

PROFESSIONAL *strength & conditioning*

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Welcome to the fourth edition of the UKSCA Journal. Following feedback from the members, this again takes the printed format which members indicated as their preferred format. This will now become a quarterly journal, exclusively for UKSCA members, which we hope will prove an invaluable resource as we look to develop the profession of strength and conditioning in this country. The need for a professional journal has been discussed extensively at Board level, and we now have a mechanism in place to meet this need.

As a Board we want the Journal to meet the professional needs of our members. Part of meeting these needs will be open communication as to what members want to see in the journal. To this end we welcome feedback on all aspects of the journal, and encourage members to indicate areas and topics they would like us to address. Similarly, we encourage members to contribute items for the Journal, whether it be column articles or full articles. We hope that as this Journal develops, it will become a key means of communication for both the profession and the UKSCA.

Ian Jeffreys (Editor)



Jeffreys wins NSCA Award

At the NSCA National Conference in Washington, UKSCA Board Member Ian Jeffreys (*above centre*) was awarded the NSCA's coveted High School Professional of the Year Award. This was the first time the award had been won by a coach outside the USA. *'To win this award was a great honour for myself and the programme at Coleg Powys,'* said Jeffreys. *'Hopefully it can raise the profile around the world of the great work being done by strength and conditioning coaches in the UK.'*



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NEWS

UKSCA ACCREDITATION

The UKSCA is continuing to provide a pool of accredited strength and conditioning coaches for the UK through its accreditation process. The latest accreditation events were in Belfast on August 26th and Bisham Abbey on September 17th. The Belfast event, organised by SINI lead Phil Moreland saw 12 coaches take the assessment, whilst the Bisham event directed by Harry Brennan saw 32 coaches undertake their assessment. Coaches who pass the assessment are able to use the letters ASCC, which is the main strength and conditioning credential in the UK, and acknowledged by all of the Home Institutes as a key qualification for employment in the industry.

NEW DIRECTORS ELECTED

At the UKSCA Conference three members were elected to the Board, armed with key roles in the development of the organisation.

Clive Brewer, Development Manager for Sport Scotland was elected to the role of Director of Memberships. This is Clive's second successful election, and he has been a member of the Board since the organisations inception.

Raphael Brandon, lead Strength and Conditioning Coach for the EIS London Region, was elected to the role of Director of Commercial Partnerships.

Jon Goodwin, lecturer at St Mary's College London was elected to the role of Education and Training – Development.

They join current Board Members, **Gil Stevenson (Chairman)**, **Harry Brennan**, **Daniel Cleather**, **Ian Jeffreys**, **Jeremy Moody**.

2007 UKSCA ANNUAL CONFERENCE ANNOUNCEMENT – DATE FOR THE DIARY

We are pleased to announce the 2007 conference will be held from 18 to 20 May at Inverclyde, near Glasgow, Scotland. The conference committee is working to pull together an exceptional programme of UK and international speakers and we will be announcing full details soon.

UKSCA SHOP NOW OPERATIONAL



The UKSCA website now has the ability for you to make purchases directly from the site or the office. We are developing relationships with suppliers to enable discounted products to be available to UKSCA members. You will see a range of books now available for members and we will be adding more products over the course of the year.

SUPERTRAINING

by *Mel C. Siff* available in the UK

Quite possibly the most comprehensive book ever written on the science behind strength and conditioning. It has been said before that in training, methods change, principals stay the same – this is the great strength of Supertraining. It is for this reason alone that Mel Siff's book is a timeless classic.

Make no mistake – this is not a book which will drop on your doorstep and be instantly read cover-to-cover. The sheer range and depth of the information within makes this more of a reference than a page-turner. However, the best strength coaches will always evaluate a situation and relate it back to fundamental principles – which is when this book becomes your bible.

Bottom line – whenever you think you are pushing the envelope and setting new boundaries, a quick look back in Supertraining will usually remind you that Mel Siff was already doing it before you'd so

much as picked up a bar. If you can get hold of copy, grab one today.

Review by

Mark Jarvis MSc ASCC

Strength & Conditioning Coach, English Institute of Sport

Level of Reader:

Intermediate to advanced

Suitable for accreditation preparation:

Yes, but not an ideal starting point for the beginner

Content basis: Science

Star rating: 5

Previously only available from the US, the UKSCA now holds stock of Supertraining. – see our website or call the office for details and to place orders.



MARK VERSTEGEN HITS THE UK WITH A WORLD CLASS PRESENTATION

The UKSCA were privileged to be able to host one of the best strength and conditioning events seen on these shores. Mark Verstegen (*right*) presented a workshop entitled, Multi-Directional Speed and Rotational Power for Sports. As an organisation, one of the UKSCA's aims is to promote and develop the field of strength and conditioning. Part of that is ensuring that UK based coaches are able to access the best speakers available in an attempt to develop quality practice. This event was a massive step forward in this aim.

Verstegen is known as one of the world foremost leaders in the field of performance enhancement. Starting as a strength and conditioning coach at Washington State University and then Georgia Tech Mark then went on to form the International Performance Institute in Bradenton Florida, before establishing Athletes' Performance in Tempe Arizona. Since its inception Athletes' Performance has pioneered the development and training of world class athletes and teams. Mark and the Athletes' Performance Team have trained many of the top champions in the world of sports at their state-of-the-art facilities, implementing unique and breakthrough concepts in athletic performance.

This was the first time Mark had spoken in the UK, and he made a massive impression on all delegates. In the morning Mark outlined the philosophy of Athletes' Performance and the methodology behind his highly successful system. A major feature of Mark's presentation was the impact that a strength and conditioning coach can have on all aspects of athletic performance, and how total performance depends upon the seamless integration of a wide range of disciplines into a systematic developmental approach. This is an important aspect as the industry tries to develop in the UK. Mark's insights clearly emphasised the importance of the profession at all levels of performance, and the importance that the organisation has on developing the industry at all levels, not just at the elite level.


The afternoon saw Mark deliver a hands on practical session, where he outlined key exercises and coaching points in the development of pillar strength, movement preparation, movement skill, and rotational power. This saw all participants taken through examples of



effective workout sessions which addressed all of these key aspects of performance. This gave the participants not only a high number of effective exercises, but also highlighted key coaching points in maximising performance efficiency. Mark concluded by taking time to answer any questions from the audience, ultimately delivering a workshop that presented a fantastic learning experience for all attendees and excellent value for money.

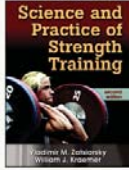
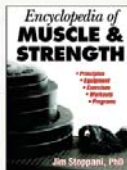
The UKSCA are extremely grateful for the work of Richard Hardy of Keiser for his huge contribution to this event. Any coaches wishing to learn more about Athletes' Performance or their Professional Mentorship Program can log onto their web site at www.athletesperformance.com

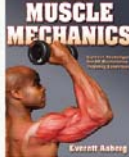

Additional references can be found at www.coreperformance.com for exercise libraries & program examples. Use the access code 'AP-UK2006' for a three week free trial.



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The Split Squat

Alex Wolf,
Strength & Conditioning
Coach.

Alex Wolf is a Strength and Conditioning Coach for the English Institute of Sport based in Yorkshire. Alex leads on the physical preparation for many of the regional based athletes including cycling, badminton and wheelchair basketball. Alex's main interest is youth and athletic long term physical development.

The split squat is generally used as a supplementary exercise for the development of leg strength and hypertrophy. What maybe overlooked is the use of the split squat in the development of single leg strength. This is critical for most ground based sports, especially racket sports which requires a large degree of lunge based movements – a lunge being a progression once the split squat has been technically mastered.

This article aims to highlight the mechanics and technical issues associated with the split squat along with possible variations of the exercises

Mechanics

When designing an effective strength training programme Single leg strength cannot effectively be developed through the traditional double legged (bilateral) exercises. To develop this single leg strength, unilateral or partial unilateral exercises must be completed. As mentioned above, most ground based sporting movements require single leg strength. It is important to understand some of the mechanics of split squat and how they are applied to sports performance.

