

PROP-SPECIFIC STRENGTH TRAINING AT THE SHOVE BY CONRAD COMER

Conrad Comer is the strength and conditioning specialist and sport psychologist at Truro College and South West England Rugby Academy. His background is as a sport scientist who qualified at Exeter University in Sport and Exercise Science. He has been an elite personal trainer as well as a rugby and cricket academy coach, giving him a uniquely wide perspective in the field of high-performance athletic training.

The scrum, like an arm wrestle, is often won and lost in the moments before the true pressure is applied. Between two equals, the competitor who obtains the upper hand usually triumphs. This applies to many competitive sporting contests, both on a psychological and physical level. The scrum in rugby is no exception; it is a battle within a battle that divides a team between those on the front line and those who can only stand and await the outcome before proceeding.

Much like an arm wrestle, the eight players that take dominance in the brief moments before the ball is put in will invariably carry the momentum and win up-front - and it's the role of the props to lead the charge. The question then is, how can we improve our chances of increasing our dominance?

Like most elements in sport, a combination of skills practice, tactical knowledge and physical training will bring about positive results. My background in strength and conditioning has led me into conversations about this particular area of the game and an examination of the current training methods used in its advancement. The one word that kept recurring throughout these discussions was 'specificity'. The concept of specificity as a principle of training should be at the absolute heart of any sport's training programme. After all, what would be the point of hours of distance running in order to improve our maximal bench press?

The general requirements of a front row forward are fairly self-evident. Core strength and flexibility should be exceptional as a protection against injury, especially around the neck, shoulder girdle and lumbar spine. Furthermore, the muscular balance and magnitude of a prop's upper and lower body should be of the highest standard to withstand the immense pressure at the engagement. Finally, props need to be heavy enough to create inertia in order to produce the momentum to surge forward.

We know from standard academy and international training programmes that core compound exercises such as bench presses, back squats and power cleans are a staple diet of front-row forwards in the weights room. However, are these exercises completely specific to the task at hand? The back squat is probably the most scrum-

specific of all the compound multi-joint exercises. The fixed distal extremity contact from the feet and the compression through the spine, make this closed kinetic chain exercise a clear example of a position-specific movement.

As we increase the depth of flexion in the knee from approximately 180° through 90° in the back squat, the quadriceps, hamstrings and gastrocnemius activity generally increases (Escamilla, R F, 2001). This suggests that squats in the 90° range and lower may lead to increased strength gains in the hip, knee and ankle musculature, all of which are crucial in the development of forward play functionality. In contrast, front row scrummaging produces biomechanical idiosyncrasies of its own. The specific movement at the knee joint at the point of engagement (shove and brace) begins as a relatively low level isotonic contraction and rapidly converts into a near maximal, near isometric contraction. This is difficult to replicate as a quantifiable exercise in the gym. (Isometric resistance training involves a static muscular contraction with no movement at the involved joint. In contrast, isotonic resistance training refers to dynamic movements about single or multiple joints. This form of dynamic movement is widely acknowledged as the most sport-specific form of resistance training.)

Fig 1 back squat at 90 degree angle.



As far as comparisons between lower limb exercises go, we know that back squats produce approximately twice as much hamstring activity as a leg presses or knee extensions (Escamilla, R F et al, 1998). The quadriceps group muscle activity is greatest in closed kinetic chain exercises (squats and leg presses) when the knee is near full flexion. Conversely, the greatest muscular activity in open kinetic chain exercises (knee extension), is when the knee is in near full extension (Escamilla, R F et al, 1998). Open kinetic chain training develops more rectus femoris activity, while closed kinetic chain produces more vasti muscle activity. (Escamilla, R F et al, 1998). This suggests that the primary exercise for pure muscular development in both the quadriceps and hamstring groups should be the deep squat. (NB: This is not

necessarily the case if the player has suffered cruciate ligament damage as shear forces increase with deep flexion).

