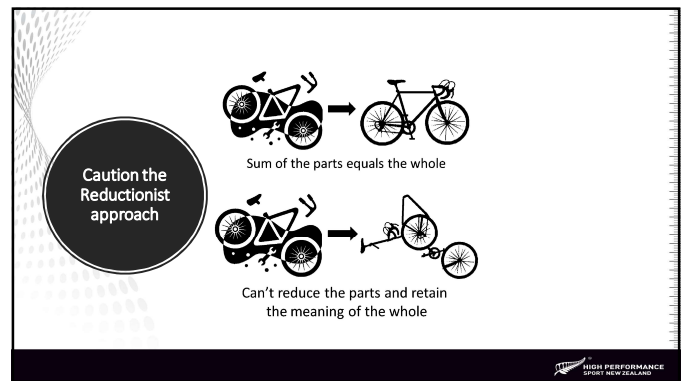
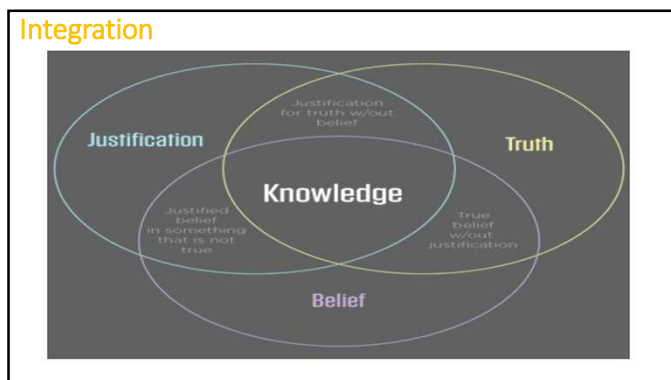




