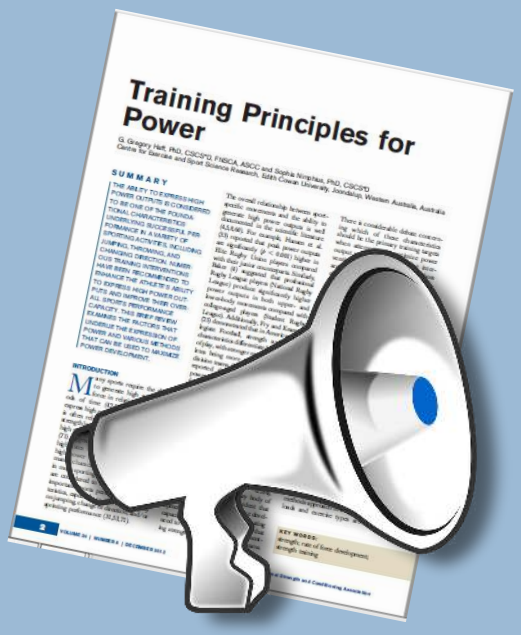
Research Alerts

JANUARY EDITION: ISSUE #4

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

(click a heading to jump straight to the topic)



SCIENCE for SPORT

Foreword

An introductory word from the chief editor.

Issue #4 - January 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. February 2017 issue will be published on the 28th February 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

THE EFFECT OF STRENGTH TRAINING ON PERFORMANCE INDICATORS IN DISTANCE RUNNERS

Beattie, K, Carson, BP, Lyons, M, Rossiter, A, and Kenny, IC. J Strength Cond Res 31(1): 9–23, 2017.

2

EFFECTS OF A STRENGTH TRAINING SESSION AFTER AN EXERCISE INDUCING MUSCLE DAMAGE ON RECOVERY KINETICS

Abaidia, A-E, Delecroix, B, Leduc, C, Lamblin, J, McCall, A, Baquet, G, and Dupont, G. J Strength Cond Res 31(1): 115–125, 2017.

3

COMPARISON OF OLYMPIC AND HEXAGONAL BARBELLS WITH MIDTHIGH PULL, DEADLIFT, AND COUNTERMOVEMENT JUMP

Malyszek, KK, Harmon, RA, Dunnick, DD, Costa, PB, Coburn, JW, and Brown, LE. J Strength Cond Res 31(1): 140–145, 2017.

SCIENCE for SPORT

THE EFFECT OF STRENGTH TRAINING ON PERFORMANCE INDICATORS IN DISTANCE RUNNERS

OBJECTIVE: The objective of this study was to investigate the effect of a long-term (40-week) strength training intervention on strength (maximal and reactive strength), velocity at V02max (vV02max), running economy and body composition (body mass, body fat, and lean mass) in competitive distance runners (1,500–10,000 m).

WHAT THEY DID:

Twenty competitive distance runners were divided into two groups: intervention group (n = 11) and a control group (n = 9). Performance testing was conducted during week 0, 20 and 40, with each participant required to complete three assessments: physiological, strength and body composition. The intervention including a variety of plyometrics (e.g. Drop Jumps [DJ]) and strength training exercises (e.g. squats, lunges and RDLs).

MEASUREMENTS:

- v2 mmol·L-1 BLa [blood lactate]
- v4 mmol·L-1 BLa
- Running economy
- V02max
- vV02max
- 1RM back squat
- Countermovement jump (CMJ)
- DJ at 0.3m
- Body mass
- Fat mass
- Overall lean mass
- Lean leg mass

WHAT THEY FOUND:

- Strength training significantly improved maximal and reactive strength qualities, running economy and vV02max at weeks 20 ($p < 0.05$) and 40 ($p < 0.05$).
- The control group showed no significant changes in any performance measures at either time point (week 20 or 40).
- There were no significant changes in body composition variables between- or within-groups.

WHAT THIS MEANS:

This study found that 40 weeks of strength training can significantly improve maximal and reactive strength qualities, running economy and vV02max in competitive distance runners. It also found that these performance improvements are associated with no concomitant increase in muscular hypertrophy – a continuous concern within the distance running community as it is often believed to induce decrements in performance (e.g. V02max and running economy).

Overall, it appears that long-term strength training is an effective method for improving strength qualities, running economy and vV02max in running athletes.

LIMITATIONS:

Firstly, the participants were not randomly allocated into the two groups, nor was there any concealed allocation, which for anyone with a bit of knowledge on this topic knows that this is a big no goer. This is because the researchers may have fixed the group to get the results they wanted—but of course we don't know. The authors also did not control for the participants endurance training (volume or intensity) or their daily nutrition.

FUTURE RESEARCH:

Minus some fairly important methodological problems, overall the concept and execution of this study was good. Therefore, future research should aim to replicate this study but instead correct for the fundamental issues.

Beattie, K, Carson, BP, Lyons, M, Rossiter, A, and Kenny, IC. The effect of strength training on performance indicators in distance runners. J Strength Cond Res 31(1): 9–23, 2017. [Link]

ARTICLE TITLE

EFFECTS OF A STRENGTH TRAINING SESSION AFTER AN EXERCISE INDUCING MUSCLE DAMAGE ON RECOVERY KINETICS

OBJECTIVE:

The purpose of this study was to investigate the effects of an upper-limb strength training session the day after an exercise inducing muscle damage on recovery of performance.

WHAT THEY DID:

In a randomised crossover design, twelve physically active men (age 29.2 ± 5.5 years) completed an exercise inducing muscle damage routine consisting of: 5 sets of 15 eccentric contractions of the knee flexors exercise (dominant leg on one occasion/ condition and the non-dominant leg in the other occasion/condition). In a crossover design, participants then completed either active recovery (upper-body strength session) or passive rest (seated for 15 minutes). Creatine kinase, hamstring strength, and muscle soreness were assessed immediately and 20, 24, and 48 hours after exercise-induced muscle damage.

WHAT THEY FOUND:

The active recovery method (upper-body strength session) appeared to accelerate the recovery of slow concentric force (effect size = 0.65; 90% CI = 20.06 to 1.32). Apart from this, neither of the recovery protocols (active or passive) had any effect on the other recovery kinetics. The authors suggest that an upper-body strength session the day after competition does not negatively affect recovery, and therefore may be programmed the day after a match or competition.

Reference:

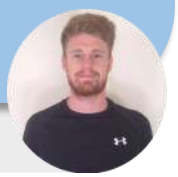
Abaidia, A-E, Delecroix, B, Leduc, C, Lamblin, J, McCall, A, Baquet, G, and Dupont, G. Effects of a strength training session after an exercise inducing muscle damage on recovery kinetics. J Strength Cond Res 31(1): 115–125, 2017. [Link]

EDITORS COMMENTS:

"Given the time-constraints of elite sport, the results from this study may be extremely valuable.

However, whilst this may be promising, I'm not convinced 5 sets of 15 eccentric reps used in this study accurately reflect the fatigue accumulated during a competition or match. Fatigue and soreness can also be present for >48hrs post-exercise, yet this study only measured these markers until this point.

Regardless, current evidence appears to suggest that predominantly lower-limb sport athletes' can train upper-body the day after competition with little, to no, negative consequences, and perhaps even positive ones.



