Strongman training – a rationale for its inclusion in S&C: Part 1

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INTRODUCTION

This article, the first in a two-part series, aims to introduce the concepts of strongman-type training relative to some of the exercises adopted. It should give the reader a detailed background into the evolution of strongman training with a strong rationale for its inclusion within the practice of strength and conditioning.

Introduction

The feat of being the strongest man has been an obsession for mankind since the early sixth century in the days of 'Milo of Croton' (one of the greatest wrestlers in ancient Greece), who was renowned for his remarkable levels of strength. During these times of antiquity, wrestling matches were held within the Olympic Games, with the winner being honoured the title of 'The World's Strongest Man'. During the 12th century, more sophisticated methods developed with the advent of the 'Highland Games', where large unusual objects were lifted for athletic events. The popularity of the Highland Games during the late 1970s led to the production of a contest known today also as 'The World's Strongest Man' (WSM).

The first WSM contest was held in 1977 in California, where the strongest men across the world were invited to compete in a series of maximal strength events. In essence, these events require the manoeuvring of heavy, awkward and unevenly balanced objects for sustained periods of time.[4] The use of these exercises that occur within the various events has been shown to bring about substantial increases in maximal strength, and therefore could be considered within the programme of an elite athlete.[18] This style of training, however, is often regarded as a contentious topic within the strength and conditioning (S&C) industry, largely due to the perception of increased injury risk. The exercises adopted for the events are themed variations of the squat, deadlift, clean and press, platform loading, flipping or pulling and asymmetric carries. As a result of this modernisation, as well as increased media coverage, the variation in exercises are ever increasing in an attempt to provide greater challenges for those competing, and to increase the popularity of the event. In addition, there has recently been an increased surge in the popularity of 'The World's Strongest Woman' contest, with women taking part in the same events.

In order to understand the nature of the exercises involved within the WSM, this article aims to analyse critically the technical description of a select number of exercises that apply to each theme. The exercises chosen are as follows: squat, keg toss, log clean and press, Atlas stone, tyre flip, truck pull, farmers walk and Yoke walk. The use of these exercises will then be evaluated as a training stimulus, for their purpose within the practice of S&C.

'strongman exercises could provide a valuable addition to traditional resistance-based exercises ... in a periodised training programme'

Applicability of strongman exercises

Within the practice of S&C, an informed coach will often seek to identify key exercises to promote strength training adaptations and sporting longevity.[15] The majority of exercises adopted for this purpose could be categorised as 'traditional-based methods', formed of the generic lifts, which may include exercises such as the squat, deadlift and bench press.[8] In order to continue to adhere to the training principle of sports specificity – ie, to improve the rate of transfer to sporting performance – the S&C coach often seeks innovative and more functional methods of training. This desire to continually refine and improve upon the level of training specificity has resulted in the increased awareness of non-traditional resistance based methods, such as Olympic weightlifting, plyometrics, kettlebells, medicine balls and strongman-based exercises.[13, 15, 22]

Traditional-based resistance exercises offer a high level of safety when performed with accurate technique; this is largely due to the fact that barbell and dumbbells follow a linear movement pathway. This linear movement, however, often significantly reduces the ability to effectively train the stabilising muscles (fixator muscle groups) across multiple planes.[5] These stabilising muscles aid to strengthen stability about a joint, and are therefore particularly important in those joints that permit higher ranges of motion, such as the glenohumeral joint located in the shoulder, and joints that often lack stability, such as the knee. It is fundamental when trying to minimise the risk of injury to improve control over motion within the joints. This is further supported with the S&C coach continually seeking to reduce varus and valgus deformations, known as a pre-requisite to serious knee injury, through training stability about the joint.[9] As such, the conditioning coach will often prescribe various instability exercises to supplement these traditional exercises, although some of these exercises – such as lunges, rear foot elevated split squats and step-ups – are still largely characterised as linear movements within the sagittal plane. This could decrease the degree of transfer of training, due to the fact that taking part in sporting exercise often requires joint stability during a series of movements across multiple planes under significant load.[10] To combat this potential issue, it is suggested that non-traditional resistance-based methods such as strongman exercises could provide a valuable addition to traditional resistance-based exercises during the planning of a periodised training programme. This suggestion is based on the premise that strongman-training offers a degree of unpredictability in loading, in particular during exercises such as the farmer's walk and tyre flip. This degree of unpredictability challenges the supporting muscles around the acting joints, as they seek to provide stability in order for the body to function appropriately relative to the demands of the exercise.

