



INJURY PREVENTION - CASE STUDY



CORE STABILITY IN THE FOOTBALLER TIME TO BIN THE OLD SIT-UP REGIME?

By David Binningsley, MCSP

Current medical research has highlighted the need to focus on the conditioning of the abdominal muscles as a whole, rather than developing the more visible and aesthetically muscle responsible for the 'six pack', rectus abdominus. However the growing number of Gilmore's groin injuries, particularly among footballers has shifted attention towards the other abdominal muscles responsible for the core stability of the body. This article outlines a core stability programme with a focus on injury prevention, followed by premier league club, Middlesbrough FC.

While the prevention of injury is important to all athletes the commercial aspects and popularity of football where transfer fees regularly reach millions of pounds, has made it particularly important. According to a report published earlier this year by the Football Association, the value of the Premiership players alone was £425 million and their wages for the 1998/1999 season estimated at £241 million. The FA's audit of injuries indicated that on average 10% of a squad can be unavailable to train each week due to injury which alone costs professional football around £40 million a year in lost games and training, without accounting for medical fees, insurance pre-

miums, reduced income from lower match attendances and diminished prize money received as a result of the final league position. As a result football training programmes focusing on injury prevention are becoming increasingly popular. The importance of good core stability has been identified as a particularly important factor in preventing injuries such as Gilmore's groin.

Aetiology of Gilmore's groin

- torn external oblique aponeurosis
- conjoined tendon torn from pubic tubercle
- dehiscence between conjoined tendon and inguinal ligament

Box 1: Core stability programme

1 Straight leg side crunches (left and right) – side lie, propped up on the elbow, keeping the body straight. Slowly lower the hip to the floor then return to starting position



10 Superman (upper-body/lower-body/both together) – lie prone, arms in front, upper body – lift arms and upperbody off floor, same with lower body. Both – involves reciprocally lifting arms and legs together

2 Abdominal hollowing in four point kneeling (3 reps, 5 second hold) – in four point kneeling, slightly pull in the naval, arching like a cat



9 Foot squeeze – lie prone, knees at 90°, feet together but with knees slightly apart, lightly contract the abdominals, holding this, squeeze the feet together

3 Pelvic raises – lying in supine with hands by side for support, lift both legs together into the air lifting the pelvis off the floor



8 Supported crunch – feet against wall, knees at 90°, perform normal trunk curls



Anatomy

The abdominal muscles lie in layers, the most superficial being the rectus abdominus which encompasses nearly the whole midsection of the body. It is a large broad flat muscle which runs from the lower three ribs to the pelvis. It is divided by four fibrous layers (three lying horizontally and one lying vertically across the stomach).

The rectus abdominus muscle is very strong and is rarely injured. Contraction of the muscle will allow sitting up from lying down, and it also assists in rotating the body. When lying flat the muscle can be felt by lifting the head.

The internal oblique muscle lies under the external obliques and both have similar attachments and function. The main difference between the internal and external obliques is that the muscle fibres run per-



Figure 1: Bridging assessment

pendicular to each other. Both are broad, thin muscles which arise from the lower ribs anteriorly and the fibrous tissue covering the lower back. The fibres flow around the abdomen into the pelvis and linea alba. The internal oblique assists in flexion, one side of the muscle can contract individual-

ly allowing rotation to the opposite side. The deepest of the four muscles, which is usually neglected, is the transverse abdominus. Its fibres run horizontally, acting like a belt on the abdominal contents. It acts as a corset, supporting the abdomen during movement.

- Stage 1

4 Abdominal hollowing in supine – alternate extension of leg (3 reps, 5 second hold) – in supine knees at 90°, maintain neutral spine position while extending slowly one leg returning to start position then alternating legs



5 Seated bent knee tuck – sit with arms supporting behind, keep spine in neutral, lift both feet then extend both and back to start



7 Bridging – lie in supine, knees 90°, feet together, lift the pelvis until body in alignment



6 Trunk curl – lie in supine knees 90°, hands on thighs, slowly lift the head then upper-body until fingers touch patella

Assessment

A basic assessment of abdominal stability is the bridge movement (Fig.1). The player raises his/her pelvis off the floor and stops when the knees, hips and chest are in line. While maintaining a level pelvis, the player is asked to lift one knee in the air (5cm). This is sufficient to force the weight bearing side into stabilising the entire trunk region. If the pelvis lowers, rotates or a level position cannot be maintained, it indicates poor abdominal control.