Both unilateral and bilateral movements require hip and knee extension. The split squat requires greater recruitment of the gluteus medius and Quadratus Lumborum to stabilise the pelvis in the frontal plane. During a back squat, the contra-lateral leg will provide most of this frontal plane pelvic stability. Ground based sporting movements which demonstrate a high degree of unilateral leg strength such as lunging and gait will display this same pelvic stability shown in a split squat.

The split squat has a small base of support when compared to the back squat. This small base of support makes any shift in the line of gravity very close to the edge of the base of support. This requires good ankle, knee and hip proprioception and stability.

The split squat places the trail leg hip flexor in a lengthened position. This lengthened position is mechanically similar to that of the stance leg while running. The front leg of the split squat will have the hip and knee extensors in a greater lengthened position. Not only will the split squat improve the development of single leg strength but also the mobility of the hip and flexibility of the surrounding hip musculature.

Below is a brief overview of the muscles and their major actions involved in the correct movement of a split squat:

| Muscle | ACTION | | | |
|--------------------|---------------|----------------|------------------------------|----------------------|
| | Hip Extension | Knee Extension | Spinal & Trunk Stabilisation | Pelvic Stabilisation |
| Quadriceps | | ✓ | | |
| Hamstrings | ✓ | | | |
| Gluteus Maximus | ✓ | | | |
| Adductor Magnus | ✓ | | | ✓ |
| Abdominals | | | ✓ | ✓ |
| Spinal Erectors | | | ✓ | ✓ |
| Quadratus Lumborum | | | ✓ | ✓ |
| Gluteus Medius | ✓ | | | ✓ |
| Gluteus Minimus | | | | ✓ |



Stuart Yule is the column editor for the 'Exercise of the Month' section.

Technique

| POSITION | DESCRIPTION | PROBLEMS | VARIATIONS/SOLUTIONS |
|--|---|---|---|
| Start position (figure 1) | Split position is a moderately large step forward | Split position too narrow - lead knee travels too far over toes | Allow athlete to vary split stance position to find appropriate position for correct execution of movement |
| | | Split position too wide - restrict descent due to excessive starting hip extension of trail leg | |
| | Weight evenly distributed between both feet | Majority of weight on front foot | Ensure trunk is vertical |
| | Bar resting on upper trapezius and rear deltoids | Neck pain where bar is positioned | Ensure bar below C7 vertebrae |
| | Spine in full extension and trunk braced - the trunk remains vertical | Unable to hold extended position | Ensure athlete has no spinal pathology limiting thoracic or lumbar extension |
| Ability to maintain extension unloaded | | | |
| Keep chest elevated | | | |
| Descent (figure 2) | Inhale and brace the trunk | | |
| | Knee and hip flexion of the lead leg - trail leg knee descends to floor | Excessive anterior movement of knee - travels past toes | Athlete to lower trail leg knee to floor |
| | | Reduced range of movement of hip flexi | Trail leg hip flexor flexibility - static and dynamic flexibility of hip flexors (Rectus Femoris, Iliacus and Psoas complex) |
| | Trunk remains in the vertical position | Anterior forward trunk lean (figure 4) | Athlete to maintain extension in spine and keep trail leg hip extended. Keep chest elevated. Is the load too great? Trail leg hip flexor flexibility issue? |
| | | | Use of dumbbells to lower centre of gravity and reduce spinal compression - helps maintain spinal extension |
| | | Lateral trunk lean (figure 5) | Athlete to widen stance of lead leg from midline of trunk |
| | | | Use of dumbbells to lower centre of gravity and increase stability |
| | Ankle-knee-hip alignment of lead leg while flexing | Knee valgus (figure 6) | Athlete to control descent with weight on lateral border of foot - medial border still remains in contact with floor. |
| Is the load too great? | | | |
| Possible hip abductor weakness? | | | |
| Ascent (figure 3) | Drive lead foot into floor | | |
| | Lead leg knee and hip extend | | |
| | Ankle-knee-hip alignment of lead leg while extending | Knee valgus (figure 6) | Athlete to control ascent with weight on lateral border of foot - medial border still remains in contact with floor. |
| | | | Is the load too great? |
| | | | Possible hip abductor weakness? |
| | Trunk remains in the vertical position | Anterior forward trunk lean (figure 4) | Athlete to maintain extension in spine and keep trail leg hip extended. Is the load too great? |
| | | | Use of dumbbells to lower centre of gravity and reduce spinal compression - helps maintain spinal extension |
| | | Lateral trunk lean (figure 5) | Athlete to widen stance of lead leg from midline of trunk |
| | | | Use of dumbbells to lower centre of gravity and increase stability |
| | | Spinal flexion | Weakness in spinal erectors? |



Figure 1. Start Position



Figure 2. Descent



Figure 3. Ascent



Figure 4. Anterior



Figure 5. Lateral Trunk Lean



Figure 6. Knee Valgus

Application

Limited flexibility of the hip flexors of the trail leg (including the knee extensor Rectus Femoris) will lead to an anterior forward trunk lean. Limited flexibility in the hip and knee extensors will restrict the range of movement of the hip and knee through the descent of the split squat. With this in mind, using a body weight unloaded split squat as a dynamic or static flexibility exercise can improve the flexibility of the hip musculature as this can be incorporated as part of a warm up. Mobility of the hip joint is not limited to the flexibility of the musculature around the hips, but also by the mechanical structure of the joint (For further details, refer to Sahrmann's Diagnosis and Treatment of Movement Impairment Syndromes). Increasing the multi-planar mobility of the hip is essential for its health and the ability to safely complete compound movements without excessive lumbar mobility. A split squat can be an affective tool to help with this important hip mobility along with the flexibility of the hip musculature.

The split squat has a variety of progressions and regressions (some described above in the technique solutions) for the strength coach to implement within an athletes training programme. Completing the split squat holding dumbbells to the side rather than a barbell across the shoulders will lower the athlete's centre of gravity. This can help improve balance and stability of the movement by bringing the mass closer to the line of centre of gravity.

A natural progression of the split squat is to develop the movement into a lunge. The lunge will have a large eccentric loading of the hip and knee extensors while also decelerating the lead leg. This action is similar to that seen in lunges in racket sports such as tennis and badminton. Again, the use of dumbbells can be used to improve stability and balance.

A further progression is the bench split squat where the trail leg is raised on a bench. This will increase the loading of the lead leg while reducing the loading of the trail leg. The base of support is further reduced making ankle, knee and hip stability even more significant when completing the exercise.

Hopefully, you will now have a greater understanding of the mechanics and technique of the split squat. Having this understanding will assist the correct implementation of the split squat within a training programme and also encourage you to question the inclusion of other exercises within a training programme.

Acknowledgements

Thank you to Richard Chessor, the photographer for this article.

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Column Editor, Graham Turner, interviews **DR AUDREY DUNCAN**, *ASCC*, Scottish Institute of Sport Approved Strength and Conditioning Supervisor, BASES Accredited Physiologist



Audrey, you are currently Sport Science Manager at the University of Dundee Institute of Sport & Exercise but you can tell us about your academic career prior to obtaining this position? You studied for your first degree at Glasgow University. Was this where your interest in Strength & Conditioning began and how did you first get involved?

Before studying at Glasgow University, I spent a year at high-school in Florida and the attitude (at this time) towards sport, and sports science, in schools at a time when Sports Science was still in its infancy in Scotland, was what sparked my interest and confirmed my decision to study Sports Science. I went on to study an undergraduate degree in Physiology and Sports Science at The University of Glasgow but while this course struck a good balance between the science and the application of the science, strength and conditioning (at this time) was under-represented. As such, it wasn't until later, that my specific interest in strength and conditioning grew, firstly as an athlete, then as a coach, then as a researcher and finally into a Strength and Conditioning coach.

