOW MUCH IS ENOUGH?

Morton R, Murphy K and McKellar S et al. (2017) British Journal of Sports Medicine, bjsports-2017-097608.

3

DIETARY FAT AND CARDIOVASCULAR DISEASE: AN UPDATE

Wang D and Hu F (2016) Dietary Fat and Risk of Cardiovascular Disease: Recent Controversies and Advances. Annual Review of Nutrition, 37(19).

SCIENCE for SPORT

CARBOHYDRATE PERIODIZATION IN ELITE ENDURANCE ATHLETES

OBJECTIVE: To determine the effects of 4 weeks of regular endurance training, supplemented with periodic carbohydrate restriction on endurance performance and metabolic markers in elite endurance athletes. This study follows prior research indicating that periodic restriction of carbohydrate availability during, or following, exercise may result in acute improvements of parameters associated with muscle oxidative capacity, mitochondrial biogenesis and lipid oxidation.

WHAT THEY DID:

Twenty-six male elite endurance athletes (VO2 max > 60ml O2/kg/min) completed 4 weeks of regular endurance training, while randomised into two groups training with, or without, carbohydrate manipulation three days a week. The carbohydrate manipulation days involved a 1hr high intensity bike session in the morning, recovery for 7hrs while consuming isocaloric diets containing either high CHO (414g; 6g/kg body weight) or low CHO (79.5g; 1g/kg body weight), and a 2hr moderate intensity bike session in the afternoon with carbohydrate (1g/kg body weight/hr) or without carbohydrate during.

MEASUREMENTS:

- VO2 max
- Fat oxidation rate
- Power output during a 30min time trial
- Muscle biopsies (muscle glycogen and enzyme activity)

WHAT THEY FOUND:

- Changes in VO2 max, endurance performance, resting glycogen levels and mitochondrial adaptations were similar regardless of carbohydrate availability.
- VO2 max was increased by 5 and 6% in the low- and high-carbohydrate groups, respectively, with no difference between the groups.
- Mean power output during the 30-min time trial including carbohydrate provision increased by 6 and 5% in the low- and high-carbohydrate group, with no difference between the groups.
- Finally, respiratory exchange ratio values were identical within and between the groups in all 30-min time trials.

WHAT THIS MEANS:

Periodic carbohydrate restriction during 4 weeks of routine endurance training in highly trained endurance athletes does not lead to superior training effects compared to the same training with a carbohydrate enriched diet. The lack of group differences could be explained by the relatively modest glycogen depletion in the low group after the carbohydrate manipulation. Furthermore, due to their high volumes of training, elite endurance athletes often unintentionally train in a glycogen depleted state anyway when doing twice a day training, so it is unlikely that the level of carbohydrate restriction imposed in this study would impact performance. Finally, while this study shows that carbohydrate periodisation does not enhance performance, an alternative way to look at this study is that carbohydrate restriction does not impair performance either.

LIMITATIONS:

- Short study duration of only 4 weeks – differences in effects on performance may be revealed after longer time frames
- Findings are confined to male participants

FUTURE RESEARCH:

Only a few studies have examined low carbohydrate availability strategies in highly-trained endurance athletes. Therefore, to construct future recommendations, there is a need for further research of the performance effects induced by periodic carbohydrate restriction, especially over longer time frames and in female participants. Furthermore, future studies in elite athletes should investigate even longer performance tests, to clarify how long these athletes can exercise before carbohydrate availability limits performance, and if low carbohydrate availability is beneficial during competitive events where glycogen availability becomes more markedly reduced.

Gejl K, Thams L and Hansen M et al. (2017) No Superior Adaptations to Carbohydrate Periodization in Elite Endurance Athletes. Medicine & Science in Sports & Exercise, 1. [Link]

SCIENCE for SPORT

TITLE

PROTEIN INTAKES: HOW MUCH IS ENOUGH?

OBJECTIVE:

To determine if dietary protein supplementation augments resistance exercise training-induced gains in muscle mass and strength. Additionally, to answer the question - is there a protein intake beyond which protein supplementation ceases to provide a measurable benefit in increasing muscle mass during resistance training?