Owen Walker

ARTICLE TITLE

COMPARISON OF OLYMPIC AND HEXAGONAL BARBELLS WITH MIDTHIGH PULL, DEADLIFT, AND COUNTERMOVEMENT JUMP

OBJECTIVE:

The purpose of this study was twofold: 1) compare how the isometric mid-thigh pull (iMTP) and isometric DL (iDL) peak forces and joint angles differ between using the Olympic bar (OBar) and the Hexagonal bar (HBar); and 2) determine which of these exercises and bars have the strongest relationship, if any, to dynamic performance (countermovement jump: CMJ).

WHAT THEY DID:

20 resistance-trained men (age: 24.05 ± 2.09 years) performed the iMTP and the iDL (at the bottom position) using both bars and a CMJ. Peak force, rate of force development and joint angles were recorded for all pulls, whilst jump height, joint angles and impulse were measured in the bottom position of the CMJ.

WHAT THEY FOUND:

IMTP peak force and rate of force development was not significantly different between the two bars, though the hip and ankle angles were. Correlations were found between the iDL peak force and the CMJ with the OBar (r = 0.85) and HBar (r = 0.84), and the authors suggest that this was due to the joint angle similarities between the two movements.

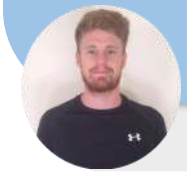
Reference:

Malyszek, KK, Harmon, RA, Dunnick, DD, Costa, PB, Coburn, JW, and Brown, LE. Comparison of olympic and hexagonal barbells with midthigh pull, deadlift, and countermovement jump. J Strength Cond Res 31(1): 140–145, 2017. [Link]

EDITORS COMMENTS:

"I believe the key take home messages from this study are that there were no force differences between the bars for either exercise, but the HBar allowed for more extended and upright joint angles.

As a result, when working with relatively unexperienced athletes/clients, or those with poorer mobility, perhaps the HBar is more appropriate as it doesn't require such a deep and horizontal body position. This suggests that the HBar is potentially less demanding technically, and more comfortable to perform."



Owen Walker

Technology & Monitoring

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

FEATURE

TRADITIONAL VS. SPORT-SPECIFIC VERTICAL JUMP TESTS: RELIABILITY, VALIDITY, AND RELATIONSHIP WITH THE LEGS STRENGTH AND SPRINT PERFORMANCE IN ADULT AND TEEN SOCCER AND BASKETBALL PLAYERS

Rodrıguez-Rosell, D, Mora-Custodio, R, Franco-Marquez, F, Yanez-Garcıa, JM, Gonzalez-Badillo, JJ. J Strength Cond Res 31 (1): 196–206, 2017.

2

ELECTROMYOGRAPHIC ACTIVITY IN SUPERFICIAL MUSCLES OF THE THIGH AND HIP DURING THE BACK SQUAT TO THREE DIFFERENT DEPTHS WITH RELATIVE LOADING

Hammond B, Marques-Bruna P, Chauhan E, Bridge C. Journal of Fitness Research Volume 5.3.

3

EFFECTIVENESS OF AN INDIVIDUALIZED TRAINING BASED ON FORCE-VELOCITY PROFILING DURING JUMPING

Jiménez-Reyes P, Samozino P, Brughelli M and Morin J-B. (2017) Front. Physiol. 7:677.

SCIENCE for SPORT

TRADITIONAL VS. SPORT-SPECIFIC VERTICAL JUMP TESTS: RELIABILITY, VALIDITY, AND RELATIONSHIP WITH THE LEGS STRENGTH AND SPRINT PERFORMANCE IN ADULT AND TEEN SOCCER AND BASKETBALL PLAYERS

OBJECTIVE: The aim of this study was to analyse the reliability and validity of 4 different vertical jump tests (2 standing jump tests and 2 sport-specific jump tests), and their usefulness as predictors of sprint and strength performance for soccer and basketball players.

WHAT THEY DID:

127 soccer and 59 basketball players from 3 different age categories (Under-15, Under-18 and Adults) participated in this study. Two standardized (countermovement jump [CMJ] and Abalakov jump [AJ]) and two sport-specific (run-up with 2 [2-LEGS] or 1 leg [1-LEG] take-off jump) jump tests were analysed. Three attempts for each of the 4 jump tests were recorded.

MEASUREMENTS

- 0-10m sprint
- 10-20m sprint
- 0-20m sprint
- Estimated 1RM back squat

WHAT THEY FOUND:

- All 4 jump tests showed high absolute and relative reliability, regardless of age or sport (ICC = 0.969–0.995; CV = 1.54– 4.82%).
- The 1-LEG sport-specific jump test had the lowest absolute and relative reliability, whilst the CMJ and AJ were the most reliable tests.
- All jump tests were significantly and positively correlated to each other (r = 0.580–0.983), with the CMJ, AJ and 2-LEG test demonstrating the strongest relationships in both soccer and basketball players.
- All jump tests showed significant correlations with sprint and strength performance, except the relationship between 1-LEG and sprint times in adult soccer players.
- The 2-LEG jump test was the best predictor of sprint and strength performance in both adult soccer and basketball players, whilst the 1-LEG test had the lowest associations.
- Overall, the results suggest that the CMJ and AJ, respectively, are the most reliable tests for measuring explosive force in soccer and basketball players in all age categories (U-15, U-18 and Adults).

WHAT THIS MEANS:

All jump tests demonstrate sufficient reliability for assessing the jump capacity of soccer and basketball players from various age groups. As all tests measure the same physical quality (jump capacity), it is recommended that only 1 of these tests is included in the fitness testing battery. Therefore, practitioners should choose the most reliable test for assessment purposes—that test being the CMJ.

LIMITATIONS:

There were two primary limitations to this study: 1) there was no randomised cross-over design with regards to the jump test procedure—all participants completed the same jumps in the same order; and 2) the authors only measured the within-day reliability of the tests and did not assess its between-day reliability. Not knowing the between-day reliability means it is uncertain if the same results are possible when the tests are performed on another day—which causes a bit of an issue if a coach wants to test their athletes on another day and compare it to the last.

FUTURE RESEARCH:

Future research should replicate this study but also do the following: 1) adopt a randomized crossover design; and 2) measure the between-day reliability of the tests as well as the within-day reliability.

Rodrıguez-Rosell, D, Mora-Custodio, R, Franco-Marquez, F, Yanez-Garcıa, JM, Gonzalez-Badillo, JJ. Traditional vs. sport-specific vertical jump tests: reliability, validity, and relationship with the legs strength and sprint performance in adult and teen soccer and basketball players. J Strength Cond Res 31 (1): 196–206, 2017. [Link]

SCIENCE for SPORT

ARTICLE TITLE

ELECTROMYOGRAPHIC ACTIVITY IN SUPERFICIAL MUSCLES OF THE THIGH AND HIP DURING THE BACK SQUAT TO THREE DIFFERENT DEPTHS WITH RELATIVE LOADING

Reference:

Hammond B, Marques-Bruna P, Chauhan E, Bridge C. Electromyographic activity in superficial muscles of the thigh and hip during the back squat to three different depths with relative loading. Journal of Fitness Research Volume 5.3. [Link]

OBJECTIVE:

The aim of this study was to determine the muscle activity of the quadriceps, hamstrings and the glutes at different depths of the back squat using a relative load for each depth (partial, parallel and full depth).