You went on to study for your PhD in Birmingham. This is of course the ultimate academic achievement. What advice would you give to anyone else contemplating embarking upon such a journey?

I worked towards a PhD while on a studentship at The University of Birmingham with Dr Martin McDonagh, in the area of motor control. Undertaking a PhD is a commitment both in terms of time (and money or lack of it) and in terms of career direction because of the potential to specialise in a particular area. The best piece of advice I can provide is to embark on this because you want to answer a question in an area that interests you (and to which the question hasn't yet been provided), and not just to obtain a few more letters after your name. On reflection, I would say that the individuals who have the potential to get the most out of a PhD are the ones who have been working in the industry first, whatever that is – as a coach... a scientist... a researcher... – they have a working knowledge and understanding of the area and have identified the gaps and the questions that need to be answered. Even now, I am undertaking applied research to try and answer questions that I realise the literature can't provide for my programme areas. Most importantly, in our field... it's important to remember that science has to at some point be able to be translated into practice (ie get from the lab to the field).

You were awarded the Philip Read Memorial Award for the best presentation by a young investigator for your presentation entitled 'Motor Control of Eccentric Muscle Contraction in Landing' at the Annual BASES Conference in 2001. Is this work from your PhD?

Yes – this presentation was founded on research undertaken during my PhD and a lasting memory of this conference was the opportunity to discuss and present this research with the late Dr Mel Siff. If you haven't read "Supertraining", you should!



AUDREY DUNCAN

What does your role as Sport Science Manager at the University of Dundee Institute of Sport & Exercise involve?

It's pretty far reaching... I contribute to our undergraduate BSc degree in Sports Biomedicine, provide sports science support programmes for athletes and coaches and manage the day to day administration of the sports science support programmes (budgets, equipment, labs, staffing etc). Our sports science consultancy service encompasses physiological testing and monitoring (field and lab), strength and conditioning support (programming, monitoring & supervision) as well as coach and athlete education programmes on varying aspects of performance. Ideally this is done as part of an integrated and interdisciplinary support team approach.

How does this position combine with your S & C work for the Scottish Institute of Sport?

My strength and conditioning work for the Scottish Institute of Sport is an integral and important part of the consultancy work that I undertake within my role as Sports Science Manager. The University of Dundee greatly values

the contract with the Scottish Institute and we work closely with them to ensure the programmes of support are appropriate and progressive. I am currently lead strength and conditioning coach for the Scottish Institute of Sport golf programme and my colleague, Paul McPate and I provide supervised training sessions for Tayside and Fife Area Institute of Sport and Scottish Institute of Sport athletes who live in the Dundee area.

Which different sports have you worked with? You specialise in supporting Scottish Golfers. What does this entail and what are some of the challenges that you have faced?

Over the last eight years, I have provided strength and conditioning support for a number of different sports and athletes across the performance continuum, from grass root to Olympic level. With the network of strength and conditioning set up in Scotland, The University of Dundee provides supervised training sessions for athletes within the Area Institute and Scottish Institute setup who live in the Dundee area and as such I work with all of the core sports supported by the Institutes (including eg hockey, rugby, swimming, golf, football). I've also worked with a number of sports and individuals outwith the Institute set up ranging from fencers to skiers to track athletes. We have, however, developed a particular expertise in the sports of football and golf. Each sport and individual brings with it its own challenges and a constant process of needs analysis, intervention and evaluation is essential.

With regards to golf... I am currently lead strength and conditioning coach (and exercise physiologist) for the Scottish Institute of Sport golf programme as well as for the Scottish Golf Union amateur squad programme. The sport of golf is an interesting one to work with, in particular as we have seen the culture change that the sport has undergone over the last 5-10 years. Golfers are increasingly recognising the importance of a programme of physical preparation as an integral component in their preparation for performance. We only have to look to the two leading professionals (Tiger and Annika) to see that golfers are becoming more athletic. The overall support doesn't differ from any other sport though... I educate them on warm-up (in the gym and on the course), cool-downs and recovery, write strength and conditioning programmes, provide or facilitate supervised training where appropriate and implement a monitoring programme to track progress both in the gym and in the field. I've also accompanied squads on training and competition camps. What's perhaps different with golf is the lack of current (but growing) research undertaken on the physiology of this sport that makes it a challenge, but an exciting one, to work with.



Golfers are increasingly recognising the importance of a programme of physical preparation as an integral component in their preparation for performance

What is your greatest achievement as an S & C Coach?

There are many examples but let me present two extremes...

Sometimes the day to day achievements can be the most satisfying... getting an athlete to commit to regular training, master technique, return from injury, improve their posture, prevent relapsing injury/pain, increase their confidence, engage mentally in a programme... all bring a sense of achievement (and the associated frustration if it doesn't work this way!).

However at the glory end... being able to work with the Scottish Institute of Sport women's curling squad in their lead up to Olympic gold medal in 2002 (as Scottish Institute of Sport lead S&C coach for curling) was a fantastic experience. There was an integrated support team looking after this squad, of which I was an integral part, and it was rewarding to work with Rhona Martin's very committed squad (in another sport which was undergoing a culture change with regards to physical preparation).

S & C Coaching is currently a predominately male profession. What is needed to get more females involved?

I have to be honest and say that I have never once felt as if I was a girl in a man's world and personally, I've never felt disadvantaged (or advantaged!) for being a female in the industry. I've just followed a path that I was interested in and passionate about and would recommend any other individual (male or female) to do the same. However, I do acknowledge that the profession as a whole is male dominated. This perhaps stems from the misconception of strength and conditioning from the classical body-building or intimidating weight-lifting image. As an association, the more we profile our work with athletes (of all levels) and the more we educate the wider community about our work, the quicker these myths will be broken. I believe this is already happening.

As an industry, I also think we will benefit from having more female coaches (and / or female athlete role models) involved – in some sports there is still a reticence for female athletes to engage in strength training because of the concern of building too much muscle bulk. Female coaches and female athlete role models may help break this myth.

Who has had the biggest influence upon your development as a coach and what have you learned from him or her?

Am I allowed three answers? I have to give credit in the first instance to two accomplished athletic coaches that I was very fortunate to work with as an athlete, Alan Scobie (West of Scotland) and Mike Dolby (Midlands). These were two pro-active coaches who were using Olympic lifting long

before it became topical or sexy. I learned how to lift technically correctly and to appreciate the importance of Olympic lifting with these coaches. However, in the years since hanging up my spikes, I have to say that Dave Clark, Head Strength and Conditioning Coach for The Scottish Institute of Sport, has been instrumental in up-skilling me, providing opportunities for professional development, opportunities for networking and putting knowledge into practice with the fantastic network of coaches and facilities that he has set up in Scotland. He has challenged me and allowed me to challenge him and my knowledge and skills have been fast tracked as a result of this. There is now a network of S&C coaches within Scotland (part and full time) who are in a similar position and we continue to develop through professional exchange, sharing ideas and programmes, with each other.

What would be top of your wish list to help you improve the way that you do your job?

At the moment, I have to say facilities but since we've just started a new facility development which will house a Regional Strength and Conditioning Performance Centre (with part funding from SportsScotland), this isn't so much a wish list as a wish list for completion on time (summer 2007 – watch this space)! However, a facility is only a room and to make success you need committed athletes and a committed group of integrated support staff working alongside you.

What advice would you give to an aspiring Strength and Conditioning Coach?