WHAT THEY DID:

The authors performed a systematic review, meta-analysis and meta-regression of all available data from studies on this topic published up until January 2017. They conducted a systematic search of Medline, Embase, CINAHL and SportDiscus for such studies, and included only randomised controlled trials with resistance training ≥ 6weeks in duration.

WHAT THEY FOUND:

Dietary protein supplementation significantly increased changes in: strength—one-repetition-maximum (2.49 kg), FFM (0.30 kg) and muscle fibre cross-sectional area during periods of prolonged resistance training. The impact of protein supplementation on gains in fat free mass was reduced with increasing age and was more effective in resistance-trained individuals. Protein supplementation beyond total protein intakes of 1.62 g/kg/day resulted in no further resistance training-induced gains in fat free mass. Finally, the type of supplemented protein (e.g. whey, casein, soy) did not appear to influence results.

Reference:

Morton R, Murphy K and McKellar S et al. (2017) A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training -induced gains in muscle mass and strength in healthy adults. British Journal of Sports Medicine, bjsports-2017-097608. [Link]

EDITORS COMMENTS:

"This review is important as there have been conflicting results on the efficacy of protein supplementation in previous reviews, likely due to the use of divergent inclusion criteria. This more comprehensive review shows that beyond 1.6g/kg/day, additional protein does not provide any further benefit.

However, the 95% confidence interval (in other words, to be 95% certain) spanned from 1.0 to 2.2g protein/kg/day, so if maximal muscle hypertrophy is the goal, you may want to consume up to 2.2 g/kg/day to be safe. An important takeaway from this study is that protein shakes are not likely to enhance your muscle or strength gains if you consume adequate protein from your diet."

Tim Rowland

TITLE

DIETARY FAT AND CARDIOVASCULAR DISEASE: AN UPDATE

OBJECTIVE:

To summarise current evidence on the relation of dietary fatty acids to cardiovascular disease (CVD) risk and review some recent controversies and advances in knowledge in this area.

WHAT THEY DID:

The authors reviewed the available evidence on the effects of various types of fatty acids, especially saturated fatty acid, on risk of cardiovascular disease (CVD). The authors also examined the impact of replacing saturated fat with other types of fat and with carbohydrate on CVD risk, as well as the relationship between total amount of fat intake and CVD risk.

WHAT THEY FOUND:

There is compelling evidence that different types of dietary fatty acid have divergent effects on CVD risk, and that the type of fat is more important than the total amount of fat consumed. Firstly, the evidence suggests that a significant reduction in CVD risk is achieved when saturated fat intake is replaced by monounsaturated and polyunsaturated fat (PUFA) intake. Although higher intake of trans fats from hydrogenated vegetable oils has adverse effects on CVD risk, the effects of trans fats from ruminant fat (mammals such as cattle) remain inconsistent. Abundant evidence supports the benefits of both n-6 and n-3 PUFA, and epidemiologic studies have found little relationship between dietary n-6:n- 3 ratio and CVD endpoints or between plasma n-6:n-3 ratio and CVD risk factors.

Reference:

Wang D and Hu F (2016) Dietary Fat and Risk of Cardiovascular Disease: Recent Controversies and Advances. Annual Review of Nutrition, 37 (19). [Link]

EDITORS COMMENTS:

"Due to the presence of numerous conflicting studies, controversies exist on the effects of various types of fatty acids, especially saturated fat, on cardiovascular disease (CVD). This has caused widespread confusion in the biomedical community and the general public about the importance of types of dietary fat for prevention of CVD. Therefore, reviews like this one are crucial, to synthesise the evidence and make recommendations based on the totality of the evidence, and not off just one study.

This review suggests that dietary advice should put emphasis on optimising types of dietary fat and not reducing total fat. Specifically, current evidence supports recommendations of consuming less than 10% of calories from saturated fat and replacing saturated fat with unsaturated fatty acids. Following these recommendations has a significant potential to reduce the risk of CVD."

Tim Rowland

Team Sports

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

FEATURE

RUNNING INTENSITIES: HAVE WE BEEN UNDERESTIMATING THEM ALL ALONG?

Delaney JA, Thornton HR, Burgess DJ, Dascombe BJ, Duthie GM. J Sci Med Sport (2017).