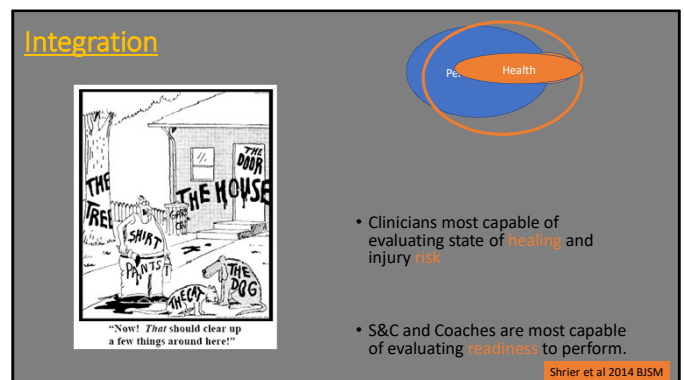
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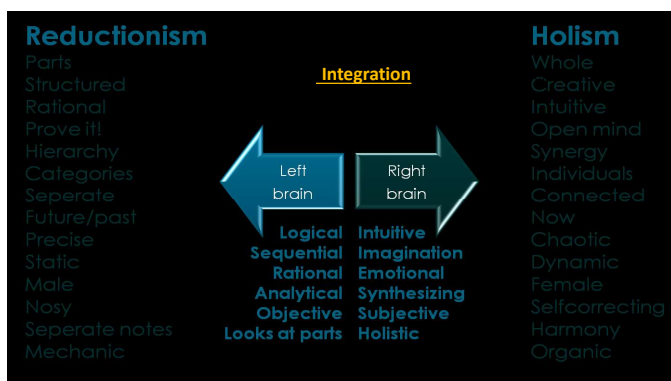
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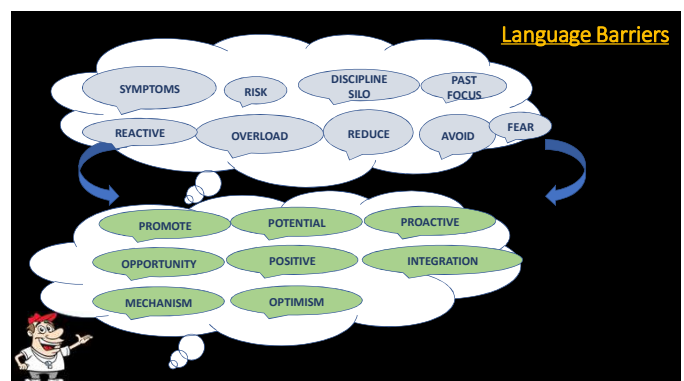
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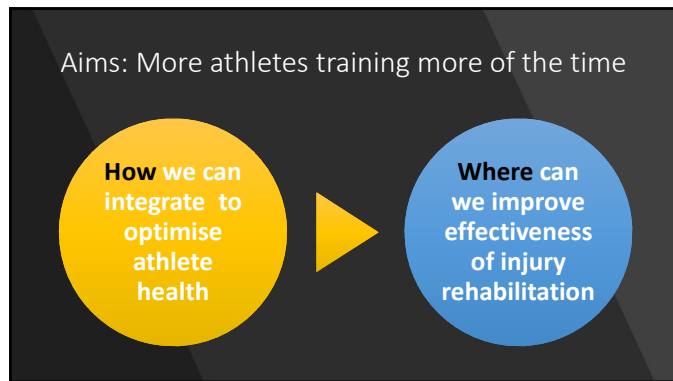
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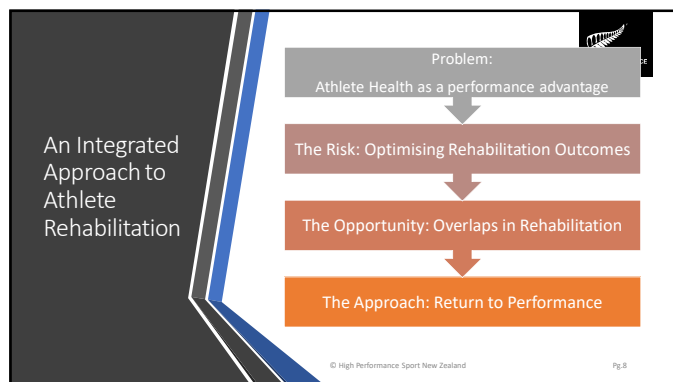
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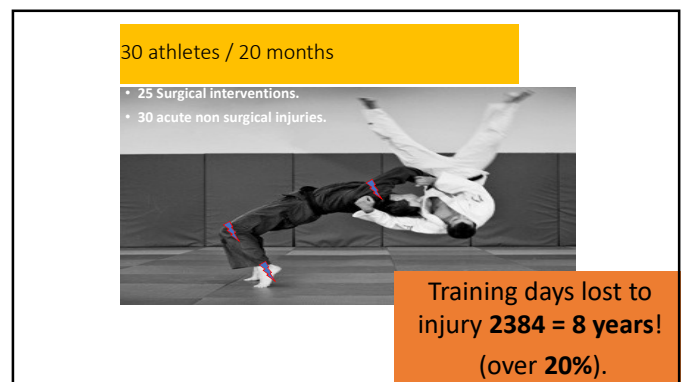
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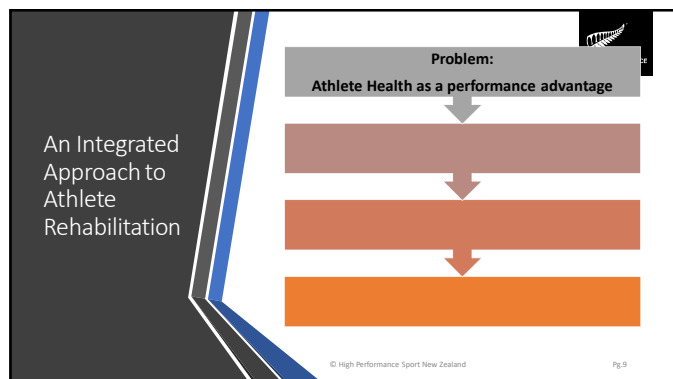