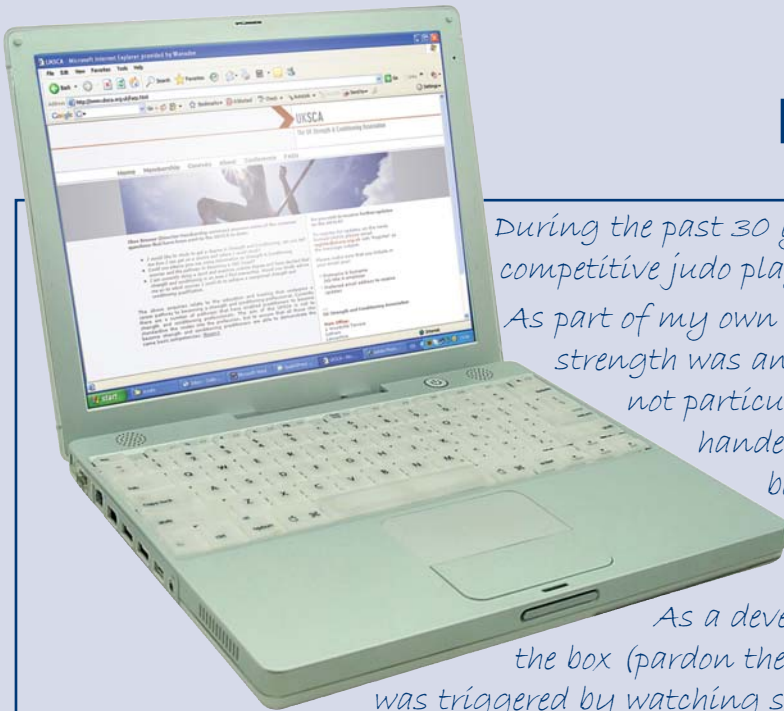
The same advice I would give to an athlete... if you want to succeed you've got to work at it. You'll get out what you put in and how far you take it is up to you.

More practically... as with all career development, I would say that gaining relevant experience is essential on top of the relevant qualifications. As an employer, I would be looking for this on a CV both to show commitment to the field but also to show that the individual can put theory into practice. There is now a fantastic network of Home Institute, and UKSCA accredited, strength and conditioning coaches across the country who can provide experience, advice and mentoring... ask a local one what route is best for you. Don't be afraid to ask questions (or to be wrong).

Similarly, starting to work towards a programme of CPD which will culminate in UKSCA accreditation will become essential if any individuals are hoping to aspire to become a strength and conditioning coach with any of the Home Nation Institutes and /or Governing Bodies of Sport. With London 2012 and (can I hope for...?) Glasgow 2014, it's an exciting time to be involved in elite sport, and equally with the associated health legacy that will follow on from this.

MEMBER'S VIEW

from UKSCA member
NIGEL THOMPSON



During the past 30 years, I have been involved as a competitive judo player, and now as a coach.

As part of my own personal competitive training programme strength was an important factor, but the exercises were not particularly sport specific, and were exercises handed down by past coaches! This has often been the case for so many athletes, and I am sure many of us have similar stories to tell!

As a developing coach I felt the urge to look outside the box (pardon the pun), at strength and conditioning, this was triggered by watching so many young judo cadets competing internationally, and just simply being overpowered by their opponents explosive abilities. "I felt a desire and need to explore".

I thought I would start at the very top and contacted the British Olympic Association to put me in touch with a recognised strength and conditioner in my area (East Anglia). I was first put in contact with Tim Newenham from the E.I.S, who helped enormously in my journey, with information and knowledge, from which I attended a Strength and Conditioning Symposium in Largs, Scotland during May 2002, where I met for the first time the likes of Gil Stevenson, Mike Stone, Meg Stone and Marco Cardinale.

This completely opened my mind and I became hooked on the strength and conditioning concept, and now yearned practical and sound knowledge.

To my delight UK Sport were running a two-day workshop in March 2003, headed by Gil Stevenson at Loughborough. This was my very first taste of Olympic lifts and its derivatives, and feel it's a judo player's dream to have such sport specific explosive movements, which just simply work hand in hand with our sport.

After the workshop I carried out further research, from a variety of sources, purchasing my own bar and weights, and practising whenever possible. Moreover, I have since attended several workshops run by Gil Stevenson and Clive Brower, and find them as stimulating as ever, learning something every time!

In just over three years I have gone from conventional weights to Olympic lifts and its derivatives, and my athletes now have these as a key part of their strength and conditioning programmes.

My goal is to become a certified UKSCA practitioner, and in particular to introduce sports specific strength and conditioning programmes in cadet, junior and senior judo. I also wish to expand my coaching further, taking up the challenge from a variety of different sports.

The recent development of UKSCA provides a fantastic base for my future development.

Send us your views: info@uksca.org.uk

Strength and Conditioning: What is Specificity?

Dan Cleather MA, ASCC, CSCS

English Institute of Sport S&C Coach in the London region

The principle of specificity is one of the least well understood concepts in strength and conditioning. Broadly, the principle of specificity states that any training conducted by an athlete should be specific to their sport. This maxim should be interpreted in a general sense. All sports require an athlete to have a number of qualities to be successful (for example, skill, speed or strength). Therefore, any activity that improves a quality that is necessary for a given sport is specific to that sport. Where the confusion lies, is in the fact that the term sport-specific is sometimes interpreted too narrowly. For example, some coaches may advocate training that replicates a particular movement pattern evidenced in their sport, only use training modes that emphasize the prevalent energy systems in a sport or utilize training philosophies that mirror those of the sport. Of course, this approach is not inherently flawed – the fault lies when training is restricted only to activities defined by such a narrow definition of sports specificity.

No matter what approach a strength and conditioning coach takes to training his or her athletes, ultimately the defining philosophy of his or her system is that it is impossible (or at least not efficient) to get in the best possible shape for a sport simply by participating in that sport. If this was not the case then strength and conditioning would be obsolete and athletes would train solely in their sport. Generally, after an athlete has reached a certain level of cardiovascular fitness, strength, speed, etc, by playing their sport they cannot make further improvements simply through continued participation in their sport. Instead to make further gains they need to seek other training modalities that allow them to further challenge their physiological system and hence make continued improvements. This is analogous to the principle of progressive overload .

It is important, therefore, to distinguish between playing and practicing sport skills and strength and conditioning training for a sport. In the former, an athlete is concerned with improving their skill base and becoming better able to use their physical attributes in the competitive environment. In the latter, an athlete is focused on developing their physical attributes in order to be a more commanding physical presence when competing. This distinction is important. The weight room (or track, etc) is not an appropriate place to develop specific sporting skill, and if an athlete needs to improve in this area this should be achieved through increased skill practice. In fact, later we will explore why training activities should not be too movement pattern specific. Instead the weight room should be used for developing physical qualities and general movement skills.²



Dan Cleather

Plyometric exercise – hurdle hop. From a performance perspective, plyometrics are most effective when an athlete has developed some strength capabilities, and plyometrics are used to transfer this strength into power.



Modern training in sport is generally structured around a periodised plan. Periodisation is the planned progression of an athlete through a series of training cycles with different aims leading to a planned peak in performance at some point in the competitive season.¹ Classically a periodised plan begins with a period of high volume, low intensity training, and over the course of the season volume is reduced and intensity increased.¹ The amount of technical practice increases commensurately with the increased intensity. Another way to characterize a periodised plan is by considering it as three phases: a period of general training, a period of specific training and then the competitive season.^{7,12} It is important to note that the success of any periodised plan is, therefore, built upon a foundation of general physical preparedness (GPP). Thus in order to reap the benefits of more specific conditioning and increased technical practice the athlete must first be physically prepared in a general way (with regards to the qualities that are important for success in their sport). If we extend this model to a long term athlete development plan we can infer that before an athlete can reap the most benefits from specific training, they must first become a well conditioned athlete.²

An example of this is the employment of plyometric training in athletics. Many coaches use these more specific tools for the development of

explosive power early in the periodised plan before a period of structured strength training. This exposes the athlete to an unnecessary injury risk as they may not be strong enough to withstand the forces developed. From a performance perspective, plyometrics are most effective when an athlete has developed some strength capabilities, and plyometrics are used to transfer this strength into power. Equally, plyometrics are often used too early in an athlete's long term development. The NSCA recommends that an athlete should be strong (i.e. generally physically prepared) enough to back squat one and a half times their body weight before commencing a plyometric training programme.¹

Thus when we consider sport specific training we must first ask ourselves what general qualities are specific to that sport and to what extent has the athlete trained and developed these qualities? In many cases this type of analysis will reveal that the most specific training that that athlete can then do is to train for the improvement of some very general qualities.