2

THE ACUTE:CHRONIC WORKLOAD RATIO IN RELATION TO INJURY RISK IN PROFESSIONAL SOCCER

Malone, S; Owen, A; Newton, M; Mendes, B; Collins, K; Gabbett, T. Journal of Science and Medicine in Sport. 20: 2017. 561-565.

3

WHAT DETERMINES SCRUM SUCCESS?

Green, A, Dafkin, C, Kerr, S, & McKinon, W. (2017). European Journal of Sport Science: Epub

4

ARE LINEMEN MORE SUSCEPTIBLE TO STRESS, ILLNESS, AND INJURY?

Flatt AA, Esco MR, Allen JR, Robinson JB, Bragg A, Keith CM. The University of Alabama. Kinesiology. 2017.

5

HAMSTRING INJURY RISK FACTORS IN PROFESSIONAL CRICKET

Orchard, J. W., Kountouris, A., & Sims, K. (2017) Journal of Sport and Health Science.

SCIENCE for SPORT

RUNNING INTENSITIES: HAVE WE BEEN UNDERESTIMATING THEM ALL ALONG?

OBJECTIVE: The aim of this study was to accurately determine the running demands of Australian Football (AF) by accounting for duration-specific intensities.

WHAT THEY DID:

40 professional male AF players (age: 24 ± 3 year) were observed using time-motion analysis over the 2014-15 season (total 30 games). Player movements were collected and peak values were calculated for moving averages of between 1–10 min in duration. A mixed-model analysis was used to detect positional differences, and differences were described using a magnitude-based network.

MEASUREMENTS:

- Peak relative distances ($m \cdot min^{-1}$)
- Peak high-speed (>5.5 $m \cdot s^{-1}$)
- Peak average acceleration/deceleration ($m \cdot s^{-2}$)
- Peak average metabolic power ($W \cdot kg^{-1}$)

WHAT THEY FOUND:

- All the duration-specific running intensities increased significantly as the time window decreased (from 10-mins towards 1-min).
- For relative distance, intensities increased by 147% to as much as 157% (203 ± 15 $m \cdot min^{-1}$) for 1-min time windows.
- For peak high-speed running (>5.5 m·s−*1*), intensities increased by 367% to as much as 538% (110 ± 45) for 1-min time windows.
- For peak average acceleration/deceleration ($m \cdot s^{-2}$), intensities increased by 141% to as much as 166% (20.8 ± 3.6) for 1-min time windows.
- Relative distance was likely greater for midfielders (MID), and mobile forwards (MF) compared to tall backs (TB) across all moving average durations, with MF peaking at 223 ± 35 $m \cdot min^{-1}$ for a 1-min window.
- High-speed relative distance was at least likely to be greater for MF compared to all other positions, across all moving average durations (ES = 0.27–0.94).
- Acceleration/deceleration demands were similar across positions.

WHAT THIS MEANS:

The results from this study demonstrate that peak running intensities in AF are much higher than previously reported, and therefore, believed by many practitioners. There is no significant acceleration/deceleration demands between positions, however, it is acknowledged that the reliability of this metric is questionable.

The data from this study should guide coaches in there practice design in order to ensure their athletes are training to meet the peak intensities of match-play.

LIMITATIONS:

- The type of the acceleration/deceleration algorithm used.
- The data has only been collected on one team which is likely to have a different playing style than other competitors in the same league.

FUTURE RESEARCH:

Future research should replicate this study in various other contact-based team sports such as football (soccer). It should also conduct a similar methodology using radio frequency identification systems in order to account for the accuracy issues associated with GPS units.

Delaney JA, Thornton HR, Burgess DJ, Dascombe BJ, Duthie GM. Duration-specific running intensities of Australian Football match-play. J Sci Med Sport (2017). [Link]

SCIENCE for SPORT

TITLE

THE ACUTE:CHRONIC WORKLOAD RATIO IN RELATION TO INJURY RISK IN PROFESSIONAL SOCCER

OBJECTIVE:

To examine the association between combined sRPE measures and injury risk in elite professional soccer.