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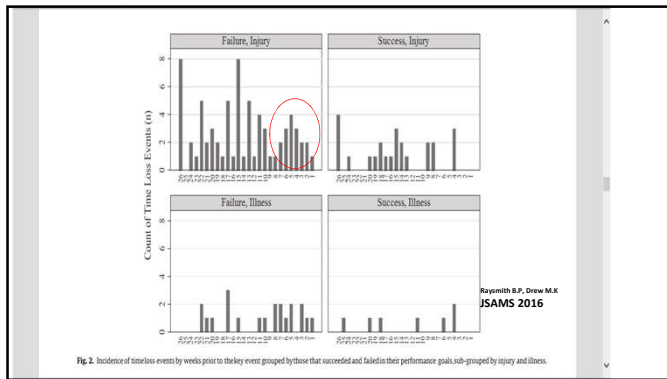
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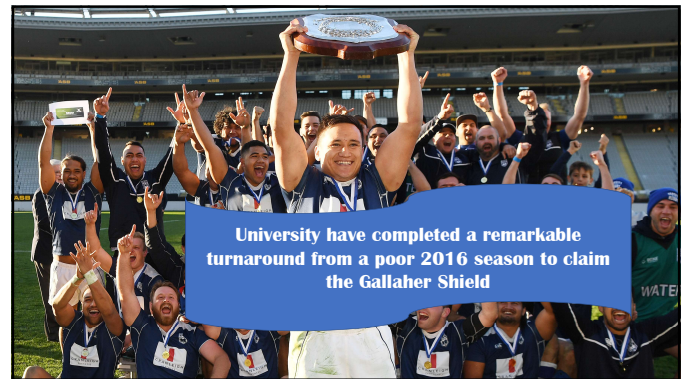
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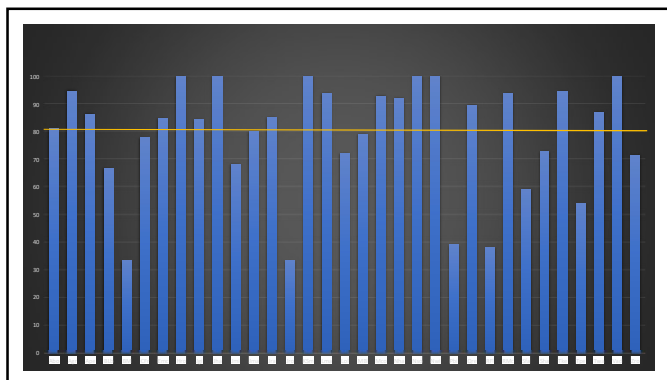
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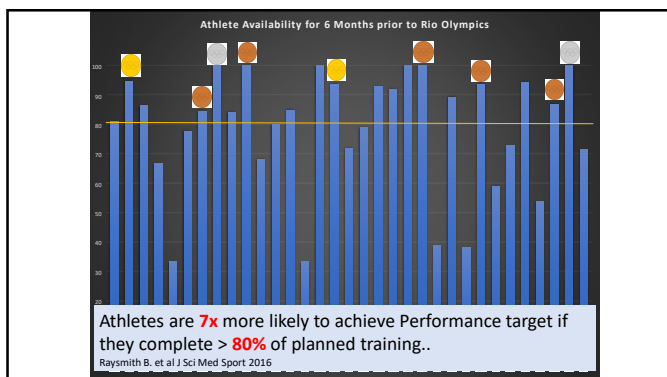
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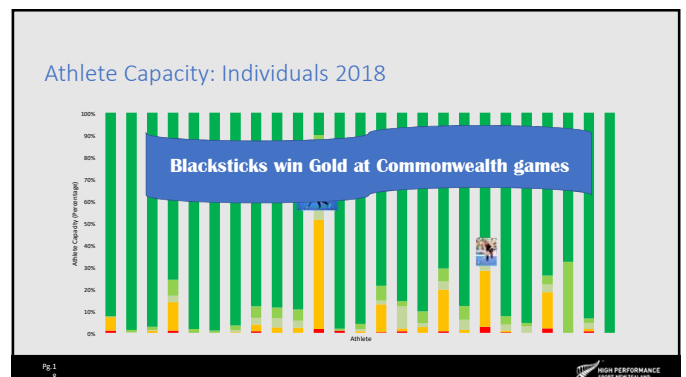
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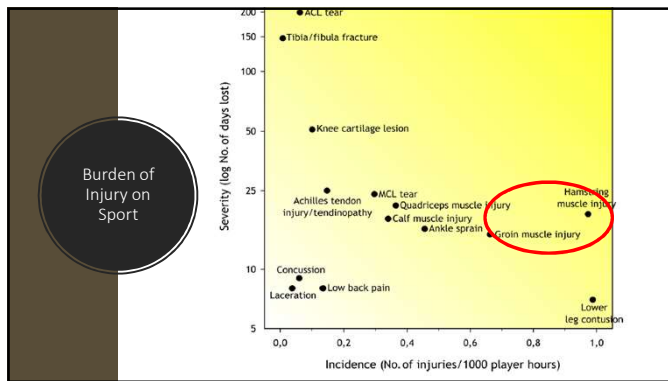
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22