We have already defined sport specific training as being focused upon improving the qualities that an athlete needs on the field. In the selection of appropriate training activities we must be careful to ensure that the stimulus prompts adaptations that improve performance on the field. This is the concept of transfer of training. The degree to which a training modality transfers is hard to evaluate, with the gold standard being validation of training protocols in peer reviewed research. For example, there is an abundance of literature that demonstrates that strength training with free weights results in adaptations that transfer to a wealth of sports.^{3,5} Not all training modalities have been shown to be as effective, however. For example, preliminary research suggests that some types of core stability training may not be performance enhancing.⁹ Similarly, we need to guard against making intuitive (and possibly erroneous) judgments. For example, does an increase in balance skill on a swiss ball, really translate to improved balance on the rugby field. Balance skills may not be transferable generally, and in this case there are differences between swiss ball activity (where the supporting surface moves) and rugby (where the ground stays still and everything else moves).¹⁰

In the selection of appropriate training activities we also need to consider the effectiveness of a training modality. For example, if a rower is training for pressing strength, is a flat bench press or swiss ball dumbbell bench press more appropriate? Although both activities will increase pressing power the flat bench press will allow the athlete to handle a greater load and thus increase pressing power more efficiently. One might argue that the swiss ball version will improve that

athlete's balance, but a) will this transfer to the water, and b) is this gain worth the sacrifice of greater strength improvements.¹⁰

In choosing training activities we also need to appreciate the potential for a negative transfer of training. A negative transfer describes a reduction in sporting performance due to sport specific training. For example, a cricketer who practices bowling with weighted balls in order to improve their "throwing specific strength" may become less accurate – with a consequent decrease in performance. A negative transfer can often arise when a training movement pattern is too similar to the sporting skill. In this case a "pattern confusion" arises – the two motor patterns are too similar and the body's ability to perform the original skill is diminished.⁶ For this reason it is often useful to choose training activities that are different to the sporting skill. Remember, we train for sporting skill on the field, and use the weight room to improve general skills and physical properties.

Selecting training activities that are different to the sporting skill also introduces variety to the programme. Variety in training is vital in terms of making continuing improvements and preventing overtraining.¹¹ One of the pitfalls of narrowly defined sport specific training is that the programme becomes based upon improving only one or two components of fitness and this compromises potential gains. For example, if muscular endurance is important to your sport (for example in rowing) a narrow definition of sport specific training might restrict your work in the weight room to specific muscular endurance training. However, there is a strong correlation between maximal strength and muscular endurance,¹³ therefore, muscular endurance can also be improved with maximal strength training. The most efficient training programme may therefore include both of these facets of strength training.

When considering elite athletes, variety in programming becomes critical. These athletes may spend hours each week in very specific training. To continue the rowing example, elite rowers may spend twenty hours a week rowing on the water or ergometer. A narrow definition of sport specific training would suggest that the most specific work these athletes could do in the weight room may be circuit training (which trains the cardiovascular fitness necessary for their sport) or muscular endurance training. However, these athletes are already engaging in this type of activity for hours each week in their training, and the law of diminishing returns suggests that more of this type of work will not improve their fitness noticeably. Conversely, if these athletes engage in strength or power training they may improve dramatically, and these gains could transfer to the boat in terms of improved

muscular endurance as a result of increased strength, increased power in each stroke (making the boat travel faster) and improved posture (due to strength and flexibility gains).

When considering specific training it is, therefore, important to have a broad frame of reference and take an holistic view of a training programme. Fitness qualities should not be viewed in isolation. For instance, increased strength may improve an athlete's agility, aerobic training may allow an athlete to reap better returns on their strength training and flexibility training may improve an athlete's power. Most athletes would benefit from becoming more generally athletic. Not only will this improve their quality of life, but improvements in overall athletic ability generally transfer well to the sporting context.

A broad philosophy of training may encompass many topics and considerations. For example, the best injury prevention strategy may involve exercises that from a performance perspective can not be considered to be specific at all. However, being healthy and able to train and compete is clearly the paramount concern of any training programme. The more specifically an athlete is training the more important general training becomes. If an elite rower was to train purely specifically (in the narrow sense of the word) they may only engage in pulling activities. This would result in imbalances in muscular strength across joints due to the pulling musculature being relatively more developed than the pressing musculature.

The purpose of this article is not to argue that sport-specific training is unnecessary. In fact, all training objectives should be considered in relation to the specificity of the adaptation for a given sport. However, the criteria by which specificity is assessed is often poorly understood, as illustrated in this article. The appropriate criteria for assessing the specificity of training are encapsulated in the principle of dynamic correspondence,⁷ which states that training should be chosen with consideration to the following factors.⁷

- The amplitude and direction of movement
- The accentuated region of force production
- The dynamics of the effort
- The rate and time of maximum force production
- The regime of muscular work

A detailed description of this principle is outside the scope of this article. Suffice it to say that it is common for activities to be considered specific to a sport based purely upon kinematic (i.e. movement) considerations. However, we also need to consider the kinetics (i.e. force, energy and power) of a movement.² Similarly, we may need to consider the metabolic or hormonal demands of an activity, the mechanical specificity or the joint angles at which forces are

developed.⁸ A detailed evaluation of the similarities between activities is generally quite involved.⁴

When designing a sport specific training programme it is important to guard against being too specific. The best method of training is not simply to overload the particular movement patterns involved in a sport.⁷ If the best way of training an athlete was to replicate their sport in the weight room, then the most efficient training would be to simply participate in their sport. If this was the case, there would be no need for strength and conditioning coaches.

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The members below are all UKSCA Accredited and as such have proven their competency against the nationally agreed standards in strength & conditioning. The National Register is now available online on the UKSCA website to enable users to search for Accredited members by name or postcode.

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OPTIMISING SPEED AND AGILITY DEVELOPMENT USING TARGET CLASSIFICATIONS AND MOTOR LEARNING PRINCIPLES – PART TWO

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Part one of this article deconstructed agility movements into a number of basic patterns, each with their own target functions and mechanics. In this article, this theme is developed to address the issues of constructing agility development programmes which conform to the basic principles of motor learning. In this way, the long term development of agility can be optimised

Optimising drill distribution within a session

Part one of this article outlined the need for selecting drills that develop the key target mechanics associated with a given movement. Once selected, the way in which they are arranged can also influence skill development.

Random practice, where different drills are carried out on successive trials is the most effective way of enhancing the long term development of skills.^{5,6,10} This is believed to be due to the fact that during a random practice, athletes must retrieve a motor program and parameterize it before each movement, as they are producing different movements from one practice attempt to another.¹⁰

Random practice is the preferred method of drill distribution within a session, apart from with complete beginners, where blocked practice (where all the reps of a single drill are performed successively) can be effective.⁹ To utilise this advantage, drills should be randomly arranged wherever possible. *Figure 1* outlines how three attempts of four drills (sideshuffle, cutting, backpedal and cross-step) can be arranged in a blocked arrangement and a random arrangement.