WHAT THEY DID:

8 resistance trained males (age: 21 ± 1 years) performed back squats to various depths (partial, parallel and full depth) using a depth-relative 5RM load in a randomized counter -balanced design. Surface electromyography (EMG) was used to determine the muscle activity of the Vastus Medialis Oblique (VMO), Vastus Lateralis (VL), Gluteus Maximus (GM), and Biceps Femoris (BF) during the concentric and eccentric phases of the squats. Peak (Peak EMG), mean (Mean EMG), and integrated (iEMG) EMG were normalised to their respective maximum voluntary isometric contraction (MVIC) for each muscle.

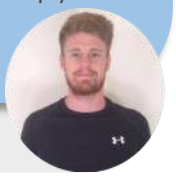
WHAT THEY FOUND:

The results suggest that squatting to the parallel position, or lower, optimises the activity of the quadriceps. It also suggests that squatting to a parallel depth maximises the muscle activity of the GM. The authors suggest that the increase GM activity during the parallel squat may be related to a more advantageous external moment arm, and/or a reduction in neural drive due to relative muscular effort.

EDITORS COMMENTS:

"Overall the methodology of this study is pretty robust, meaning the results can be consumed with a degree of confidence.

I'm pleased to see the researchers used relative 5RM loads for each squat depth, as this has been an issue with previous studies. This study may therefore suggest that you should increase squat depth to increase quad activity, and go to parallel for optimal glute activity. Having said this, higher EMG activity does NOT imply higher motor unit recruitment."



Owen Walker

ARTICLE TITLE

EFFECTIVENESS OF AN INDIVIDUALIZED TRAINING BASED ON FORCE-VELOCITY PROFILING DURING JUMPING

Reference:

Jiménez-Reyes P, Samozino P, Brughelli M and Morin J-B. (2017) Effectiveness of an Individualized Training Based on Force-Velocity Profiling during Jumping. Front. Physiol. 7:677. [Link]

OBJECTIVE:

The aim of this study was to determine if an "optimised" training programme based upon each athletes individual force-velocity (F-V) profile would lead to superior improvements in jump performance when compared to a "traditional", non-optimised programme.

WHAT THEY DID:

84 semi-professional soccer and rugby players (age: 23.1 ± 4.4 years) with 1-3+ strength training experience were separated into three distinct groups: optimised, non-optimised and a control. The "optimised" group was sub-divided into categories based upon each participants F-V imbalance (F-Vimb): force deficit, velocity deficit and well-balanced. The optimised group then underwent a specific 9-week training programme designed to reduce the F-Vimb, whilst the non-optimised group followed a traditional programme with no individualisation.

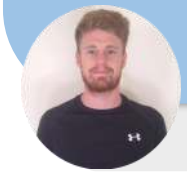
WHAT THEY FOUND:

All participants in the optimised training group significantly decreased the F-Vimb and improved jump performance without an increase in peak power, whereas the results were much more varied and uncertain within the non-optimised group. The authors concluded that a training programme based on individual F-V profiles is more effective for improving jump performance than a traditional approach. Lastly, they also reported that decreasing the F-Vimb without increasing peak power output also leads to positive increases in jump performance.

EDITORS COMMENTS:

"Firstly, I'd like to say that referring to the non-optimised group as "traditional/classic" is unfair, as traditional training is more often than not still individualised, though maybe not to the same detail as F-V profiling—so perhaps the performance improvements between these two methods are over-exaggerated.

F-V profiling does present an interesting and exciting avenue for performance optimisation, but it doesn't come without its complications. Apps such as the *MySprint* and *MyJump* have improved the practicality of this training method, but it does require some amount of education and upskilling before you can implement it. To add to this, coaches should be more concerned about improving the fundamentals of their training programme (movement quality, training frequency, adherence, periodisation etc) before attempting to utilise this technology and others alike (e.g. velocity-based training)."



Owen Walker

Fatigue & Recovery

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

FEATURE

AQUA CYCLING DOES NOT AFFECT RECOVERY OF PERFORMANCE, DAMAGE MARKERS, AND SENSATION OF PAIN

Wahl, P, Sanno, M, Ellenberg, K, Frick, H, Bohm, E, Haiduck, B, Goldmann, J-P, Achtzehn, S, Bruggemann, G-P, Mester, J, and Bloch, W. J Strength Cond Res 31(1): 162–170, 2017.

2

THE EFFECT OF DIFFERENT FOAM ROLLING VOLUMES ON KNEE EXTENSION FATIGUE

Monteiro ER and Neto VGC. (2016) International Journal of Sports Physical Therapy. 2016 Dec; 11(7): 1076–1081.

3

INFLUENCE OF COLD-WATER IMMERSION ON LIMB BLOOD FLOW AFTER RESISTANCE EXERCISE

Mawhinney C, Jones H, Low DA, Green DJ, Howatson G & Gregson W. (2017) European Journal of Sport Science.

SCIENCE for SPORT

AQUA CYCLING DOES NOT AFFECT RECOVERY OF PERFORMANCE, DAMAGE MARKERS, AND SENSATION OF PAIN

OBJECTIVE: The purpose of this study was to investigate the effects of active recovery (aqua cycling) versus passive recovery on strength, markers of muscle damage, muscle soreness, and the persons perceived physical state (PEPS) after exercise.

WHAT THEY DID:

Twenty healthy male sport students (age: 24.4 ± 2.2 years) were randomly assigned to either the active recovery (AR) or the passive rest condition (P) after the completion of 300 countermovement jumps (CMJs). The AR protocol consisted of aqua cycling at chest depth and with a cadence of 65-75 rpm, whilst the passive condition consisted of lying supine; each protocol lasted 30-minutes. The performance of leg extensor muscles, damage markers, the PEPS, and DOMS were measured before, after exercise, after the recovery session, and at 72hrs post-exercise.

MEASUREMENTS:

- Maximal isometric voluntary contraction and dynamic fatigue
- Creatine kinase (CK)
- Lactate dehydrogenase (LDH)
- Myoglobin
- Lactate
- Heart rate
- Persons perceived physical state (PEPS)
- Delayed onset of muscle soreness (DOMS)

WHAT THEY FOUND:

- Maximal isometric and submaximal dynamic strength showed significant decreased in the P group by 21%, and in the AR group by 39%; however, these were not statistically different.
- CK, LDH and myoglobin all significantly increased over time, with no significant between group differences.
- PEPS showed significant decreases, and DOMS showed significant increases in both groups, but again, no significant between group differences were observed.
- Overall, no significant differences were found between both groups for any of the measured parameters.

WHAT THIS MEANS:

The findings from this study suggest that 30-minutes of post-exercise aqua cycling is not an effective method for reducing the negative effects of intense exercise on muscular performance, markers of muscle damage, DOMS, or the PEPS compared with passive rest. It also highlights that many of these performance markers (PEPS, CK, LDH and myoglobin) still remain affected up to 72-hours post-exercise, suggesting that perhaps 96-hours is needed to observe these markers return to baseline values.

LIMITATIONS:

There are two key limitations when interpreting the results of this study. Firstly, these findings were observed in recreational sports students, not elite athletes. And secondly, the authors only monitored the recovery markers up to 72-hours post-exercise. As such, it is unknown if either the P or AR condition would have returned these markers to baseline quicker than the other beyond this point (e.g. 96-hours).