Burden of Injury :

1. What are the biggest injury risks in your sport consider:

- time of year
- body area
- time lost from sport

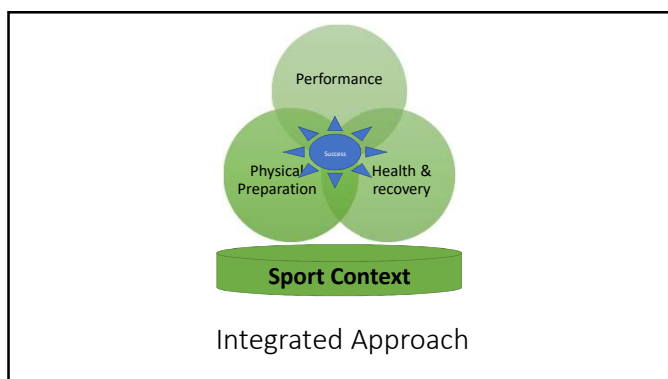
20

Ankle Injury

74% of all Lateral Ankle sprain have ongoing symptoms
 18% sustained a subsequent strain within 12 months
 *Malliaropoulos N et al Scand J Med Sci Sport 2009;39(5)
 50% increased risk of ankle sprain
 *Boswell BK et al J Rehabil Res 2008;45(1)
 Evertor strength higher in dominant leg EXCEPT for those with Hx ankle sprain