Variability in practice, where the drill is varied on successive trials, is another excellent tool for the coach, and can enhance error detection capacity,⁴ which can further contribute to an ideal learning environment. All drills can be varied in terms of

direction, distance, or movement combinations e.g. a sideshuffle drill can be over varied distances, and can be followed by a sprint away in multiple directions. By varying each drill as often as possible, what is developed is a general capability to produce many different versions of a class of actions, a general rule for movement, rather than just the capability of producing one action, in other words a schema.⁷ This is especially effective for developing skills in open situations.⁹

Coaching is key

The amount of quality practice is possibly the most important element of any skill development programme. In developing agility, simply selecting an appropriate drill for an athlete, one which develops the key movement patterns and mechanics, is only one part of the equation. Equally important, if not more, is the quality of the athlete's movement during that drill, and

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Figure 1. Blocked and random arrangement of four agility drills

| BLOCKED | RANDOM |
|---------------|---------------|
| 1 Sideshuffle | 1 Sideshuffle |
| 2 Sideshuffle | 2 Cut |
| 3 Sideshuffle | 3 Backpeda |
| 4 Cut | 4 Cross-step |
| 5 Cut | 5 Sideshuffle |
| 6 Cut | 6 Cut |
| 7 Backpedal | 7 Backpeda |
| 8 Backpedal | 8 Cross-step |
| 9 Backpedal | 9 Sideshuffle |
| 10 Cross-step | 10 Cut |
| 11 Cross-step | 11 Backpedal |
| 12 Cross-step | 12 Cross-step |

coaching is vital to ensure that this conforms to the key target mechanics for that movement (as outlined in article one). It is important that the athlete is firstly aware of the target mechanics, and secondly develops the ability to perform these movements efficiently and effectively. Additionally, it is important that they develop their ability to detect errors in these mechanics, and appropriate coaching feedback is essential here. It must be remembered that no matter how specific the drill, it will not be effective if the movement patterns are not correct, and quality coaching is vital in establishing these patterns. There are a number of ways in which the coach can optimise their levels of coaching:

- introduce the session
- provide quality instruction
- provide quality feedback

Introducing the session

Athletes are motivated when they see how their work relates to their goals i.e. how is this drill going to make me a better player.¹¹ Whilst the aims of many of the drills may be clear to the coach, the athlete is not always aware of these aims. By relating the drill to how it can affect their performance the coach can enhance motivation and the subsequent adherence to the session.

Providing quality instruction

The level of initial instruction is an important part in any speed and agility programme, as it is vital that the athlete is provided with a general idea of the movement. While providing instruction, the coach must keep in mind that the short term memory is limited to just a few items, estimated at 7 +/- 2⁶ and athletes will only be able to remember a few of the things they hear. The coach should be wary of giving too much information, and should limit their instruction to

one or two key points. Additionally, the way in which the coach gives the instruction is important. Athletes have differing preferred forms of communication, either visual, auditory or kinaesthetic. If a coach can integrate all three of these into their instruction, then they are likely to enhance communication with all of their athletes.⁸ For example a demonstration (a visual instruction) can be supplemented with an auditory instruction (e.g. land on the balls of the feet), and a kinaesthetic element (e.g. feel you are treading on hot coals). The use of consistent terms and cues enhances athletes understanding, and the ability to transfer the term into different situations for example an athlete familiar with the term athletic position will be able to transfer its use across a range of movements.

Using demonstrations

Quality demonstrations are an important tool in a coach's armoury. A quality demonstration provides the ideal medium for the communication of a skill to those with a visual preferred communication style. By integrating verbal and kinaesthetic instruction into this demonstration the coach can enhance the quality of the demonstration yet further. As with any form of instruction, a demonstration can provide too much information, and cueing techniques that direct the athletes attention to important aspects of the demonstrated model are important tools for the coach. These cues will need to become more advanced and precise when working with more advanced athletes.

Guidelines for giving feedback

Feedback will be related to the athletes ability, and it should be remembered that more is not necessarily better. In general, the more developed the athlete the less feedback they will need. However, whilst advanced athletes require less feedback, the precision of this feedback needs to be much greater, as more precise performance adjustments need to be made. The aim is to produce athletes who are able to consistently monitor their performance, and make adjustments to their performance as and when required. This requires the ability to detect and adjust to key performance information, but this is not always a natural development, unless the ability is developed by effective feedback it will remain undeveloped. To facilitate this, the coach needs to assess the athlete's ability to access important information,³ and shape their feedback appropriately. Via the use of tools such as movement related questions, the coach should be able to determine the athlete's ability to detect and correct errors and in this way can determine the type and quantity of feedback needed.

In the early stages, the key is to give the athlete

general information about the movement, and their patterns of actions within this framework.¹⁵ The aim of this process is to progressively develop the athlete's abilities of error detection and correction, and this requires the coach to draw an athlete's attention to the key elements of performance. Given the limit of the short term memory feedback⁶ should be restricted to one or two points, and should focus on the major limiting factor within current performance.¹⁴ In general, a good guideline for feedback is that it should be clear, direct and limited to avoid information overload. The feedback should also be directed at factors within the athlete's control, such as foot positioning, centre of gravity etc. Prescriptive (offering suggestions) as well as descriptive feedback is effective at enhancing performance.¹⁰

As the athlete's abilities develop, then the frequency of feedback will reduce,² to a point at which it will only be needed when an athlete's quality of performance falls outside a prescribed range. In these situations, feedback will be increased until performance quality again falls within the range of tolerance.¹⁰ As athletes develop and their movement become more automated, attention will need to move to key environmental aspects that dictate effective sport specific performance such as the movement of an opponent,⁵ as this is more conducive to skill development at this level.^{4,12,13,16} These will often be the key stimuli to which an athlete will need to read and react to within their activity. This is best developed via the use of specific random drills.

Throughout, the quality of feedback given will be dependent upon the coach's own error detection capacities. It is therefore vital that the coach has a thorough knowledge of the target movement patterns and the target mechanics required for optimal performance.

A Long Term Agility Development Model

To facilitate effective program design, a pyramid development system can be utilised which comprises three levels:

1. Foundation
2. Development
3. Peak

At the bottom of the pyramid is the **foundation** level, this broadly corresponds to the Cognitive (verbal-motor) phase of motor development which is the first stage in the learning of any skill.¹ At this time, the coach will often be introducing novel tasks, with the athlete needing to develop a general idea of the movement.⁴ This phase needs to develop the fundamental target movement patterns, and their associated target mechanics. The patterns developed at this stage will transfer well to the more advanced work to come later, and success at this stage will enhance

performance at subsequent levels. Failure to develop these patterns and mechanics will always compromise future performance. As many sports rely on the same target movement patterns, then general agility classes can be employed at this time, and classes like this can be effectively introduced into school classes. Guidelines for constructing foundation level sessions are given below:

- Develop the key discrete movements of the sport.
- Focus on movement quality not movement speed.
- Focus initially on single task skills.
- Use quality instructions utilising all three communication preferences.
- Perform skills in uncompetitive situations until the movement pattern is developed.
- Break down skills into smaller parts where appropriate.
- Use frequent feedback but without undue precision.
- Target only one area during feedback.
- Use distributed practice to minimize fatigue.
- Blocked practice can be used initially but following this initial period random practice should dominate.

The next level of the pyramid is the **development** level. This broadly corresponds to the Associative (Motor) phase of motor skill learning. This is the second phase of learning, where learners develop motor patterns.¹ It is important that this is only entered once the base level has been successfully completed, as the target mechanics and movement patterns form the basis of successful motor patterns. This phase needs to develop the ability to combine the basic movement patterns into the movement combinations of the athlete's sport. This is initially achieved via the use of closed drills such as bag drills, cone drills etc. As the drills become more sport specific, they need to identify key elements of the target movement patterns such as the movement combinations, the aims of each part of the combination, the directions distances and speeds of movement for each combination, which can then be utilised in the construction of appropriate drills.

Additionally, the coach should increasingly integrate sport skills such as using a hockey stick to increase sport transfer. As the phase continues there will be a gradual move towards more random (open) drills. Athletes will be seen to have completed this stage when they are able to produce effective, efficient, consistent and fluid movement patterns in a wide range of closed and open situations, with little need to focus on the movements themselves. Guidelines for constructing development level sessions are given below:

- Focus on the key movement patterns and transitions of the target skills.
- Initially use closed drills and then gradually move to open drills.
- Increase the speed of drills and introduce competition.
- Increase the variety of drills.
- Reduce the quantity of feedback, whilst increasing its precision.
- Challenge athletes to monitor their performance via questioning in feedback.
- Practices should be randomly distributed and include variance.
- Drills should be increasingly performed in the target context.

