An Online Movement and Performance Screen to Identify and Classify Uncontrolled Movement

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PURPOSE

An online movement screening tool has been developed to identify uncontrolled movement (UCM) in functionally relevant multi-joint movement skills. Many current screening tools identify that there is a problem in movement control, but do not classify the uncontrolled movement. This tool has set out to classify the UCM in terms of 3 criteria: 1) the site of UCM, 2) the direction of UCM, and 3) the threshold of UCM. This *identification* of UCM enables the development of highly specific retraining strategies to optimise movement control recovery.

RELEVANCE

In sport, a significant predictor of re-injury is having a history of previous injury (Watson AW 2001 *Int J Sports Med* 22:222-5, Locke S. 2003 *J Sci Med Sport* 6; Sup:60). Therefore, athletes who return to sport with painfree full strength and mobility function are the group with significant risk of re-injury. The question of, "what is undetected in this group that predisposes them to re-injury" – has not been adequately answered.

A link has been established between uncontrolled movement and risk of injury (Roussel et al 2009 *Man Ther* 14(6):630-5). A battery of movement control tests has been shown to be effective in assessing for aberrant movement patterns (UCM) in people with musculoskeletal pain (Luomajoki et al 2007 *BMC Musculoskelet Disord* 12;8:90).

Although UCM has been shown to be closely related to the presence of musculoskeletal pain, UCM can be identified in people who have a history of recurrent pain, when they are currently pain free (in between pain episodes). UCM has also been identified in people who are pain free and have never had previous pain. Therefore, uncontrolled movement may be a potential risk factor for the development of musculoskeletal pain or injury.

DESCRIPTION

The Performance Matrix - Movement and Performance Screen (MPS) is an online tool consisting of a battery of movement control tests based on the theory of movement dissociation (Sahrmann 2002 *Mosby*). The tests identify specific sites of UCM (e.g. low back, scapula, hip). They further sub-classify the direction of the UCM at the problem site (e.g. low back-flexion, scapula-forward tilt). In addition, this classification process evaluates the threshold of control failure as being either low threshold (related to aberrant movement coordination, synergistic patterns of recruitment and alignment) or high threshold (related to strength or speed deficiencies). The MPS identifies multiple movement weak links. Each movement weak link is prioritized as high risk or low risk.

PARTICIPANT SCREENING

Ninety male professional footballers from two UK premier league football clubs and one Dutch football club were screened with a Performance Matrix - Movement and Performance Screen during pre-season screening in 2009. A performance profile of movement control risks and assets can be generated for each player.

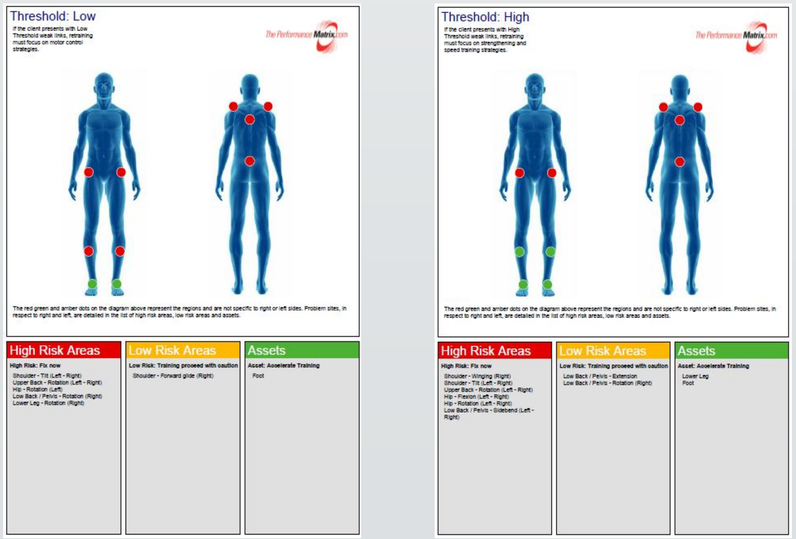

Figure 1. Examples of the results of risk analysis profile generated by the online tool. Low threshold and high threshold sites and directions of UCM are illustrated.

ANALYSIS

The two most common sites of injury in football are the low back and hip. The MPS identified uncontrolled low back sidebend (high threshold), and low back rotation and low back extension (both low and high threshold) as high risk UCMs. Screening also identified uncontrolled hip flexion and hip medial rotation (high threshold) as high risk UCMs. (Table 1)

Uncontrolled Movement		Low Threshold		High Threshold	
Site	**Direction**	**(L)**	**(R)**	**(L)**	**(R)**
Low Back	Flexion	30%	30%	30%	30%
	Extension	70% *	78.9% *	70% *	78.9% *
	Rotation	82.2% *	74.4% *	84.6% *	81.1% *
	Sidebend	54.4%	46.7%	92.2% *	80.0% *
Hip	Flexion	35.6%	36.7%	88.9% *	87.8% *
	Rotation	26.7%	28.9%	73.3% *	80.0% *

Table1. Frequency of failed tests of Site, Direction & Threshold for the low back and hip. (* indicates high risk)

CONCLUSIONS

A battery of movement control tests can identify UCM in people with and without musculoskeletal pain. This uncontrolled movement may be a potential predictor of re-injury risk. The UCM can be classified (site, direction and threshold) and prioritized as high risk or low risk.

IMPLICATIONS

The classification of UCM may predict movement control dysfunctions, which if corrected, may prevent the onset or recurrence of pain and musculoskeletal injury. The ability to assess for and retrain control of uncontrolled movement is a valuable skill for physical therapists involved in injury prevention.

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