THE STRONGMAN SQUAT

The start position of the strongman squat requires the feet to be approximately shoulder-width apart. with weight distribution evenly across the whole foot. The scapulae are retracted with the chest upright, maintaining a neutral spine. The bar should be resting on the trapezius with a claw grip ready for the descent (see Figure 1.0).

Simultaneous flexion of the hips and knees initiates the descent in a controlled manner, with back alignment being maintained throughout, facilitating an upright posture. The descent continues, with the knees tracking alignment of the toes (second or third) until the thighs break parallel with the ground, with hips positioned below the level of the knees (see Figure 1.1)

Simultaneous extension of the hips and knees initiates the ascent. An upright posture and neutral spine should be maintained throughout (see Figure 1.2). This movement is intended to be carried out explosively; although the degree of loading may restrict this slightly, a forceful and explosive movement is desirable during the ascent. This exercise as an event within the WSM is a challenge of repetitions with a load of around 400 kg. Note that during this exercise, strongmen may rest the bar lower on the trapezius with a wide arm grip; however, for its use in S&C, to minimise lumbar loading, a higher bar positioning and grip narrow enough to promote scapulae retraction is suggested.

Transfer to sporting performance

In the majority of sports, there is a requirement for a significant degree of lower body strength as it has been shown to translate highly to sporting performance.[1,14] The use of the back squat provides a stimulus to train the lower extremity, providing positive effects on both sprint and countermovement jump performance,[20] both considered key traits in a number of athletic sports.

KEG TOSS

During the start position, the feet are placed in a wide sumo stance (comfortable enough to allow the keg to swing between the legs). The keg is held with both hands with a closed neutral grip. Initial position is similar to that of a sumo deadlift, with flexion at the hips, knees and ankles (see Figure 2.0). The arms remain loose, allowing the object to swing between the legs.[17] The keg is swung until sufficient momentum has been gathered (see Figure 2.1). Note that this should be controlled to allow for correct trajectory during the explosive propulsion phase of the exercise.

Upon achieving sufficient swing speed, proceed with a vigorous triple extension of the hips, knees and ankles with a concomitant shoulder flexion as the keg is thrown overhead (see Figure 2.2). This exercise as an event within WSM requires a strongman to throw kegs between 15kg and 24kg over a 4.42 m wall. Of course, for this substantial load, an athlete must have a good baseline of strength; however, due to the popularity of the contest for females, kegs are now available in loads as little as 2kg. The use of a lighter load will allow this exercise to become more aligned with the training of speed-strength qualities, a crucial factor in a series of sports.

Transfer to sporting performance

The keg toss exercise allows the athlete to train power qualities in the triple extension position, a desirable trait for sporting performance. The application of vigorous vertical force is largely correlated to improvements in jumping ability, which is generally adopted as a measure of overall lower-body power.[2] As an alternative exercise to that of Olympic weightlifting, the keg toss allows for explosive movement without the requirement for deceleration. In addition, it can be adopted with those athletes who have mobility and flexibility limitations, with minimal time being required to teach adequate technique.

LOG CLEAN AND PRESS

Position the body close to the log with feet between hip and shoulder-width apart, toes pointing forwards. Initial set position is similar to that of an Olympic lift with hips slightly above the knees. The arms are extended at the elbows with the log grasped with a closed neutral grip. Back position remains neutral, scapulae depressed and retracted, shoulders slightly in front of log (see Figure 3.0).



Figure 1.0
Start position of the strongman squat exercise



Figure 1.1
Bottom position of the strongman squat exercise



Figure 1.2
Ascent phase of the strongman squat exercise





Figure 2.0 (left)
Start position for keg toss exercise
Figure 2.1 (right)
Swing phase of the keg toss exercise



Figure 2.2
Finish position of the keg toss exercise



Figure 3.0
Set position for the log clean and press exercise



Figure 3.1
End of first pull of the log clean and press exercise



Figure 3.2
Transition phase of the log clean and press exercise

The log is lifted with simultaneous extension of the hips and knees, maintaining torso angle and a neutral spine, with shoulders remaining slightly in front of the log (see Figure 3.1).