At the top of the pyramid is the **peak** level, which broadly corresponds to the autonomous stage of motor skill development, where movements are largely automatic.¹ Success in this level is based upon success in the previous levels, and the rush to perform drills characteristic of this stage is a major mistake. At this time, drills aim to express the potential of the previous levels, and there is in reality little difference between agility drills and the exact requirements of the sport. The coach needs to utilise sport specific drills, including read and react drills, performed in the target context (i.e. the sport specific environment). Movement focus can now be on the sport skills and the key reaction stimuli, in the knowledge that the basic movement patterns are being performed autonomously, via efficient motor programs. Guidelines for constructing peak level sessions are given below.

- Use a variety of complex open drills.
- Drills should be highly sport specific and in the target context.
- Drills should be randomly distributed and include variance.
- Feedback should be infrequent but precise.
- Feedback should enable the athlete to answer movement related questions.

Conclusion

By aligning the agility development programme with the principles of motor learning coaches can provide their athletes with the best possible learning environment. In this way, a long term development programme is essential, as the

ultimate quality of movement will depend upon the quality of the target movement patterns. At all times, coaches should be aware of the influence they have on the development of agility and how quality coaching can provide for the ideal learning environment.

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Weight lifting technique: Observations and coaching practice

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Clive is the National Lead for Athlete Development, Sportscotland

I am not sure how many members of the UKSCA read Brian Hamill's weightlifting newsletter. I would suggest that this is a worthwhile, as it contains many interesting snippets of information and opportunities to stimulate discussion amongst coaches. For example, in the latest edition (Bulletin 10), I particularly enjoyed the following extract:

"If you think what sprinters must do the point is clear. With a foot contact time of 0.1-0.2s he must push up to 5 times his own body weight. He needs great force capacity (strength) and a high rate of force development, neither of which come from open kinetic chain machines or high rep medium to low weight routines" (P.5)

Previous papers^{4,14} have illustrated the importance of multi-joint, multi-muscle lifting actions that replicate the biomechanical demands of sports specific movements.¹ This includes replication of joint ranges of movement (strength gain is specific to the angle at which training occurs⁷: incorporation of co-ordinated (simultaneous) triple extensions of the ankle, knee & hip,^{2,3,11,12} countermovements & very explosive actions.^{17,18} Weight lifting is also a medium that allows all of these factors to be progressively overloaded in an easily controlled manner in a skilled individual, through the addition of more weight to the bar whilst maintaining the velocity of the movement being performed.¹⁰

Brian's newsletter also refers to watching a strength coach working with a sprinter on the clean. The commentary refers to the fact that every demonstration included the double knee bend, but none included the hip thrust, with a consequence that the bar stopped at mid-pull (mid-thigh), went down, and then came up again.

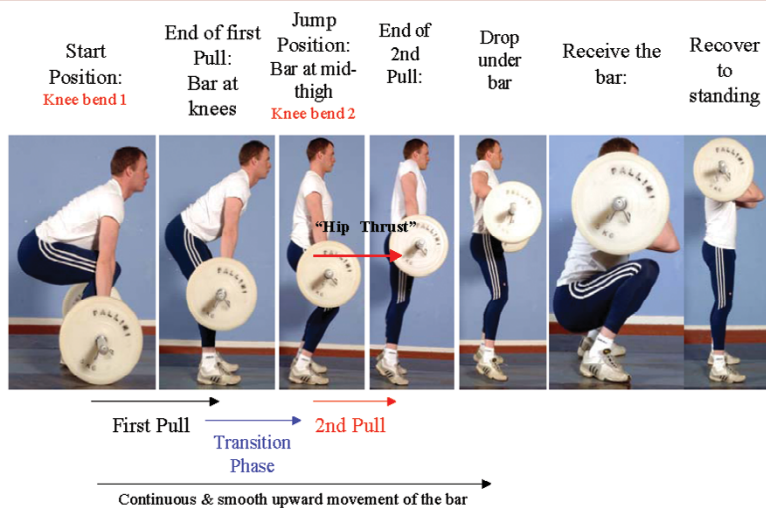
The purpose of this article is to try and articulate, as we do on the UKSCA weight lifting courses, that this is not the correct way to perform a lift, and not a practice that is the consequence of an appropriately developed technique progression, such as would be endorsed by the UKSCA. Prompted by Brian's newsletter, I have written this discussion piece to look at firstly what the correct positions of the bar are at each stage of the lift, and, more importantly, how a coach can put together teaching sequences that facilitate these positions as part of a natural movement within an athlete (with a sign-posting to a video-based resource that can be accessed for free). The end result should be that, when the full technique is displayed, the bar should move up the front of the body in "one clean movement", and there should be no loss in upward movement during this process. There will be a change in bar velocity at different stages of the upward movement,¹⁵ but it is a continuing upward movement none-the-less.

Before I progress to look at the different stages of the upward movement, can I also say that, whilst agreeing that the coaching demonstrations were not technically correct, we need to realise that there was no context upon the newsletters' authors observations of the coaching practice. I am heartened to hear that people are working with sprinters of different levels on free weight lifting techniques (as opposed to the some of the more traditional methods, such as circuit training or



Clive Brewer

Figure 1. The clean lifting sequence



done by completing the first pull appropriately⁹: through the jump position (where the bar brushes against the thigh as the lifter performs the hip thrust movement) creates a stretch-reflex in the knee extensor muscles.⁶ The need to incorporate speed-strength exercises, and to perform these at high velocities has been well documented for power-based sports.¹⁴ Similarly, when considering pre-habilitation of injuries, we need to ensure that the neuromuscular system is adequately trained to

those referred to in the above quote), and also, we need to consider the amount of coaching experience that the observed coach has: Nobody gets to become good without gaining experiential learning on the way, and that means not being afraid to make mistakes on the way, and trying things to develop your own coaching methods, and individualise these to each athlete, as no 2 athletes will have the same pattern of technical execution!

Being receptive to feedback about your coaching practices is part of this process. Therefore, as part of the coaching role, I would encourage experienced practitioners to ask some questions that enable coaches to think about the practices that they are delivering. Effective questioning is a vital tool that enables levels of awareness to be raised from “unconscious incompetence” (I don’t know what I am doing wrong) to conscious incompetence (I know what I am doing wrong), and this can form the basis for action planning to enable the coach to become consciously competent (I know that what I am doing is right – or within the boundaries of technical competence). I would hope therefore that, within the UKSCA, we become confident in speaking to other coaches at the end of the session and asking questions of the coach about what they were trying to achieve. I hasten to add that this should be done in a supportive & non-threatening manner, and not in front of the athlete, but it should stimulate some interesting dialogue, and hopefully some learning scenarios, that enable coaching practices to progress towards more acceptable technical deliveries.

So what are the correct technical positions for the lift described, and how can we develop these in our athletes? Firstly, let us look at the positions of the body and bar that should be achieved as the bar moves up the body in a clean or snatch lift (Figure 1).

These stages of the lift are crucial, as moving through a transition phase (which can only be

tolerate the imposed strains during functional tasks.¹ Most explosive movements in sport (such as running kicking or throwing) involve the reflex/elastic properties of the muscle-tendon complex and are ballistic in nature, even when initiated from a static position. For more information on the stretch-reflex, the reader is directed to Siff.¹³

Training for maximum strength will not train these elastic properties within a muscle, therefore training for sports should not only encourage the inclusion of such stretch-shortening (plyometric) methods, but it should also incorporate stretch-shortening cycles into training movements as much as possible to enable the athlete to produce maximal forces in training movements. The amortisation or reactive phases of the stretch-shortening cycle (the transition phase between eccentric lengthening and concentric shortening) should be as short / rapid as possible (hence the movement through the first pull, transition and jump phases of the lift is a smooth and continuous process): Indeed, the rules of competitive weightlifting were changed in 1964 to allow the bar to come into contact with the athlete’s thighs. This occurred as a result of coaches and athletes realising that heavier weights could be lifted by taking advantage of the double knee bend movement. Since this rule change, 99% of the first 5 places that have been achieved at international competition have been won using a DKB technique.¹⁶

Over time, many coaches have observed that the transition phase (or double knee bend – see Figure 1 – however it is termed) “just happens” in experienced lifters. However, it would seem logical for a coach to be able to make a particular skill execution happen in all athletes from the initial phases of skill learning, rather than waiting for an athlete to stumble upon the technique as an accidental phenomenon.⁴ Put another way, given the fact that the major training benefits of the snatch and clean cannot be gained by an

athlete who is not experiencing the stretch-shortening cycle of the transition phase, it can be argued that the coach who is not using techniques to make this happen is doing his / her athlete a dis-service: Therefore the way the coach teaches the athlete to perform these pulling movements in training should lead to the correct execution of the lift. However, this doesn't mean that the most appropriate manner (realising of course that the "most appropriate manner" is specific to the needs of the individual athlete) in which to coach this is to start with the bar on the floor and coach the lift in sequence.