FUTURE RESEARCH:

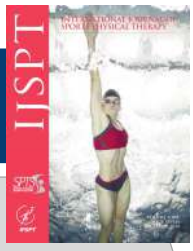
Future research should investigate these responses in elite-level athletes and monitor these parameters for a longer duration of time (e.g. 96-120 hours post-exercise).

Wahl, P, Sanno, M, Ellenberg, K, Frick, H, Bohm, E, Haiduck, B, Goldmann, J-P, Achtzehn, S, Bruggemann, G-P, Mester, J, and Bloch, W. Aqua cycling does not affect recovery of performance, damage markers, and sensation of pain. J Strength Cond Res 31(1): 162–170, 2017. [Link]

SCIENCE for SPORT

ARTICLE TITLE

THE EFFECT OF DIFFERENT FOAM ROLLING VOLUMES ON KNEE EXTENSION FATIGUE



OBJECTIVE:

The aim of this study was to determine the effect of different foam rolling volumes on the fatigue of the knee extensors during 3 sets of knee extensions.

WHAT THEY DID:

25 recreationally active females (age: 27.7 ± 3.56) were required to perform 3 sets of 10-RM knee extensions to concentric failure. In a randomised crossover design, the participants were then instructed to perform a foam rolling (FR) task or 4-minutes of passive rest (CONT) between each intra-set rest interval. There were 3 FR conditions (60-, 90- and 120-seconds), each of which were tested on separate days. The fatigue index (FI) was calculated and compared between each condition. The FI is calculated using the following: FI = 3rd set / 1st set *100

WHAT THEY FOUND:

There was a dose-response relationship between intra-set FR durations of 90- and 120-seconds and a decrease in the resistance to fatigue (p = 0.001). It was also observed that FR for 120-seconds led to a higher level of muscular fatigue than 60-seconds (p = 0.048). This information suggests the longer the FR duration, the higher the muscular fatigue, thus the longer durations appear to be more detrimental to performance.

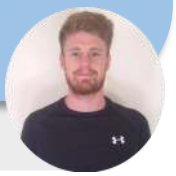
Reference:

Monteiro ER and Neto VGC. (2016) The effect of different foam rolling volumes on knee extension fatigue. International Journal of Sports Physical Therapy. 2016 Dec; 11(7): 1076 –1081. [Link]

EDITORS COMMENTS:

"The findings from this study are in agreement with several other studies which have also observed decreases in performance by using intra- and inter-set foam rolling.

Causing an earlier onset of fatigue will most likely lead to an unwanted reduction in training volume (e.g. kg's lifted in a session). Based on the current evidence, it may be suggested that practitioners avoid using intra- and inter-set FR . However, if you do use it, durations of <60-secs appear to be best if you want to sustain performance.



Owen Walker

ARTICLE TITLE

INFLUENCE OF COLD-WATER IMMERSION ON LIMB BLOOD FLOW AFTER RESISTANCE EXERCISE

OBJECTIVE:

The objective of this study was to examine the effects of cold (8°C) and cool (22°C) water immersion on lower limb blood flow and muscle temperature changes, after a typical bout of resistance exercise.

WHAT THEY DID:

12 recreationally active males (age: 12 ± 6) performed 4 sets of 10-repetition maximum squats and were then immersed, semi-reclined, into cold or cool water for 10-mins, or rested in a seated position (control) in a randomised counterbalanced order on separate days. Rectal and thigh skin temperature, muscle temperature (1-3cm), thigh and calf skin blood flow and superficial femoral artery blood flow were measured before and after immersion.

WHAT THEY FOUND:

Both the cold and cool water conditions significantly reduced thigh skin temperature and deep muscle temperature for up to 30-mins after immersion (p < 0.001). Reductions in rectal temperature were similar across all three conditions (0.2–0.4°C; p < 0.69). Cold and cool immersion reduced femoral artery blood flow and conductance by approximately 55% in comparison to the control (p < 0.01). Both immersion conditions increased thigh and calf cutaneous vasoconstriction (40–50%) compared to the control. The results from this study suggest that cold and cool water immersion reduce deep muscle temperature, femoral artery and cutaneous blood flow.

Reference:

Mawhinney C, Jones H, Low DA, Green DJ, Howatson G & Gregson W. (2017) Influence of cold-water immersion on limb blood flow after resistance exercise, European Journal of Sport Science. [Link]

EDITORS COMMENTS:

"Firstly, these findings agree with previous research and support the use of cold water immersion for reducing muscle temperature and blood flow responses, whilst not affecting core temperature.

As cool water temperatures (22°C) appear to provide very similar effects as cold water (8°C), it also supports the concept of using cool water for athletes who struggle to tolerate colder water temperatures— a very important issue for compliance."

Owen Walker

Youths

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

FEATURE

IMPACT SPORTS AND BONE FRACTURES AMONG ADOLESCENTS

Lyncha KR, Kemperc HCG, Turi-Lyncha B, Agostinetea RR, Itoa IH, Luiz-De-Marcoa R, Rodrigues-Juniora MA, and Fernandesa RA. (2016) Journal of Sports Sciences.

2

THE IMPACT OF PHYSICAL GROWTH AND RELATIVE AGE EFFECT ON ASSESSMENT IN PHYSICAL EDUCATION

Dalen T, Ingvaldsen RP, Roaas TV, Pedersen AV, Steen I & Aune TK. (2016) European Journal of Sport Science.

3

THE IMPACT OF SPORT PARTICIPATION ON BONE MASS AND GEOMETRY IN MALE ADOLESCENTS

Vlachopoulos, D., Barker AR, Williams CA, Arngriçmsson SA, Knapp KM, Metcalf BS, Fatouros IG, Moreno LA, and Gracia-Marco L. Med. Sci. Sports Exerc. Vol. 49, No. 2, pp. 317–326, 2017.

SCIENCE for SPORT

IMPACT SPORTS AND BONE FRACTURES AMONG ADOLESCENTS

OBJECTIVE: The aim of this study was to examine the effects of various sports and their impact on stress fractures among adolescents during a 9-month follow-up period.

WHAT THEY DID:

184 adolescents were divided into three groups according to sports participation: non-sports (n = 47), swimming (n = 35) and impact sports (soccer, basketball, volleyball, karate, judo and kung-fu [n = 102]) and were evaluated at baseline and at the end of the 9-month follow-up period. Average minutes participants spent practicing their sport (impact sports, 470mins per week; swimming, 876mins per week).

MEASUREMENTS:

- Occurrences of fractures during the 9-month period, including the severity (low-, medium– and high-impact fractures).
- Chronological age
- Age at peak height velocity
- Height
- Weight
- Body fat percentage
- Lean soft tissue
- Bone mineral density

WHAT THEY FOUND:

- Adolescents who reported stress fractures were similar in all variables (age, weight, height, body fat, lean soft tissue, somatic maturation and bone mineral density) to those adolescents who did not report fractures.
- Gender (p = 1.000), age at peak height velocity (p = 0.733) and engagement in resistance training (p = 0.308) were not related with the occurrence of fractures.
- Sports participation was related with lower occurrence of fracture during the 9-month longitudinal study (non-sports = 12.8%, swimming = 8.6% and impact sports = 3.9%; p = 0.047).
- Adolescents engaged in swimming and impact sports were taller, heavier and had higher lean soft tissue than those adolescents not engaged in sports.
- Fracture risk after the follow-up was lower in adolescents engaged in impact sports than in non-active ones, while swimming was not associated to lower fracture risk.