Fulton et al USPT Vol 9, No. 5, Oct 2014

23



21

ACL

Return To Sport: 83% Elite, 60% non Elite
?RTPerform
 Courtesy C.H.L et al BJSM 2018

Rupture graft 6.4%
 *Salmon L et al Arthroscopy 2005;21(8)

5.7% rupture contralateral ACL
 *Opar DA, et al Sports Med 2012;42(3)

10% disruption of graft 4-12 months
 *Gerber P et al Phys Ther 2009;89(5)

Fulton et al USPT Vol 9, No. 5, Oct 2014

24

Hamstring



Strong predictor of future HS
4.3 x more likely to sustain another
27% all HS in AFL relate to previous HS

↓ Eccentric strength = ↑ injury risk 37% , football
Witvally & 2022, Sports

Fulton et al USPT Vol 9, No. 5, Oct 2014

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What is the greatest **risk factor** for Injury?

28

Original Research

Reduced shoulder strength and change in range of motion are risk factors for shoulder injury in water polo players

Andrea Hams ^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Kerrie Evans ^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Roger Adams ^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Gordon Waddington ^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Jeremy Witthall ^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}

<https://doi.org/10.1016/j.ptsp.2019.10.003> [Get rights and content](#)

Highlights

- Pre-season TROM difference of $\geq 7.5^\circ$ was a significant predictor for future episodes of shoulder injury.
- Shoulder IR strength PBW of $\leq 16.8\%$ was a significant predictor for future episodes of shoulder injury.
- Shoulder ER strength PBW of $\leq 12.5\%$ was a significant predictor for future episodes of shoulder injury.

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An Integrated Approach to Athlete Rehabilitation

Problem:

Athlete Health as a performance advantage

↓

The Risk: Optimising Rehabilitation Outcomes

↓

The Opportunity: Overlaps in Rehabilitation

↓

© High Performance Sport New Zealand Pg. 29

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Return to Sport and Performance After Hip Arthroscopy for Femoroacetabular Impingement in 18- to 30-Year-Old Athletes

A Cross-sectional Cohort Study of 189 Athletes

Lasse Ishikawa^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Kristian Thorborg^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, Otto Kraemer^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, MD, and Per Hølmich^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}, MD, DMSc.

Investigation performed at Sports Orthopaedic Research Center-Copenhagen (SORC-C), Department of Orthopaedic Surgery, Copenhagen University Hospital, Amager-Hvidovre, Denmark.

Hip Pain

Outcomes

- 9/10 athletes RTS
- 3/4 athletes RTS @ same level

Clear and strict definition of return to sport.

- 57% RTSP with labral repair and cam resection.
- 17% RTSP reported sports performance to be optimal

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CAN TRAINING REDUCE YOUR INJURY RISK?

Where can we have most influence?

STRETCHING 4%

MULTIPLE EXPOSURE PROGRAM 38%

PROPRIOCEPTION TRAINING 45%

STRENGTH TRAINING 69%

% Decrease in Injury Risk

AUTHORS' CONCLUSION:
Consistently favorable estimates were obtained for all injury prevention measures, **except for stretching**. Strength training reduced sports injuries to less than 1/3 and overuse injuries could almost be halved. (Sauerbrey et al, 2014)

Pg. 30

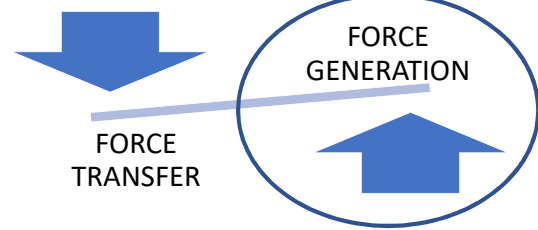
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Load

- ✓ Load is a Vehicle to drive athletes towards or away from Injury
- ✓ Risk of Injury \propto Rate of injury
- ✓ Risk factors of injury can be modifiable or non modifiable, intrinsic or extrinsic

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Injured Athletes > Force : Function



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Relationship of training load and Injury Risk

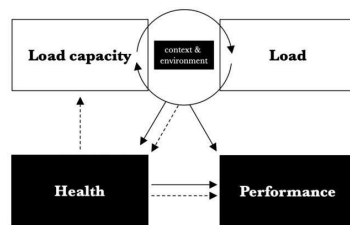
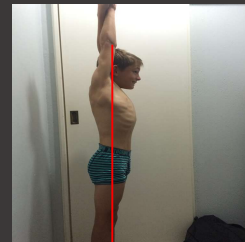
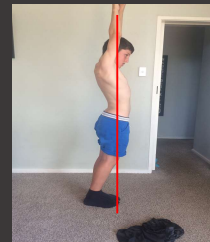


Figure 1 An integrated view on load, load capacity, performance and health in sports. Dotted lines represent negative relationships and solid lines represent positive relationships.