Indeed, Mike Stone and I⁵ published an internet paper with video clips suggesting a backward sequencing approach to coaching athletes so that they learn the positions of the lift whilst performing specific drills and activities that are great training exercises in their own right. This paper (which charts a learning progression with a novice athlete) and videos are freely available to readers at the following address:

http://www.coachesinfo.com/category/strength_and_conditioning

As presented by Internationally respected (and UKSCA accredited) colleagues from the USA, both Mike Stone (UKSCA Conference, 2005) and Kyle Pierce (UKSCA conference, 2006), it has long been recognised that often the best starting point for teaching both the snatch and clean lifts is the end phases of the lift, i.e. the front squat and overhead squat respectively, that can then be progressed to more specific and high velocity exercises such as the drop-snatch. This paper looks at sequences that might follow these stages, in relation to getting the bar up the front of the body.

Drill 1: 2nd pull from thigh:

Anecdotally speaking, I would suggest that the pull exercise (from the floor, knees or thigh) is one of the most undervalued and utilised in coaches programmes, and one which has many values in its own right. This movement allows the athlete to develop vertical power without the technical complexity and physical demands of the catch.

The athlete begins in the jump position, with knees bent to between 130-140o, and trunk vertical. To identify what will be the ideal position for individual, have them perform a couple of maximal counter-movement vertical jumps, and then hold the bottom position. This will give them an indication of the end point of the transition phase (the "jump" position).

This movement can also be made from boxes set at a height that puts the athlete into the jump position to initiate the movement (Figure 2). This has several advantages:

- It ensures that the athlete experiences a consistent jump position at the start of every lift: This replication aids the motor learning of the position.

- The boxes prevent the novice athlete moving downwards from the start position in an attempt to put in another counter-movement to potentiate more vertical force.

The boxes allow the athlete to rest between repetitions without strain on the novice athletes grip or legs.

These supports need to be sturdy and able to cope with the mass of the bar landing upon them. However, as Figure 2 shows, when doing technique work, these boxes can be built up from more temporary platforms. It is essential that the height of the platform be set at the correct height for the athlete to begin the lift in the jump position: This is determined by the height of the athlete. In the first few months of lifting, our⁵ experience tells us that the athlete should perform the majority of his / her pulling movements from this position, to ensure mastery of this stage of the lift.

Holding the bar in either the snatch or the clean grip, the athlete accelerates vertically into the triple extension position (Figure 3) followed by a violent shrug.

Drill 2: Jump, Shrug, throw:

This is a progression of drill 1: The purpose of the drill is to reinforce in the athlete the importance of the pulling movements (jump and shrug sequences) by getting the athlete to perform 2 consecutive pulls followed by a third movement which sees the completion of the snatch (or clean) lift from the high hang (jump) position. The idea is that the athlete will do nothing different in the pulling sequence of the 3rd stage of the lift (the "throw" stage) from the first 2 stages: However, the coach should watch out for cognitive intrusions relating to how to throw the bar interfering with the athletes movements at this stage. Coaching cues such as "shrug & Jump", "Shrug & Jump", "shrug, jump, THROW" may help the athlete focus away from thinking in depth about the movement patterns associated with the pull and catch stages of the lift.

This drill should also be performed from boxes as part of the lifting technique development. It can also be progressed by lessening the number of

Figure 2. The jump position from boxes (Snatch grip)



pulling movements that are performed prior to the completion of the hang clean/ snatch.

Drill 3: Shrug & Jump to hang position:

This drill is a progression from drill 2, designed to familiarise the athlete with the bar position at the knees (See Figure 1), and be comfortable moving through the transition phase, from beginning to end point, without having to link the transition and pulling phases.

Drill 4: Pull from knees:

The key positions to focus the athlete on feeling by holding them are: Bar at the knees (Start position), End of transition phase (Jump position), top of the Jump & shrug movement.

As Figure 5 illustrates, boxes set at the appropriate height for the individual provide a good starting point for this drill:

Drill 5: Pull from knees into snatch:

This drill is about 2 repetitions: A pull movement (knees forward, jump and shrug), followed by a snatch from the knees. The athlete uses the high pull movement to reinforce sequentially the stages of the pull, and uses this to potentiate for the snatch. The coach should emphasise that the athlete should not change the pulling movements between the pull and the full lift: the pull needs to be completed before the athlete moves into the position to catch the bar: An incomplete pull is often the reason why an athlete is not able to execute the catch properly in heavy lifting movements.

Drill 6: Reverse to floor:

This drill enables the athlete to further develop the proprioceptive awareness of each of the positions in the pull movement, including the movement from the floor. The athlete moves into a shrug, then down to the jump position, down to the end of the first pull (hang position: bar at knees), and then down into the start position. The

Figure 3. The top of the triple extension followed by a violent shrug (Snatch grip)



athlete should begin by holding each of the individual positions, then speeding the movement up so that the sequence becomes linked and fluid.

Drill 7: Knees back, knees forward, Shrug & Jump:

This is the first time that the athlete is introduced to the full pull sequence in its complete form. The athlete moves through the sequence following verbal cues from the coach. Thus the lift is artificially choreographed, allowing the athlete to move into the correct positions, in the right sequence, and begin to develop further motor programmes that will eventually enable skill mastery. The athlete should now be familiar with the individual positions; it is now the sequencing that the coach needs to reinforce. The speed of this can be gradually increased until the coach is confident that the athlete can self-determine the pacing of the movement through the positions into a fluid movement. It is also possible for one coach to choreograph a large number of athletes performing this motion simultaneously using this drill.

Figure 5. High pull sequence from box with bar at the knees



Figure 6. The choreographed double knee bend and pull



Coaching cues should focus the athlete in to the positions (which with practice will become more autonomous) rather than how to find the positions: If the athlete is focusing in on how to get into these positions at this stage, processing the technique thoughts may interfere with the automatic (unconscious) actions relating to the positions. Therefore the cues are kept as simple as possible:

Drill 8: Pyramids:

The athlete has now been familiarised into the DKB movement from the floor. In this drill the athlete moves the bar to the top of the pull, and then back through the positions of the movement to return the bar to the start position. This serves to reinforce both the movements and the positions of the pulling sequence.

After the technique practices, the athlete should now be challenged to put the movements together into a full lift from the floor, exploiting fully the positions of the complete movement.

Summary

Coaching techniques are developed through a process of education and experiential knowledge, and not all coaching techniques are relevant to every athlete: That's the art of coaching, and something that coaches may need help in developing.

The most efficient pulling technique for both the clean and the snatch lift has been observed over time to be one that incorporates a transition phase, or double knee bend. Not only does this introduce a sudden forceful stretch-shortening cycle into the movement, but the unweighted position also reduces tension on the back.⁸

This movement should be deliberately coached into athletes from the early stages of skill learning in order to ensure that athletes are utilising the most effective lifting techniques because of the coaching that they are receiving,

rather than despite of it. This paper has identified the key components of the double knee bend movement, and demonstrated a series of technique drills that a coach can use to develop this movement in the novice lifter from the outset of learning.

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