WHAT THIS MEANS:

The findings from this study indicate the importance of sports participation among adolescents for bone health and the reduction of stress fracture risk. More specifically, it appears that impact sports may provide the best osteogenic effect and therefore lead to the highest reduction of fracture risk.

What's more, is these results could be relevant for recognising adolescents in danger of not reaching their potential for peak bone mass and may later experience an increased risk of bone fracture(s).

LIMITATIONS:

There are a number of weaknesses to this study: 1) history of previous injury/fractures were not accounted for; 2) resistance training experience or schedules were not monitoried; 3) the short observational period (9-months) only provides a small insight into the topic and does not clarify how this is affected in later life; and 4) the participants nutrition was entirely overlooked.

FUTURE RESEARCH:

Though this research does provide some very useful information for exercise and medical practitioners alike, future research needs to identify how these sports influence bone mineral density and geometry in the longer term and whether this may result in decreased bone-related issues and diseases in later life.

Lyncha KR, Kemperc HCG, Turi-Lyncha B, Agostinetea RR, Itoa IH, Luiz-De-Marcoa R, Rodrigues-Juniora MA, and Fernandesa RA.(2016) Impact sports and bone fractures among adolescents. Journal of Sports Sciences. [Link]

SCIENCE for SPORT

ARTICLE TITLE

THE IMPACT OF PHYSICAL GROWTH AND RELATIVE AGE EFFECT ON ASSESSMENT IN PHYSICAL EDUCATION

OBJECTIVE:

The aims of this study were two-fold: 1) examine the extent to which physical growth and the relative age effect (RAE) impact the grade attainment of physical education (PE) students; and 2) to examine whether there is any gender differences in the assessment in PE students as a result of physical growth and RAE.

WHAT THEY DID:

2978 Norwegian school pupils between the ages of 13-16 years (grades 8-10) were required to complete a questionnaire containing the following information: chronological age, height, weight, body mass, gender and PE attainment grade. Pupils were then sub-divided into categories regarding their birth date (Q1 – Jan-Mar; Q2 – Apr-Jun; Q3 – Jul-Sep; Q4 – Oct-Dec) and then sub-divided again based on whether they were high or low academic achievers in PE.

WHAT THEY FOUND:

The results from this study found, despite the best intentions of the Norwegian school system, that physical growth, which is mediated by age, does have an impact on the pupils' PE attainment. In other words, the RAE appears to effect the grade in which students achieve in PE, at least in Norway.

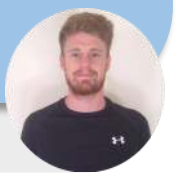
Reference:

Dalen T, Ingvaldsen RP, Roaas TV, Pedersen AV, Steen I & Aune TK. (2016) The impact of physical growth and relative age effect on assessment in physical education, European Journal of Sport Science. [Link]

EDITORS COMMENTS:

"This ongoing observation that the RAE has an impact upon not only sports participation and performance, but also the academic performance of youths should be ringing alarm bells regarding our current infrastructures relating to physical activity and education.

In both of these settings (sports and education), younger individuals appear to be "drawing the short straw" and suffering the consequences of poor performance assessment strategies. Again, this study highlights the need to reform current assessment methods to remove any age-related advantages/disadvantages."



Owen Walker

ARTICLE TITLE

THE IMPACT OF SPORT PARTICIPATION ON BONE MASS AND GEOMETRY IN MALE ADOLESCENTS

Reference:

Vlachopoulos, D., Barker AR, Williams CA, Arngrìçmsson SA, Knapp KM, Metcalf BS, Fatouros IG, Moreno LA, and Gracia-Marco L. The Impact of Sport Participation on Bone Mass and Geometry in Male Adolescents. Med. Sci. Sports Exerc. Vol. 49, No. 2, pp. 317–326, 2017. [Link]

OBJECTIVE:

The aim of this study was to examine the differences on bone outcomes between osteogenic (football) and non-osteogenic (swimming and cycling) sports and a control group (non-sports) in male adolescents.

WHAT THEY DID:

121 adolescent males (13.1 ± 0.1 years) took part in this study: 37 footballers, 41 swimmers, 29 cyclists and 14 controls. Dual energy X-ray absorptiometry measured bone mineral density (BMD) and bone mineral content at lumbar spine, right and left hip, and total body. Hip Structural Analysis evaluated bone geometry at the femoral neck. Quantitative ultrasound evaluated bone stiffness at both feet. Additional cofounding factors such as: anthropometrics, training volume, maturation, energy intake, and calcium and vitamin D intakes were all monitored.

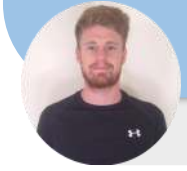
WHAT THEY FOUND:

The footballers showed significantly higher BMD (7-21%), bone geometry (8-19%), and bone stiffness (10-20%) compared to the swimmers, cyclists and controls. Also, whilst the swimmers and cyclists exhibited higher bone outcomes compared with the controls, these differences were not statistically significant.

EDITORS COMMENTS:

"When the findings from this study are acknowledged alongside the results of the Youth 'Feature Article' on impact sports and bone fracture risk, a clear message begins to expose itself. That is, impact sports which cause an osteogenic effect are not only important for reducing bone fracture risk, but may also be vital for improving bone health in later life.

Non-impact sports such as swimming and cycling may not be capable of promoting such a meaningful osteogenic effect. As a result, should non-impact sport athletes also be participating in impact-based sports?"



Owen Walker

Nutrition

This month's top research on nutrition.

FEATURE

PRE- VERSUS POST-EXERCISE PROTEIN INTAKE HAS SIMILAR EFFECTS ON MUSCULAR ADAPTATIONS

Schoenfeld BJ, Aragon A, Wilborn C, Urbina SL, Hayward SE and Krieger J. (2017). PeerJ 5:e2825; DOI 10.7717/peerj.2825.

2

LOW CARBOHYDRATE, HIGH FAT DIET IMPAIRS EXERCISE ECONOMY AND NEGATES THE PERFORMANCE BENEFIT FROM INTENSIFIED TRAINING IN ELITE RACE WALKERS

Burke L, Ross M, Garvican-Lewis L, Welvaert M, Heikura I, & Forbes S et al. (2016). The Journal of Physiology.

3

EFFECTS OF DEHYDRATION ON CRICKET SPECIFIC SKILL PERFORMANCE IN HOT AND HUMID CONDITIONS

Gamage J, De Silva A, Nalliah A, & Galloway S (2016). International Journal Of Sport Nutrition And Exercise Metabolism, 26(6), 531-541.

SCIENCE for SPORT

PRE- VERSUS POST-EXERCISE PROTEIN INTAKE HAS SIMILAR EFFECTS ON MUSCULAR ADAPTATIONS

OBJECTIVE: To investigate muscular adaptations in response to protein consumed either immediately pre- versus post-resistance training.

WHAT THEY DID:

21 trained men were randomly assigned to either a pre-training or post-training protein consumption group (protein supplement contained 25g protein from hydrolyzed whey protein isolate). The pre-training group refrained from eating for at least 3hrs after the exercise bout, while the post-training group refrained from eating for at least 3hr prior to the exercise bout. All subjects performed a hypertrophy-type full body resistance training protocol three times a week for 10 weeks.