Verhagen E, Gabbett T 2019

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Growing skeleton



35

Mechanism of injury

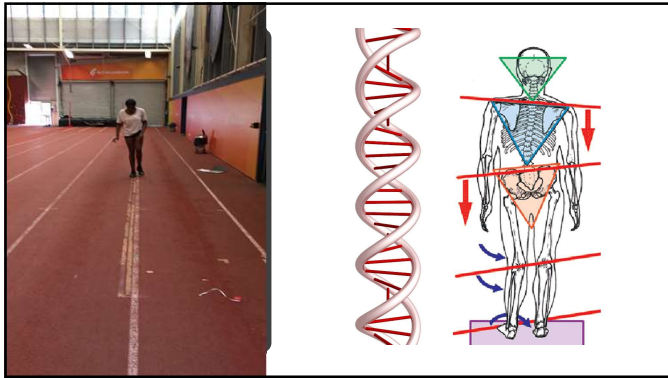
Training Load, Recovery, positional demands
Athletes movement strategy can contribute to overload and Injury
Consider the athletes ability to transfer forces through the body



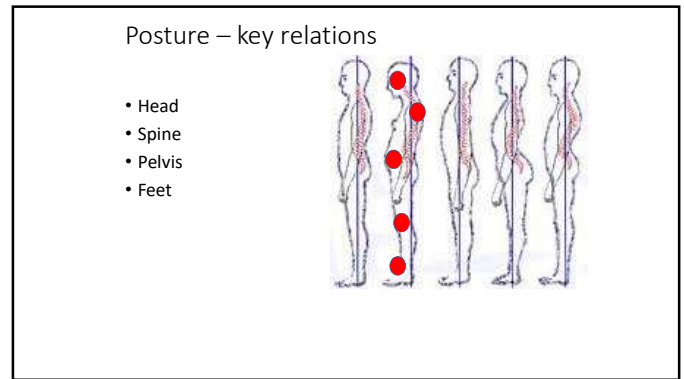
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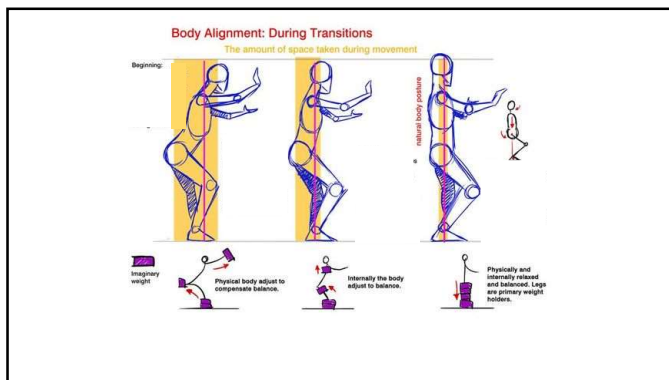
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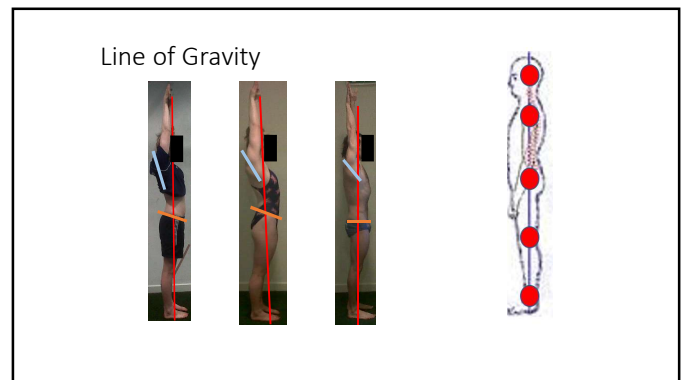
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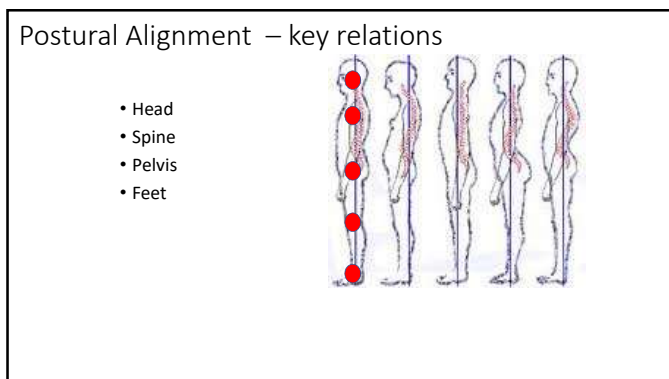
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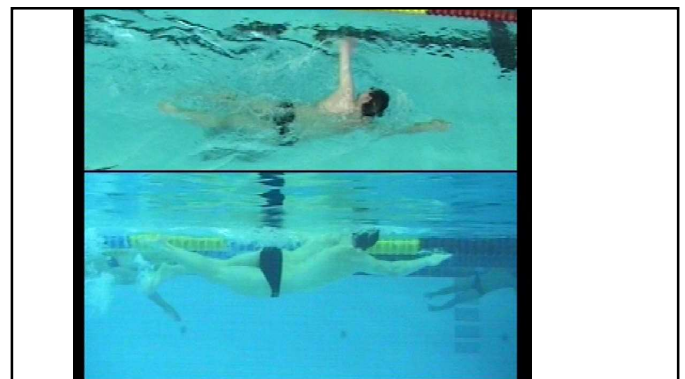