During the transition phase, as the log passes the knees, pull the log into the body flexing both the knees and elbows. Elbows are flexed at slightly less than 90 degrees with knuckles facing the floor. Briefly pause in this position with log resting on thighs (see Figure 3.2).

The second pull involves a powerful triple extension of the hips, knees and ankles, followed immediately by a powerful shoulder shrug. The log should remain as close to the body as possible. As the momentum of the log allows the elbows to flex, they are rotated rapidly underneath the log. The log should be resting on the upper clavicle, maintaining a neutral spine (see Figure 3.3). Note, due to the awkward size of the log, slight extension of the head should occur to allow room for this resting position.

At this point the feet are repositioned to hip width apart (power stance) in preparation for the final drive. Maintaining an upright posture, simultaneously flex the hips and knees to a quarter squat position (see Figure 3.4).

This is followed by a powerful triple extension of the hip, knee and ankle in an attempt to accelerate the log upwards. Both the chest and head move backwards to accommodate the movement pathway of the log. The arms should be locked out, holding the log directly above the crown of the head during the final press position. Extend both hips and knees to straighten legs, finishing in an erect stance (see Figure 3.5).

During the WSM event, this exercise initially required the greatest load to be lifted; however, this has been modernised to the greatest number of lifts overhead in a given time limit. The current record for the log lift is a load equivalent to 212.5kg. The use of logs have modernised into a variety of shapes, sizes and loads, with some logs being bulky and longer than others to further add to the instability of the exercise. When first training athletes with this exercise, it would be wise to use a smaller log (between 8–10 inches) as this brings the centre of gravity closer to the body. These smaller logs have initial loads of around 24kg and therefore are slightly higher than that of a standardised barbell.

Transfer to sporting performance

The log clean and press exercise requires forceful triple extension of the ankle, knee and hip, and has been shown to produce high levels of vertical force.[19] It can be used as a training stimulus for high-load whole-body speed strength, which could aid the transfer to sporting performance in movements requiring high vertical forces such as jumping, throwing and sprinting. The log clean and press has been shown to provide significantly greater impulse during the second pull than that of the clean and jerk.[19] This may be due to the greater mechanical demands of log clean and press, whereby the log is in a resting position on the thighs. In addition, the combination of both lower body power and upper body strength exercise may provide a time-efficient exercise stimulus in the planning of an exercise programme.



Figure 3.3
Catch position of the log clean and press exercise

ATLAS STONE

Position the body directly over the stone with feet between hip and shoulder width apart (see Figure 4.0). Note: standing too close to the stone will result in the stone moving too far backwards and unable to be lifted; equally standing too far backwards, the stone will roll forwards and out of the hands.

Squat down towards the stone maintaining neutral alignment of the spine. Spread the fingers out and position them underneath the stone as far as possible (see Figure 4.1). The arms should be locked out at the elbows (this is crucial: flexion at the elbows during the lift can result in tearing of the biceps brachii muscle).



Figure 3.4
Dip position of the log clean and press exercise

The Atlas stone is then lifted onto the quadriceps through slight extension at the hips and knees, maintaining neutral spinal alignment and locked out elbows. Once the stone is comfortably resting on the lap, hand positioning should be adjusted to a pronated handgrip over the top of the stone (see Figure 4.2).

The movement proceeds with a vigorous triple extension of the hips, knees and ankles driving the stone on to the platform (the arms should guide the stone under control). It is important to engage the hips early within the lift to avoid overuse of back musculature. Abdominal and extensor bracing should be carried out throughout movement in an attempt to coordinate hip extension with torso stiffness.[12] This should be an explosive movement throughout. The stone is then controlled on the platform (see Figure 4.3). Note: using various platform



Figure 3.5
Recovery position of the log clean and press exercise



Figure 4.0
Start position of the Atlas Stone exercise



Figure 4.1
Set position of the Atlas Stone exercise



Figure 4.2
Transition phase of Atlas Stone exercise



Figure 4.3
End position of the Atlas Stone exercise

heights can change the mechanics of this exercise to favour an increase in upper body strength and control.