MEASUREMENTS:

- Muscle thickness through ultrasound imaging
- Body composition through DXA imaging
- Maximal strength through 1RM bench press and 1RM back squat

WHAT THEY FOUND:

- The timing of protein consumption had no significant effect on any of the above measurements (i.e. pre- and post-workout protein consumption produced similar effects).
- Both pre- and post-training groups significantly increased maximal squat strength by 3.7% and 4.9%, and maximal bench press strength by 2.4% and 3.3%, respectively.
- The findings suggested a modest advantage for post-training protein on increase in biceps thickness, but the difference was not statistically significant.

WHAT THIS MEANS:

Given that the pre-training group did not consume protein for at least 3 hours post-workout, these findings suggest that no narrow post-exercise anabolic 'window of opportunity' exists to maximise muscular adaptations. Instead, it supports the theory that the 'anabolic window' may be several hours wide after a training bout, depending on when the pre-workout meal was consumed.

LIMITATIONS:

- Low sample size (21 subjects)
- Higher volume training may have produced different results
- Activities outside of research setting were not closely monitored
- DXA lean mass results can be influenced by hydration status

FUTURE RESEARCH:

Future research should examine the impact that protein sources of differing digestion speeds (whey vs. casein) have on the outcomes in this study. This is important as the present study used hydrolyzed whey protein isolate which digests rapidly, and many people performing resistance training consume mixed meals before and after training rather than protein supplements. Future research should also examine whether pre- vs post-workout protein supplementation is optimal for those performing resistance training in the evening who may not consume another meal before bed.

Schoenfeld BJ, Aragon A, Wilborn C, Urbina SL, Hayward SE and Krieger J. (2017). Pre-versus post-exercise protein intake has similar effects on muscular adaptations. PeerJ 5:e2825; DOI 10.7717/peerj.2825. [Link]

SCIENCE for SPORT

ARTICLE TITLE

LOW CARBOHYDRATE, HIGH FAT DIET IMPAIRS EXERCISE ECONOMY AND NEGATES THE PERFORMANCE BENEFIT FROM INTENSIFIED TRAINING IN ELITE RACE WALKERS

OBJECTIVE:

To determine the effects of 3 weeks adaptation to a low carb high fat (LCHF) diet during a period of intensified training on exercise metabolism and performance of world-class endurance athletes.

WHAT THEY DID:

21 elite male race walkers consumed one of three isoenergetic diets: high carbohydrate (CHO) availability (60-65% CHO) consumed before/during/after training; identical macronutrient intake periodised within/between days to alternate between low and high CHO availability; and LCHF (<50g CHO, 75-80% fat/day). The subjects consumed these diets while undertaking 3 weeks of intensified training incorporating race walking, resistance training and cross-training (running, cycling or swimming). Before and after the dietary intervention, subjects performed a laboratory test that measured V02 peak and walking economy, as well as a field test (10km race).

WHAT THEY FOUND:

LCHF increased the oxygen cost of race walking at velocities relevant to real-life race performance compared to the high CHO and periodised CHO groups. The high CHO and periodised CHO groups improved 10km race walk times by 6.6% and 5.3% respectively, with no improvement (-1.6%) for the LCHF group. Overall, compared to training with diets providing chronic or periodised high CHO availability, adaptation to a LCHF diet negated performance benefits in elite endurance athletes, in part due to reduced exercise economy.

Reference:

Burke L, Ross M, Garvican-Lewis L, Welvaert M, Heikura I, & Forbes S et al. (2016). Low Carbohydrate, High Fat diet impairs exercise economy and negates the performance benefit from intensified training in elite race walkers. The Journal of Physiology. [Link]

EDITORS COMMENTS:

"This study is important as while prior research has shown that LCHF diets impair high-intensity exercise performance, it has been proposed that at lower intensities where fat oxidation can adequately support energy demands, these LCHF diets should not impair performance and may in fact benefit performance by training the body to use fat for fuel, which the body stores in greater abundance than carbohydrate.

However, this study dismissed this theory and showed that even in a relatively low-intensity event such as race walking, LCHF diets may still impair performance."

Tim Rowland

ARTICLE TITLE

EFFECTS OF DEHYDRATION ON CRICKET SPECIFIC SKILL PERFORMANCE IN HOT AND HUMID CONDITIONS

OBJECTIVE:

To examine the effect of dehydration on cricket specific motor skill performance among fast-bowlers, fielders and batsmen playing in a hot and humid outdoor field environment.

WHAT THEY DID:

30 elite cricket players, including 10 fast-bowlers, 12 fielders and 8 batsmen participated in two field-based trials conducted 7 days apart: a fluid provision (FP; 12-15ml/kg/hour) trial and a fluid restriction (FR; 4ml/kg/hour) trial. Each trial consisted of a 2hrs standardised training session and pre- and post-training skill performance assessments that measured bowling speed and accuracy (line and length), throwing speed and accuracy (overarm, sidearm and underarm) and timed running between wickets (1, 2, and 3 runs). Pre- and post-trial body mass was also measured for each trial.

WHAT THEY FOUND:

Key findings included a 19.8% reduction in bowling accuracy (for line) in the FR group compared to 3.6% in the FP group, as well as a 14.2% decline in overarm throwing accuracy in the FR group compared to 0.8% in the FP group. On the whole, moderate-severe dehydration significantly impairs motor skill performance among cricketers, particularly bowlers and fielders, playing in hot and humid conditions. Fluid ingestion strategies maintaining body mass loss within 1% prevented a decline in skill performance.

Reference:

Gamage J, De Silva A, Nalliah A, & Galloway S (2016). Effects of Dehydration on Cricket Specific Skill Performance in Hot and Humid Conditions. International Journal Of Sport Nutrition And Exercise Metabolism, 26(6), 531-541. [Link]

EDITORS COMMENTS:

"While it is well established that dehydration impairs endurance exercise performance, less is known about the effect of dehydration on skill performance, and so this study helps fill an important gap in the research.

Unlike most studies on dehydration which are conducted in a laboratory setting, this study looked at the effects of dehydration in real ambient conditions. This is important as it allows for practical recommendations to be made on hydration strategies for cricketers playing in hot and humid environments.

Not only this, but it also leaves the question: how does dehydration effect the skill performance of other athletes (e.g. tennis or Rugby)?"