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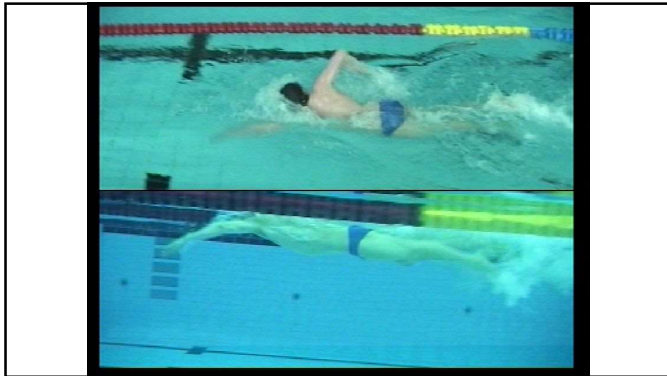
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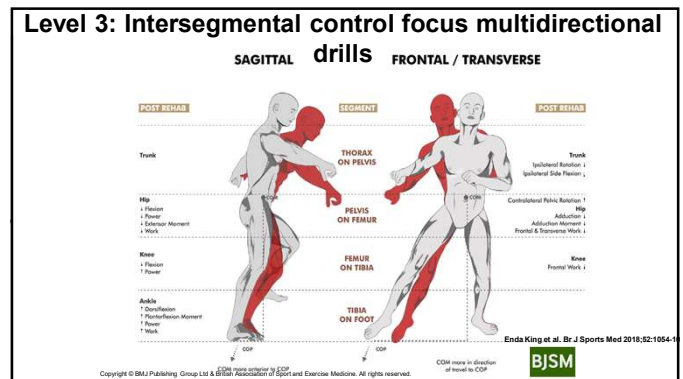
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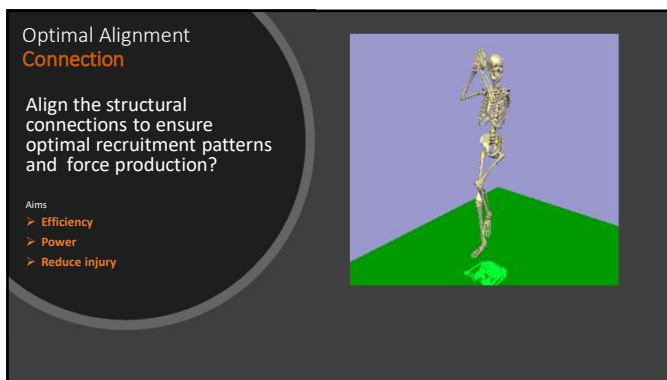
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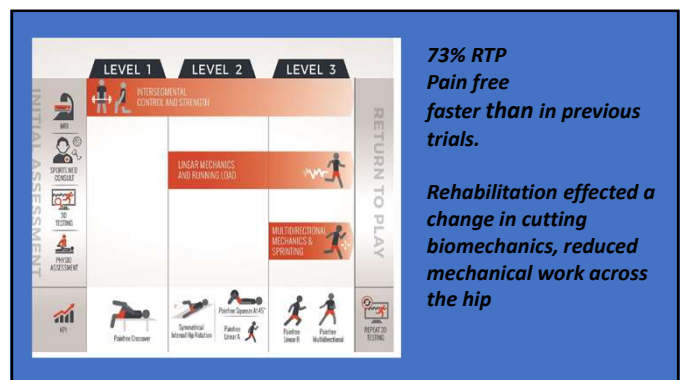
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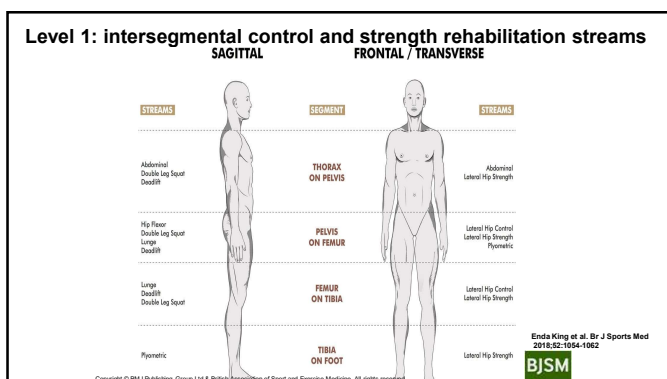
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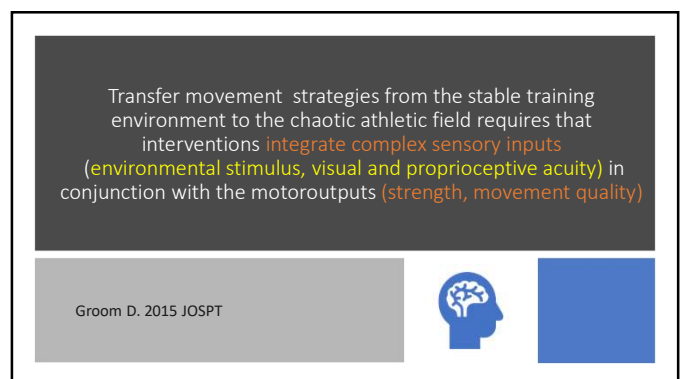
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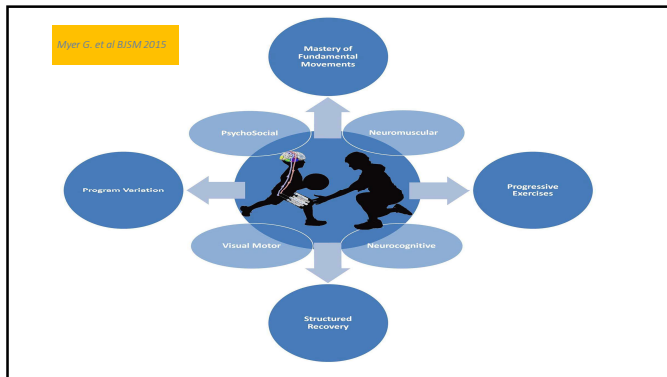
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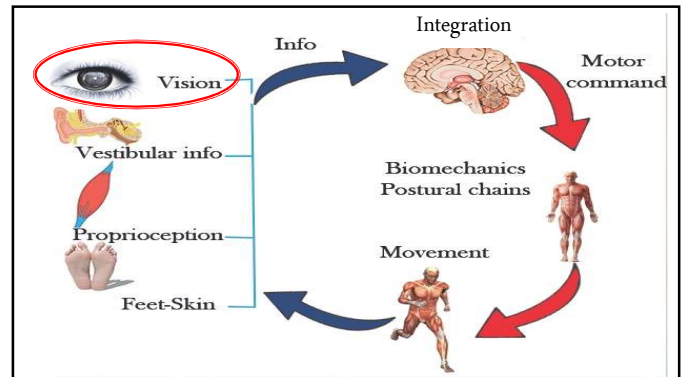
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Motor Training