The use of the Atlas Stone as a conditioning tool for the triple extension movement pattern will require a platform at a height between the navel and pectorals based on the anthropometrics of the athlete. This event within the WSM is often regarded as the signature event for the entire competition, and is often used to determine the winner. The weights lifted range between 100-200kg; they are placed on top of five platforms variable in heights of up to 1.5m, spanning across a 4–10m course. The largest load lifted has been recorded at 250kg for men and 148.9kg for women. Although these initial loads are high, Atlas stones are available with a load equivalent of 20kg.

Transfer to sporting performance

The Atlas stone has been shown to train coordinated hip extension and torso stiffness, through abdominal and extensor muscular bracing.[12] The extension effort during the latter part of the lift allows power to be trained primarily in the hip, with successful lifts being noted to require earlier hip engagement. Training strength and power through hip extension is essential for sports performance, due to its requirement in jumping, throwing and sprinting. This movement could also provide a degree of transfer to collision-based sports, due to the simultaneous torso stiffness and hip extension required to complete the Atlas stone exercise.

TYRE FLIP

Starting position should be facing the tyre with feet between hip and shoulder width apart. Squat down, leaning into the tyre with both the chin and anterior deltoids resting on the tyre. Feet should be positioned in line with the gluteal musculature to maintain a neutral spine.[8] The elbows should ideally be in full extension. It is important to find an optimal position on the underside of the tyre which provides sufficient grip, and therefore some degree of elbow flexion may occur. The arms should be placed outside of the knees with a supinated grip (see Figure 5.0).

The upward movement phase is initiated by a simultaneous extension of the hips, knees and ankles whilst pushing the tyre forwards (see Figure 5.1). Move forwards explosively towards the tyre, maintaining momentum by taking two or three steps until the body is aligned at a 45-degree angle to the tyre. As the tyre is continuing its movement forwards, the hands should be rapidly

repositioned to a pronated grip in preparation for the push phase (see Figure 5.2).

Continue moving the feet forwards, fully extending the arms in order to push the tyre over in front of the body. Note: this should be an explosive exercise maintaining momentum throughout (see Figure 5.3). Other techniques may adopt a knee striking point during the transition phase; however, with extremely large tyres this movement could be counterintuitive due to the larger load of the tyre.[8] There are other variations such as the 'sumo-style' and 'backlift-style' tyre flip; however, these require a large range of motion around the hip joints and can subsequently result in some degree of spinal flexion.[17] The tyre flip exercise as an event in WSM is often measured by repetitions within a given time period, or a set distance in the fastest time. The heaviest tyre flipped was recorded at a load of just over 612kg.

Transfer to sporting performance

The tyre flip allows power to be trained through extension of the hip, knee and ankle to apply vigorous anteroposterior force. The unique shape and loading of the tyre challenges athletes throughout the length of the tyre's resistance moment arm, with resistance torque being maximised during the first pull.[11] During the latter phases of the lift the resistance torque is reduced, and as such, the force potential of the muscles change due to force-length and force-velocity relationships. This offers a unique stimulus to athletes, that requires them to vary the contribution of the primary agonists throughout the lift.[11]

TRUCK PULL

The initial position of the truck pull is termed 'breaking the inertia' and is considered the hardest part of the movement. Although styles may vary at competitive level due to individual preference, the safest technique adopts the movement position of an elite sprinter within the starting blocks. Feet are positioned with one leg slightly in front of the other, front leg flexed at the knee between 90 and 110 degrees, with rear knee flexion between 120 to 135 degrees. Shoulders set slightly in front of the hands, elbows should be straight but not locked out, with hands positioned evenly outside of the shoulders. A neutral spine is maintained throughout. Movement proceeds with a forceful drive into the ground in an attempt to drive the body forwards, force application occurs at the ball of the foot (see Figure 6.0). Note: the body should stay in



Figure 5.0 Set position of the tyre flip exercise



Figure 5.1 Upward movement phase of the tyre flip exercise



Figure 5.2 The transition phase of the tyre flip exercise



Figure 5.3 The push phase of the tyre flip exercise



Figure 6.0 Breaking the inertia phase of the truck pull exercise



Figure 6.1 Initial drive phase of the truck pull exercise



Figure 6.2 Upright phase of the truck pull exercise

a low crawling position during this phase, almost parallel to the ground.