WHAT THEY DID:

Forty-eight professional soccer players from two elite European teams were involved within a one season study. Rolling weekly sums and week-to-week changes in workload were measured, allowing for the calculation of the acute:chronic workload ratio, which was calculated by dividing the acute (1-weekly) and chronic (4-weekly) workloads. All derived workload measures were modelled against injury data using logistic regression.

WHAT THEY FOUND:

An acute:chronic workload of between 1.00 and 1.25 is protective for professional soccer players. A higher intermittent-aerobic capacity appears to offer greater injury protection when players are exposed to rapid changes in workload in elite soccer players. Moderate workloads, coupled with moderate-low to moderate-high acute:chronic workload ratios, appear to be protective for professional soccer players.

Reference:

Malone, S; Owen, A; Newton, M; Mendes, B; Collins, K; Gabbett, T. The actue:chronic workload ratio in relation to injury risk in professional soccer. Journal of Science and Medicine in Sport. 20: 2017. 561-565. [Link]

EDITORS COMMENTS:

"The current study is the first to investigate the association between training and game loads and injury risk in elite soccer. These results highlight the importance of a periodised schedule, avoiding large spikes in workloads, with individuals aiming to be between 1.00 and 1.25 for their ACWR. Previous to this, practitioners only had data from other sports where an ACWR of between 0.8 and 1.3 appeared to be the 'sweet spot'.

I personally feel the ACWR alongside the absolute chronic and acute totals, provide an efficient way for the athletic performance coach to gain a quick overview into the training programme for the entire squad. More research, however, is needed into the most appropriate acute and chronic durations, whether certain parameters are associated with particular injuries, and do these have different 'sweet spots'? Finally, it is my opinion that further collaborations between elite teams, such as that in the current study, would be a welcome addition to scientific research."

Liam Mason

TITLE

WHAT DETERMINES SCRUM SUCCESS?

OBJECTIVE:

To determine whether combined individual kinetics and the factors associated with scrummaging performance (mass, strength, etc) can discriminate between winning and losing scrummaging performances.

WHAT THEY DID:

16 male rugby forwards from local amateur clubs were recruited and tested for squat jump (bodyweight), body mass, maximal compression force, force centre of pressure positions, and movements on an individual player scrum ergometer with load cells. The players were divided into 2 scrummaging teams and scrummed against each other with 10 different variations of teams.

WHAT THEY FOUND:

Winning scrum packs had a significantly larger sum of compression forces, less movement of centre of pressure upon engagement, and a larger sum of squat jump heights. Greater horizontal movement was seen in individuals of the winning scrums with less vertical movement. However, there was no significant difference in body mass between winning and losing scrums.

Reference:

Green, A, Dafkin, C, Kerr, S, & McKinon, W. (2017). Combined individual scrummaging kinetics and muscular power predict competitive team scrum success. European Journal of Sport Science: Epub [Link]

EDITORS COMMENTS:

"It is interesting to note successful scrummaging is not reliant on body mass. While body mass may be important for forcing opponents to overcome a greater mass, larger fat mass does not actively contribute to strength and power.

Hence, developing high levels of horizontal force in specific body positions (video below), high levels of lower body power (e.g. various jumps, Olympic lifts, throws) along with improving the technical aspect of scrummaging will contribute to greater scrummaging success. (Example video—Click **HERE**).

The example exercise can be performed with a maximal isometric contraction for 3-6sec supersetted with 2-5 banded scrum hits."

James de Lacey

TITLE

ARE LINEMEN MORE SUSCEPTIBLE TO STRESS, ILLNESS, AND INJURY?

OBJECTIVE:

The purpose of this study was to monitor the cardiac-autonomic activity (via heart rate variability) of elite college football players during the 2016 preparatory and competitive periods.

WHAT THEY DID:

17 elite college male football players (SKILLED = 10 and LINEMEN = 7) had their heart rate variability (lnRMSSD) measured using a standardised 1-minute recording via a mobile device during the preparatory and competitive period. During the preparatory period, lnRMSSD was recorded almost daily for 4-weeks. During the competitive period, lnRMSSD was recorded approximately 3 days per week for the entire period.