Tim Rowland

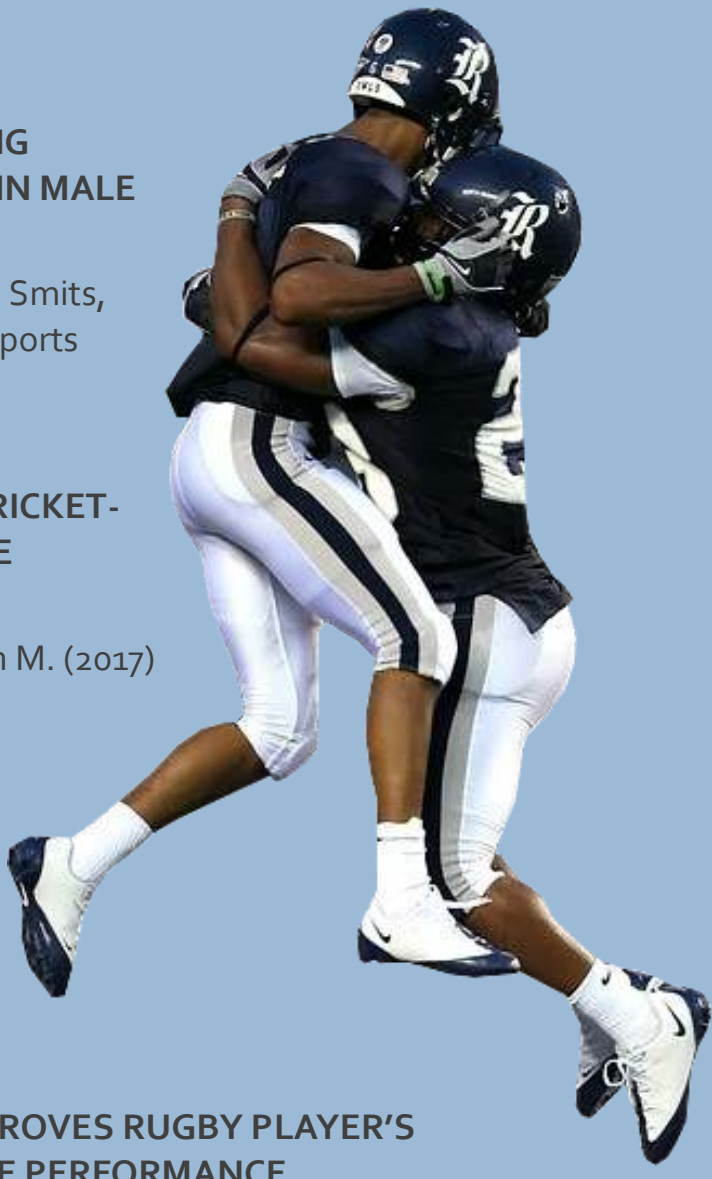
Team Sports

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

FEATURE

LONGITUDINAL BODY COMPOSITION CHANGES IN NCAA DIVISION I COLLEGE FOOTBALL PLAYERS

Trexler, ET, Smith-Ryan, AE, Mann, JB, Ivey, PA, Hirsch, KR, and Mock, MG. J Strength Cond Res 31(1): 1–8, 2017.



2

NO RELATIONSHIP BETWEEN HAMSTRING FLEXIBILITY AND HAMSTRING INJURIES IN MALE AMATEUR SOCCER PLAYERS

van Doormaal, M, van der Horst, N, Backx, F, Smits, DW, Huisstede, B. The American Journal of Sports Medicine 45: 121-126, 2017.

3

THE EFFECTS OF MENTAL FATIGUE ON CRICKET-RELEVANT PERFORMANCE AMONG ELITE PLAYERS

Veness D, Patterson SD, Jeffries O & Waldron M. (2017) Journal of Sports Sciences.

4

THE IMPROVEMENT OF STRENGTH PERFORMANCE DURING AN AUSTRALIAN FOOTBALL PRE-SEASON

Garrett, J, McKeown, I & Roger, D. J. Aust. Strength Cond. (2016) 24(7) 6-11.

5

HYPOXIC REPEAT-SPRINT TRAINING IMPROVES RUGBY PLAYER'S REPEATED SPRINT BUT NOT ENDURANCE PERFORMANCE

Hamlin M, Olsen P, Marshall H, et al. Front Physiol [Internet]. 2017;8:24.

SCIENCE for SPORT

LONGITUDINAL BODY COMPOSITION CHANGES IN NCAA DIVISION I COLLEGE FOOTBALL PLAYERS

OBJECTIVE: The aim was to track longitudinal changes in body composition over a single-year and throughout a 4-year career.

WHAT THEY DID:

57 athletes participated in the current study. Each participant's body composition was tracked over the course of a calendar year via dual-energy x -ray absorptiometry (DEXA). Measurements were taken at four time points throughout the year, including in the off-season (March-Pre), end of the off-season (May), in the pre-season (July) and the following March (March-Post). A subset of 13 participants had annual DEXA measurements in March of each year over a 4-year period to track body composition changes across a collegiate career.

MEASUREMENTS:

- Weight
- Lean mass
- Fat mass
- Body fat %
- Bone mineral content (BMC)
- Bone mineral density (BMD)
- Andriod fat
- Gynoid fat

WHAT THEY FOUND:

- The authors reported advantageous changes in body composition over 1 calendar year and across a 4-year collegiate career.
- Specifically, a significant ($p \leq 0.05$) reduction in body fat % was observed with an associated increase in lean mass across 1 calendar year from March-Pre to March-Post.
- Significant increases in BMC and BMD were also seen over the same time period.
- Similar results were noted over the course of a 4-year career with lean mass significantly increasing over this period, whilst non-significant increases in fat mass, body fat %, android and gyniod fat were also reported.

WHAT THIS MEANS:

The favourable results of this study indicate that with a well-designed strength and conditioning programme, increases in lean mass, BMC and BMD are possible in collegiate American football athletes without increases in fat mass. Increasing lean mass, BMC and BMD may benefit athletic performance and injury prevention. The results also indicate that considerable improvements in body composition are possible in well-trained football athletes at the end of their college career.

LIMITATIONS:

A notable limitation of this study is the small sample size (n = 13) used to observe changes over the 4-year period. Unfortunately, the small sample size does limit the generalizability of the results. A larger sample size would have also enabled the authors to describe changes relative to position (lineman and non-lineman), however, this may have required the collaboration of another collegiate football program.

FUTURE RESEARCH:

Future research should aim to include body composition data collected immediately after the competitive season, as this would have provided useful information into the maintenance of body composition measures across the competition schedule. It should also seek to investigate the link between body composition changes and performance data in collegiate American football.

Trexler, ET, Smith-Ryan, AE, Mann, JB, Ivey, PA, Hirsch, KR, and Mock, MG. Longitudinal body composition changes in NCAA Division I college football players. J Strength Cond Res 31(1): 1–8, 2017. [Link]

SCIENCE for SPORT

ARTICLE TITLE

NO RELATIONSHIP BETWEEN HAMSTRING FLEXIBILITY AND HAMSTRING INJURIES IN MALE AMATEUR SOOCER PLAYERS

Reference:

van Doormaal, M, van der Horst, N, Backx, F, Smits, DW, Huisstede, B No Relationship Between Hamstring Flexibility and Hamstring Injuries in Male Amateur Soccer Players. The American Journal of Sports Medicine 45: 121-126, 2017. [Link]

OBJECTIVE:

Investigate the relationship between hamstring flexibility and hamstring injuries in male amateur soccer players.

WHAT THEY DID:

Tested 450 male first-class amateur soccer players (age: 24.5 years). Hamstring flexibility was measured by performing the sit-and-reach test (SRT). The relationship between hamstring flexibility and the occurrence of hamstring injuries in the following year, while adjusting for the possible confounding effects of age and previous hamstring injuries, was determined with a multivariate logistic regression analysis.

WHAT THEY FOUND:

In this group of soccer players, hamstring flexibility was not related to hamstring injuries. Age and previous hamstring injuries as possible confounders did not appear to influence this relationship. Other etiological factors need to be examined to further elucidate the mechanism of hamstring injuries.