The initial drive phase involves maintaining a low position with small powerful steps until near extension at the knees, with the intent on applying maximum ground reaction force in an attempt to accelerate the body and truck. Note: taking too larger strides can shift the force production to becoming less horizontal and more vertical, which would result in a reduced accelerative force. Arms move with a smooth forwards and backwards motion, with a neutral spine maintained throughout (see Figure 6.1).

Upon achieving sufficient acceleration, the body transitions into a higher position but still maintaining a significant degree of forward lean. Determining this point is largely dependent upon the momentum of the truck and the ability to continue pulling the truck in a more upright position. Again, small powerful strides with maximum force application are desirable, with a neutral spine maintained throughout (see Figure 6.2). Note: to increase upper body contribution, a rope may be used for the athlete to pull during this exercise.

This exercise as an event within the WSM requires the strongman to pull a truck weighing just under 52,000kg down a 30m course in the fastest possible time. This evidences the taxing and high physiological demands placed upon the body; it must therefore be noted that this form of exercise should only be carried out under suitable supervision and expert guidelines from the sports science staff support and medical services.

In order to build up to this exercise, equipment such as the sled, or prowler should be used to train athletes to become strong and powerful when applying horizontal forces of motion. It is therefore recommended, during the initial stages, to utilise these forms of equipment, and to limit the use of the truck pull exercise within future training prescriptions to avoid excessive stress on the body.

Transfer to sporting performance

Adopting the truck pull as an exercise allows the athlete to train the acceleration body position with a significant overload component. It teaches explosive power in the hip separation movement pattern (one hip extends whilst the other one flexes), and offers minimal eccentric stress. Although the use of sleds and prowlers has become a mainstay in the majority of programmes

seeking to train acceleration, the truck pull offers a unique form of loading, in that it is an all-out full body effort that involves a high contribution from the anaerobic energy system.[4]

FARMER'S WALK

The set position for the farmer's walk is similar to that of a deadlift: feet positioning around hip width apart, toes pointing forward and hips set slightly higher than the knees. Arms are locked out at the elbows with scapulae retracted and chest elevated. Head should be neutral with a neutral spine maintained (see Figure 7.0). Either a claw or hook grip can be adopted in a neutral position, and hands can be placed either in the centre or slightly shifted back from centre. This hand placement is largely preferential, with some strongmen preferring a hand position slightly shifted back from centre, due to the load emphasis being on the first two (stronger) fingers. Note: to ensure maximum control the handles should be either pointing straightforwards or leaning slightly down in front of the body.

The load position is carried out through simultaneous extension of the hips and knees, whilst maintaining a neutral spine. The abdominals are braced throughout this movement, with the end position being that of an erect upright stance (see Figure 7.1).

The movement phase is carried out with a heel to toe contact, with the knees remaining in an extended position (see Figure 7.2). Stride length remains short, particularly during the early stages of the movement. Bracing of the abdominals is carried out throughout the movement, ensuring minimal lumbar extension. Note: during the unloading phase, take the implements as far wide as possible in a narrow stance to avoid injuring the toes. As an event within the WSM, this exercise requires strongmen to lift loads of around 150kg across distances typically set at 20m in the fastest possible time. S&C coaches must be mindful when prescribing this exercise to avoid any potential injuries. It is therefore suggested that dumbbells or kettlebells should be used initially; this will ensure the athlete feels comfortable with the exercise and allows technique to be maintained prior to the added stimulus of instability and further load.

Transfer to sporting performance

The prescription of the farmer's walk exercise provides a stimulus for athletes to train abdominal bracing through high levels of trunk activation. The farmer's



Figure 7.0
Set position for the farmer's walk exercise



Figure 7.1
Loading phase of the farmer's walk exercise



Figure 7.2
Movement phase of the farmer's walk exercise



Figure 8.0
Set position for the Yoke walk exercise



Figure 8.1
Loading phase of the Yoke walk exercise



Figure 8.2
Movement phase of the Yoke walk exercise

walk provides a significant challenge to the lateral musculature and contralateral hip abductors,[12] which transfer to sports requiring rapid changes of direction. The loading of this exercise allows the S&C coach to bring about a stimulus for robustness in their athlete, as it challenges dynamic balance and trunk activation during vertical and anterior force production.