However, this is not completely specific to the task. From analysing the knee movement of the prop at the scrum engagement, we can see that the angle at the knee changes from a pre-tension state at approximately 100°, to a near full extension of approximately 170° at maximal contraction. The difficulty arises when we look at how the player has to move from a pre-flexion state into an explosive extension and then a fluctuation between readjustment stabilisation and extreme 'near' isometric contractions. I've used the term 'near' as the unpredictability of the surface and changing forces acting against the player means that it would be rare for a player to experience a true isometric contraction. To replicate this in a weights room setting is very difficult.

On the field it would be simple enough to practise this with a scrum machine. An individual would position himself at the centre whilst a significant load was added to the machine. He could then move through the flexion/extension phase at the call from a coach (simulating the hold/engage instruction from a referee). This could then be followed by a series of three to four near isometric 'shoves' in order to simulate a true scrummage.

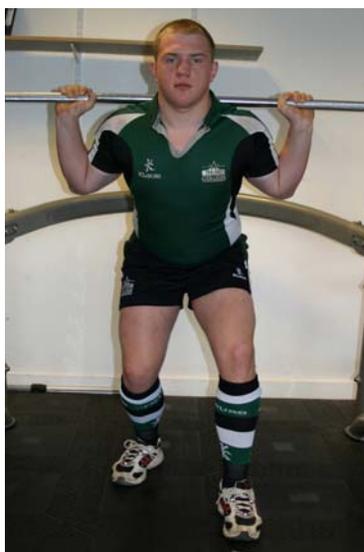
To enable a coach to quantify this particular skill (to compare specific player strengths), this practice could be performed in a stable environment. By moving indoors, placing the machine on mats and then adding weight to it and driving over a point to point distance (e.g. one metre), coaches could measure an individual's performance.

In the gym, a player could improve his specific 'engage/shove' strength by increasing his usual squat poundage and converting to a shallower range of movement. We know from research that, "the deeper the squat, the greater the effort shift from the knee to the hip joint". (Scaglioni-Solano, et el, 2005). Therefore, in a situation where the majority of force required comes from the muscles surrounding the knee, it makes sense to focus on those areas in training.

Fig 2 ‘Smith’ shallow squat with split stance.



Fig 3 ‘Smith’ shallow squat with split stance.



Recent research from San Diego University on electromyography muscle activation has found that single leg squats (Fig 4) recruited more activity than any of the above exercises (Francis, P. 2006). This was especially apparent in the Gluteus Medius muscle that remained relatively dormant in the back squat. Progression from this would be to perform the exercise on an unstable surface, further developing stability strength through the ankle, knee and hip joints (Fig 5).

Fig 4 Single leg squat (stable).



Fig 5 Single leg squat (unstable).



However, it is essential that these types of exercise do not replace the conventional 90° plus squat; they should simply act as supplementary exercises. It cannot be overstressed how important it is for players in such a vulnerable position to train through the full range of movement. This not only enables them to adapt their motor programmes on the field, but aids inexorably in joint flexibility and, in turn, injury prevention.

References:

1. Escamilla, R F. "Knee biomechanics of the dynamic squat exercise". *Medicine and Science in Sports & Exercise*. 33(1):127-141, Jan 2001. Lippincott Williams & Wilkins, Inc.
2. Escamilla, R F et al. "Biomechanics of the knee during closed kinetic chain and open kinetic chain exercises". *Medicine and Science in Sports & Exercise*. 30(4):556-569, April 1998. Lippincott Williams & Wilkins, Inc.
3. Escamilla, R F et al. "Effects of technique variations on knee biomechanics during the squat and leg press". *Medicine and Science in Sports & Exercise*. 33(9):1552-1566, September 2001. Lippincott Williams & Wilkins, Inc.
4. Saglioni-Solano, et al. "Lower extremity biomechanics during different squat depths". *Medicine and Science in Sports & Exercise*. 37(5):393, May 2005. ACSM
5. Francis, P R. "The science of strength training 2: Theory into practice". Multitrax Fitness Convention Seminar, 2006. San Diego State University.