JAP Adkins D.L. et al 2006

Structural and functional reorganization across the motor system which is dictated by the behavioral demands of the training experience

- Skill training; cortical reorganization in Motor Cortex
- Strength; Spinal motorneuron and synaptogenesis Spinal cord
- Endurance; influences blood flow changes in Motor Cortex

For reorganization of motor patterning at level of the cortex some element of skilled training is a requirement

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Rehab Transition > Sport Specific
Target motor imbalances through cortical pathways by reducing **dependence on visual feedback**

Groom D. 2015 JOSPT

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Motor Control: Rehabilitation

Level of original learning

Perceived similarity

Task Structure

Similarity of goals and processing

Number, variability and order of examples

Contextual Interference

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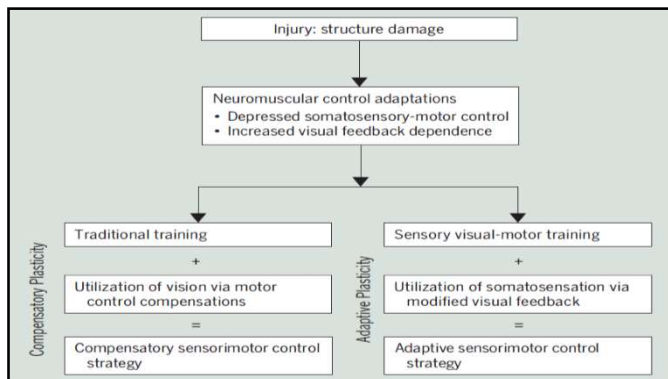


Sports Specific NMS training

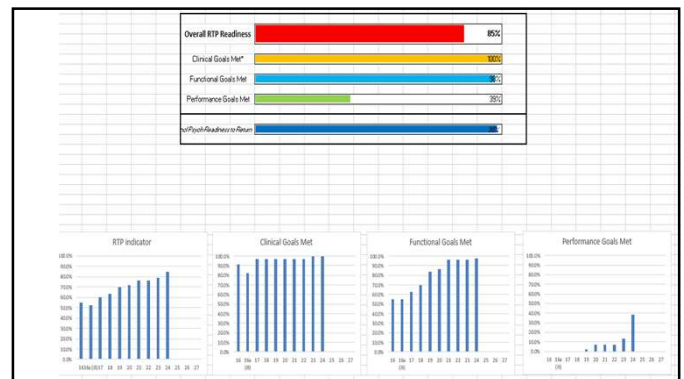
FIGURE 2 | Example of exercise training to train general rotation.

FIGURE 3 | Example of exercise training for a duel between two players to train change of direction (COD).

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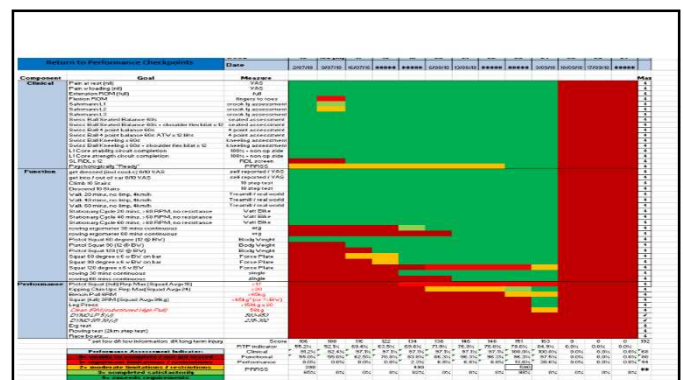
Mastering skills free up cortical space

• <https://www.youtube.com/watch?v=aoScyO2osb0>

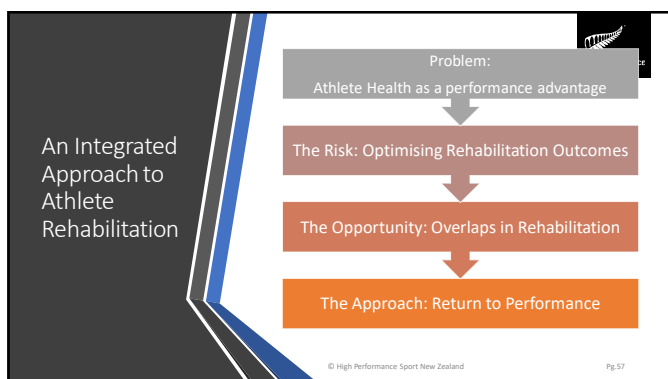
EXTERNAL FOCUS

Direct attention to the anticipated trajectory of the object leads to increased movement accuracy versus instructions that direct attention to the body part involved, such as the hand or foot

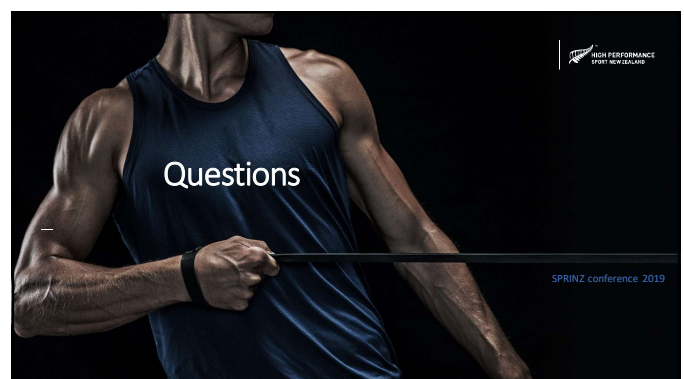
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