YOKE WALK

The set position for the Yoke walk requires slight flexion at both the hips and knees (the degree of flexion is largely dependent upon the anthropometrics of the athlete). Feet are positioned hip width apart, toes pointing forward. Bar of the Yoke is resting on the trapezius, scapulae depressed and retracted, with arms slightly extended grasping the outer poles of the Yoke in line with the shoulders. Neutral spine positioning, with eyes looking forwards (see Figure 8.0).

The loading phase is carried out through simultaneous extension of the hips and knees to an upright erect position. The abdominal muscles are braced during this movement, whilst maintaining a neutral spine (see Figure 8.1).

The movement phase again requires a heel to toe contact with knees remaining in an extended position (see Figure 8.2). Stride length remains short to ensure control over the movement. A strong bracing of the abdominals is essential in order to minimise unwanted lumbar extension. During the unloading phase, it is important to ensure the body remains directly under the Yoke as the knees and hips flex. Within the WSM, this exercise is used as an event with loads lifted equivalent to 550kg across a distance typically set at 20m within the fastest time.

Although there will be variations in techniques during strongman competitions, these techniques appear the most appropriate for the purpose of conditioning an athlete, while minimising the risk of injury. It is important to recognise that these exercises not only require a high magnitude of strength, but the equivalent loads far exceed those of elite and amateur lifters trained by the majority of S&C coaches.

Transfer to sporting performance

The Yoke walk has been shown to require very large hip abduction moments, primarily recruiting the gluteus medius and quadratus lumborum to provide much needed pelvic stability.[12] This stimulus will aid athletes in the development of strength and stability in the hip joint which is a fundamental aspect

in the majority of sports skills. In addition, this exercise has been shown to promote a strong degree of stiffness through torso musculature co-contraction, therefore aiding the development of robustness within athletes.[12]

Potential barriers

Although the use of strongman exercises appears to be achieving more widespread attention within S&C programmes,[6] there are a number of pragmatic issues which need to be considered when planning their inclusion in a periodised programme. Some of the equipment, such as the Atlas stones, have an initial load of 130kg, which could be deemed as being too heavy for the athlete, although their increased use has promoted the production of more accessible, load-adjustable equipment.[21] This increase in accessibility has resulted in Atlas stones being produced with loads as little as 20kg. Further to this, in the initial phases equipment such as medicine balls could be used to check athlete suitability, and reinforce technique before equipment is purchased. In addition, the majority of facilities are limited by room and storage, which could cause potential issues as most strongman equipment is unwieldy and oversized.[7] In this case, it may be possible to seek out 'select' training facilities, which may offer some or all of the equipment which is easily accessible. This could be incorporated within the general preparatory phase of a periodised programme, where team-based sports seek to provide a variety in both training and venue. In situations where this may not be feasible for athletes or teams, the use of dumbbells, kettlebells and other implements can be utilised as a substitute where appropriate.

In order to understand the true practical application of strongman exercises within the practice of S&C, a thorough needs analysis is required relating to the physiological and biomechanical constituents for adopting such exercises as a supplement for traditional-based resistance exercises. From this needs analysis, the incorporation of such exercises within a periodised programme can then be determined, which will be discussed in Part 2.

Conclusion

The evolution of strongman training is largely characterised by its increased popularity and media attention. It has been adopted within the practice of S&C largely due to its competitive nature and opportunity for variety within exercise programmes. However, the limited evidence suggests that this form of training may complement an athlete's physical development should it be periodised accordingly. Therefore, to fully evaluate the amalgamation of strongman exercises within S&C programming, a thorough needs analysis is required relative to the physiological and biomechanical challenges imposed upon the body. This will support the S&C coach in his or her planning prescription, to ensure that training remains both structured and appropriate.

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UKSCA Grants Update

January 2017 cycle now open

Applications are now being received in both the community and research grant categories and the deadline for this cycle is January 31, 2017.

In the last three cycles since the launch of the grants fund, the UKSCA has awarded over £26,000 to projects being run by UKSCA members.

Community grants of up to £5000 are awarded to support a range of projects: promotion of S&C initiatives (sports performance, physical act-ivity, movement coaching); the development of community and/or outreach projects; the development of S&C in education, youth and amateur sports participation; support for S&C development through the purchase of equipment.

Research grants of up to £2000 are available to support research that furthers the understanding of physical preparation for performance-based outcomes and will be of interest to Association members. Grants are also available for consumables to support research projects.

Application forms for the two grants mentioned above can now be downloaded from our website.