Exercises

The first stage of developing core stability must be aimed at developing control and understanding of the muscles. Players may not necessarily feel the benefit from stage 1 of the programme but it is important in establishing a base level of control. The whole of stage 1 can be performed in 30 minutes. Allowing for 3 sets of each exercise, with a thirty-second rest between sets (Box 1).

At Middlesbrough we started at 12 repetitions per exercise (apart from exercises 2 and 4 which have other repetition instructions described in the circuit) and progressed to 17 repetitions by week 8.

While performing these exercises, the player should never feel these exercises working the lower back region. This is a sign that the extensor muscles are being over-worked and there is an imbalance within the abdominal musculature. If this is the



INJURY PREVENTION

case, return to a basic level, demonstrate and then give hands-on advice until the exercise is being carried out correctly.

Feedback

Once players have developed a basic grasp of the exercises, they can be performed individually. By using mirrors or pressure biofeedback players can be certain that they are performing the exercise correctly. It is important for them to be reviewed frequently in order for them to be progressed.

Progression

There are a wide variety of progressions which could include the use of equipment such as the Swiss ball, inflatable discs, free weights and Therabands. Any exercise which uses the arms and legs while maintaining the trunk position are beneficial to the player as it makes abdominal control a subconscious activity.

a. Swiss ball (Fig.2)

Roll over the top of the ball, hands should be shoulder width apart, with the shoulders over the hands. The head and spine should be in neutral. It is important not to allow the spine to drop into extension. The feet are placed so the toes are pointing directly through the middle of the ball.



Figure 2: Use of Swiss ball in progression

b. Inflatable disc (Fig.3)

Using the bridging assessment position in figure 1, place the disc under one foot and perform alternate leg lifts, holding for increasing periods of time. To increase difficulty try straightening the lifted leg then returning it to the start position.



Figure 3: Use of inflatable disc in progression

c. Theraband (Fig.4)

With the knees together, brace the abdominal muscles and, very slowly open the

legs. Brace again at the end then slowly bring the knees together.



Figure 4: Theraband

d. Free weights (Fig.5)



Figure 5: Free weights

Performing free weights strengthening sessions on the ball will also provide an excellent work out for the abdominal muscles which again are made to work subconsciously.

e. Russian V sits (Fig.6)

If no equipment is available simply utilising body weight is sufficient, such as Russian V sits (Fig.6). Sit with the arms lightly supporting the weight. Keeping both legs together while maintaining the spine in neutral, lift both legs straight, as far as you are able without compromising spinal position.



Figure 6: Russian V Sit

f. Competition (Fig.7)

This game can involve any number of participants. Each balances on a ball. A ball is thrown between each player in random order and at varying trajectories. The winner is the one who maintains their balance without falling off the ball.

'The Pelvic Girdle', referenced below is an excellent book and expands on the subject of progression.



Figure 7: Competition

Conclusion

The core stability programme outlined above has been used at Middlesbrough FC and was devised in conjunction with our exercise physiologists. We worked on a periodised programme of eight weeks before progressing stages. We have found excellent compliance from the players, many of whom found the old abdominal regime boring. Even more so when a competitive element is added (Fig.7).

It is too early to say if the new regime will reduce the number of injuries which occur during the season. It is hoped the research from the FA Audit Of Injuries will support the adoption of this style of abdominal training in clubs across the UK and that it will show a significant reduction in the number of abdominal related injuries.

Further reading

- Diane Lee – The Pelvic Girdle – Churchill Livingstone
- Joanne Elphinston – The Core Workout – Total Performance
- Christopher Norris – Back Stability – Human Kinetics

David Binningsley, MCSP is the chartered physiotherapist for Middlesbrough FC. He has a specific interest in proprioception, core stability and isokinetic training.

EXERCISE CARDS

All the exercises featured in this article, including those in Box 1 and Figs. 1-7 can be purchased as laminated cards. We have standardised exercises featured in SportEX articles so they can be purchased individually and used as part of your own circuit or as complete exercise circuits as featured in specific SportEX articles. For an information leaflet on what is available please telephone 020 9287 3312 or visit www.sportex-medicine.com