












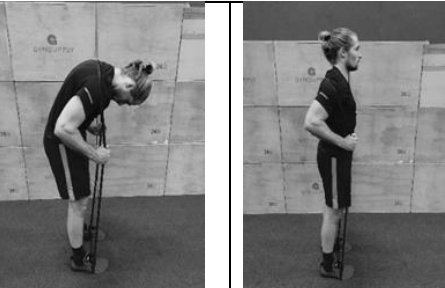
## Appendix 4 Work capacity

Name	Objective/functionality			Description and comments
Y-lift on bosu ball, Superman	Pillar conditioning extension  Non functional Static			The focus of this exercise is on keeping a neutral thoracic spine while concentrically and eccentrically controlling shoulder flexion or holding shoulders static overhead.  High functional demand on the shoulder musculature there is a risk of the shoulder being fatigued first, which could limit the amount of stress placed on the thoracic extensors.
Kettlebell swings	Pillar conditioning extension  Functional Dynamic/Static??			Kettlebell swings are performed using the large posterior hip and leg musculature to propel a kettlebell in a controlled sagittal plane. The thoracic erector spinae and latissimus dorsi musculature assist movement initiation of the kettlebell from the lowest part of its trajectory this exercise is therefore well suited to build phasic work capacity for the thoracic extensors.
Pike	Pillar conditioning Flexion  Non functional Static			This exercise focuses on keeping a stable trunk while flexing the hip from a push up position and moving the legs towards the trunk. Muscles targeted are the upper and lower rectus abdominis, internal and external obliques. This exercise demands control from the serratus anterior, pectorals as well as shoulder girdle musculature to execute properly, the athlete is therefore required to have high levels of wider muscle control





## Appendix 4 Work capacity

Kneeling power-wheel rollout	Pillar conditioning flexion  Non functional Static		This exercise greatly challenges the upper and lower rectus abdominis, internal and external obliques as well as the pectorialis major, triceps brachii and latissimus dorsi. This exercise may be too heavy for many athletes to train towards increasing work capacity. Reducing the range of motion of outwards roll or changing to different equipment such as a bosu ball may be needed. <i>Not shown in picture is start position in kneeling before rollout.</i>
Roman chair lateral holds	Pillar conditioning side flexion  Non functional Static		Side lying static isometric hold of the trunk with gravity pushing towards lateral flexion. Variable load to thoracic spine lateral flexion can be achieved with positioning and change of lever. Progression with use of additional hand weight.  <i>Exercise pictured adapted based on available equipment during photo shoot.</i>
Windmills with kettlebell	Pillar conditioning side flexion  Functional Static		By keeping a neutral thoracic spine while balancing a kettlebell overhead, the side movement during exercise execution occurs most likely in the hips as well as lower and upper lumbar spine. This results in the thoracic spine working isometrically to maintain posture. Can be demanding on shoulder stability, and hip and lumbar mobility.
One arm inverted row	Pillar conditioning rotation  Non functional Static		By only using one arm an anti-rotation force of the thoracic (and lumbar) spine is needed to perform this exercise. Although a note should be made that the exercises performed in the included studies were likely easier than the exercise shown here.  Adaptions with a more upright posture during execution or using elastic bands to reduce bodyweight can be recommended.



## Appendix 4 Work capacity

Lateral cable walkout/Palloy Press	Pillar conditioning rotation  Functional Static		Also applying a rotation force on the thoracic spine, this exercise involves not just control of the thoracic spine (and lumbar) but also hips and shoulders.  Exercise can be made more or less difficult by varying the distance cable is held from the body, as well as weight on cable. The exercise can be performed standing/kneeling still or walking sideways while holding trunk position.
Upper back extension	Segmental conditioning extension  <i>Non functional</i> Dynamic		Isolated thoracic extension. Many whole trunk extension studies are reported. This might be important as a study comparing roman chair extensions with support under the iliac crest or xiphoid process, found that by supporting the xiphoid process, the lumbar erector spinae were less active during the exercise. If the goal is to isolate thoracic extensors, performing the exercise supported from the chest without hyperextending, might be the most efficient way.
Standing thorax extensions with chains or elastic band	Segmental conditioning extension  <i>Functional</i> Dynamic		Targets the thoracic extensors and incorporates the challenge to keep the lower back and hips stable while moving the thoracic spine. This exercise can be done with a barbell, chains or elastic band. Can also be done in sitting

## Appendix 4 Work capacity

V-ups	Segmental conditioning flexion  <i>Non functional</i> Dynamic		Dynamic flexion of the upper trunk, as well as control of the arms in flexion using a medicine ball. Being non-weight bearing, isolation of upper body is better achieved. Intensive for the midsection as well as the hip flexors, which could limit its potential for sufficiently loading the upper trunk if failure is achieved outside the thoracic spine first.
Half Turkish get-up	Segmental conditioning flexion  <i>Non functional</i> Dynamic		This exercise stops at the half way to achieving a full Turkish get up, giving a dynamic challenge to both the upper trunk and shoulder girdle. It is a technical exercise and might require a familiarization period before its full potential can be used. If continued to a standing position this exercise can also be used as a thoracic pillar conditioning exercise.
Lateral sit ups	Segmental conditioning side flexion  <i>Non functional</i> Dynamic		Non-functional exercise heavily targeting the external oblique, but also the thoracic/lumbar erector spinae and rectus abdominus and latissimus dorsi. Can be limited to lateral flexion mainly in the thoracic spine if needed. Well suited to increase local work capacity in lateral flexion. Can also be performed on a bosu ball
Dumbbell/kettlebell side bend	Segmental conditioning side flexion  <i>Functional</i> Dynamic		Side flexion in standing increases the use of the whole lateral kinetic chain, it is possible to limit side flexion of the lumbar spine if desired. The strength of this exercise is its low difficulty in appropriately loading the thoracic or trunk side flexors by changing the weights held.

## Appendix 4 Work capacity

W-sit ball rotation/twister	Segmental conditioning rotation  <i>Non functional/functional</i> Dynamic			This exercise challenges both isometric flexion, and dynamic rotation. The weakness is that the static flexion might be the area of failure, therefore limiting the work being put on thoracic rotator musculature. An adaption could be done with rotation against the lateral pull of an elastic band.
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