EDITORS COMMENTS:

"The current study investigates an interesting and important topic for practitioners due to the high prevalence of hamstring injuries (HI) in football. Furthermore, the role of flexibility in the prevention of HI is not currently cogent, despite the aim of flexibility development being prevalent in many athletic development programmes.

However, despite the important objective and the large subject cohort (450 players), I have some questions regarding the reliability of the present study: 1) The SRT score can be easily over- or under-estimated, particularly with a different persons controlling the test for each club in the study; 2) The subjective nature of the definition of a HI used within this study, coupled with the fact the staff of each club decided what was and wasn't a HI, with no confirmation/check carried out by an independent physician leads to inconsistency, and may explain why only 5.1% of players were reported to pick up a HI over the 12-months (much lower than reported in other similar studies); and finally 3) With only two age categories used (18.0 -23.9 and 23.9-40.0), it is far too simplistic to state whether age is a confounding effect factor. There is simply too big of a physiological difference between a 24 and 39 year old to group them in the same category."

Liam Mason

ARTICLE TITLE

THE EFFECTS OF MENTAL FATIGUE ON CRICKET-RELEVANT PERFORMANCE AMONG ELITE PLAYERS

Reference:

Veness D, Patterson SD, Jeffries O & Waldron M. (2017) The effects of mental fatigue on cricket-relevant performance among elite players, Journal of Sports Sciences. [Link]

OBJECTIVE:

The aim of this study was to investigate the effects of a mentally fatiguing test on physical tasks among elite cricketers.

WHAT THEY DID:

In a randomised crossover design, ten elite male cricket players performed a cricket run-two test, a Batak Lite reaction time test and a Yo-Yo-Intermittent Recovery Level 1 (Yo-Yo-IR1) test, and provide a rating of perceived exertion (RPE) after completing a 30-min Stroop test (mental fatigue task) or 30-min control condition.

WHAT THEY FOUND:

The results showed that the Cricket run-two, Yo-Yo-IR1 and RPE were all negatively affected by the mentally fatiguing task. A negative trend was also found Batak Lite test, however, it was not statistically significant.

Therefore, the findings of this study suggest that mental fatigue, induced by a cognitively challenging task, can acutely reduce performance in cricket-relevant tests.

EDITORS COMMENTS:

"Due to the nature of cricket (i.e. long-duration), this study offers practitioner's valuable information regarding the physical decline in performance as a result of mental fatigue. This may be important for wicket-keepers, slip cordons and batsmen in particular, who must retain high-levels of concentration, reactive abilities and perform repeated bouts of high-intensity physical exertions for extended periods of time.

As declines in cognitive and physical ability may influence skill acquisition and competition success, practitioners should consider using well-structured training and match routines to minimise these effects."

Samuel Callaghan

ARTICLE TITLE

THE IMPROVEMENT OF STRENGTH PERFORMANCE DURING AN AUSTRALIAN FOOTBALL PRE-SEASON

OBJECTIVE:

The objective of this study was to examine the changes in strength performance during an 11-week pre-season period in elite Australian football (AF). The aim was to describe strength performance changes during a heavy period of training where competing demands of conditioning and strength were trained in a relatively high volume.

WHAT THEY DID:

Fifteen professional AF players from one AFL club, completed periodised strength, conditioning and skills training throughout an 11 week period of pre-season. Descriptive statistics (mean and SD) were calculated for all variables. Effect Size (ES) was calculated, using Cohen's d statistic. 90% Confidence Interval (CI) were also calculated. Pearson's correlations coefficient was calculated between an isometric mid-thigh pulls (Newton per kilogram (N/kg)), weekly conditioning load (total weekly distance (kilometres)) and strength volume (repetitions).

WHAT THEY FOUND:

A small increase in strength was shown (5 ± 0.78 N/kg), resulting in a small change (13 ± 0.05% increase, ES 0.69 ± 0.29) across the pre-season period. A very large negative correlation (r = -0.82) was shown between N/kg and weekly conditioning load, presenting the possible presence of an 'interference effect' over this period.

The results of this study demonstrate the ability to increase maximum strength, during a period of heavy training where competing demands of conditioning and strength were trained in relatively high volume and in the presence of an interference effect.

Reference:

Garrett, J, McKeown, I & Roger, D. The improvement of strength performance during an Australian football pre-season. J. Aust. Strength Cond. (2016) 24(7) 6-11. [Link]

EDITORS COMMENTS:

"Although this study showed an increase in Isometric Mid-Thigh Pull strength, it was a small change, and although this could be seen as valuable for older players with a higher training age, you would hope to see a much larger response in younger players.

This study does not differentiate strength differences amongst their cohort that ranged from 22.9 – 28.5. Though these findings are useful, I think further investigation into the 'interference effect' and its response in varying training ages would be of value. Finally, when it comes to the integration of all training modalities in a team sport environment, all responses come down to individuality, that is, individuals have such varying requirements and responses that grouping a cohort together can sometimes not give a great indicator of what actually occurred over the training block (i.e. pre-season)."

Lachlan Wilmot

ARTICLE TITLE

HYPOXIC REPEAT-SPRINT TRAINING IMPROVES RUGBY PLAYER'S REPEATED SPRINT BUT NOT ENDURANCE PERFORMANCE

OBJECTIVE:

The aim of this study was to investigate the changes in performance in a group of Rugby athletes after repeated sprint training in normobaric hypoxia or normobaric normoxia conditions.

WHAT THEY DID:

Nineteen rugby athletes were exposed to repeated sprint bike training (2 sessions/week for 3 weeks of 4 sets of 5x5 seconds) in either a normobaric hypoxia (HYP; n = 9) or normobaric normoxia (NORM; n = 10). Prior to the intervention, repeated sprint (8 x 20m) and Yo-Yo Intermittent Recovery Level 1 (YY) performances were tested twice at baseline (Pre 1 and Pre 2) and weekly after (Post 1-3) the initial intervention (intervention 1).

WHAT THEY FOUND:

Both groups similarly lowered fatigue in repeated sprints in comparison to baseline (mean of Pre 1 and 2) after 1 week. From Post 2 onwards, only the HYP maintained the performance improvement compared to baseline. Moreover, the HYP was likely to have substantially less fatigue at Post 3-5 in comparison to NORM. YY performances improved throughout the recovery period in both groups, with unclear differences found between groups. The conclusion, 6 sessions of repeated sprint in hypoxic conditions increased repeat sprint ability, but not YY performance in well-trained non-professional rugby players.

Reference:

Hamlin M, Olsen P, Marshall H, et al. Hypoxic repeat-sprint training improves rugby player's repeated sprint but not endurance performance. Front Physiol [Internet]. 2017;8:24. [Link]

EDITORS COMMENTS:

"Research findings on the effects of hypoxia training on performance are controversial.

In the present study the authors found benefits (~2% improvement in repeated sprint ability; ~1% faster over the 8 sprints) by cycling under hypoxic conditions. However, practitioners should question the benefits of this training method given the error of measurement of repeated sprints (~1-2%), the equipment costs, and the time and effort required to implement it. As a result, this training method may not be worth the heavy investment."

Francisco Tavares

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

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.

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.

AUSTRALIAN FOOTBALL

Lachlan Wilmot BSc ASCA L2

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

AMERICAN FOOTBALL

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.

SCIENCE for SPORT