WHAT THEY FOUND:

For SKILLED, there was no significant differences in lnRMSSD across time. However, for LINEMEN, there was a significant reduction in lnRMSSD during week 11 in comparisons to baselines values and those recorded from weeks 1-5 ($p < 0.05$). In addition, LINEMEN also demonstrated large inter-individual differences in lnRMSSD alongside illness, minor soft-tissue injury, difficulty maintaining body mass and high perceptions of fatigue. These reductions coincided with mid-term exams and when playing competitive nationally-ranked opponents.

Reference:

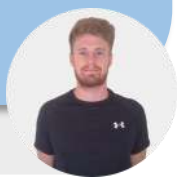
Flatt AA, Esco MR, Allen JR, Robinson JB, Bragg A, Keith CM. Heart rate variability monitoring in elite college football players throughout the preparatory and competitive season. The University of Alabama. Kinesiology. 2017. [Link]

EDITORS COMMENTS:

"In summary, this study shows that linemen may be more susceptible to stress and fatigue accumulation than other players during more demanding periods of the competitive season (e.g. exams and playing difficult opponents).

These stressful periods experienced by linemen, which appear to have little effect on other players, may potentially be due to the lower aerobic fitness, larger body masses, greater reliance on anaerobic-glycolytic metabolism, and disturbed fluid balance of the players.

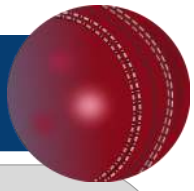
However, it is important to note that this study used a very small sample size and, therefore, results may not apply 'across the board'."



Owen Walker

TITLE

HAMSTRING INJURY RISK FACTORS IN PROFESSIONAL CRICKET



OBJECTIVE:

The purpose of this study was to assess the risk factors for sustaining hamstring injuries in Australian male professional cricket players.

WHAT THEY DID:

Data from the Cricket Australia injury surveillance database between the 1995-96 and 2014-15 season was used to investigate the incidence of hamstring injuries for professional Australian male cricket players. A hamstring injury was defined by a clinical diagnosis made by a state or national medical team personnel. Comparisons between various playing roles (i.e. batsmen, fast bowlers, spin bowlers) and match formats (i.e. Twenty20, one-day and multi-day match) were investigated. A multivariate logistic regression analysis was also performed to determine potential risk factors for hamstring injuries among professional cricket players.

WHAT THEY FOUND:

Overall, match hamstring injury incidence was 22.5 injuries per 1000 team days. One-day cricket had the highest hamstring injury incidence, followed by Twenty20 and then the multi-day match formats. The risk associated with one-day cricket is likely due to the combination of high intensity over a long duration. Fast bowling had the highest incidence of hamstring injury in the multi-day match format, while batting and fielding were the highest during in Twenty20 cricket. Not surprisingly, a previous history of hamstring injuries was a key determinant of future hamstring injuries. Interestingly matches being played in Australia also led to a higher risk of hamstring injuries.

Reference:

Orchard, J. W., Kountouris, A., & Sims, K. (2017). Risk factors for hamstring injuries in Australian male professional cricket players. Journal of Sport and Health Science. [Link]

EDITORS COMMENTS:

"This study provides valuable quantitative data regarding the incidence of hamstring injuries of professional male cricket players in Australia over a 20 year period. Not surprisingly, previous incidence of hamstring injury is a key risk factor for future hamstring injuries.

Consequently, strength and conditioning coaches should ensure appropriate hamstring strength to decrease the risk of injury. This should be achieved via known best practices, such as adopting a holistic approach which would include targeting eccentric hamstring strength over the hip and knee with such exercises as Romanian deadlifts and Nordic hamstring curls. "

Sam Callaghan

Editors

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

STRENGTH & CONDITIONING

TECHNOLOGY & MONITORING

FATIGUE & RECOVERY

YOUTHS

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.

NUTRITION

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.

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.

RUGBY

James de Lacey MSc

James is currently the Head Strength & Conditioning Coach with Austin Huns Rugby. He has previously worked in professional rugby in Romania and with the NZ Women's National Rugby League Team. He is a published author and has completed a MSc in Sport & Exercise Science from AUT, Auckland, NZ.

CRICKET

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.

SCIENCE for SPORT