ECCENTRIC HAMSTRING STRENGTH IN CLUB GAELIC FOOTBALLERS.

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The purpose of this study was to investigate the eccentric hamstring strength of Gaelic footballers during the season. The Nordic hamstring exercise was used to determine maximal hamstring eccentric Torque using the Nordbord testing system™. A total of 67 players were tested in pre-season as described previously by Opar et al. (2013). Injury data was recorded directly via questionnaire from each participant. 117 players were tested in the preseason, 98 in the in-season and a combined total of 67 players tested in both in-season and pre-season and included in the study. There was no difference in eccentric torque for in both preseason (121±25 v124±27, p>0.641) and late in-season (124±29 v 128±22, p>0.7997) when comparing injured and non injured groups. A previous hamstring injury produced a 32.88 RR. In club Gaelic footballers pre-season eccentric strength in the Nordic exercise is not a pre-requisite for the prevention of future HSI while previous HSI is a strong risk factor.

KEYWORDS: eccentric, hamstring, gaelic football.

INTRODUCTION: Gaelic football (GF) is one of Irelands leading national sports it is characterised as being multidirectional in nature involving 15 participants (McIntyre., 2005) with elite players covering on average 132m.min^{-1} which can increase to 230 m.min^{-1} (Malone et al., 2017). Hamstring strain injuries (HSI) in GF are extremely prevalent with reported rates of 3-5 injuries per 1000 hours for training and 50- 97 injuries per 1000 hours in match play (Roe et al.,2018; Wilson et al. 2007). It has previously been reported that eccentric strength is an important prerequisite for HSI prevention with players 2.7 times more likely to sustain a HSI with strength levels below 256N at the start of the season (Opar et al., 2015). The purpose of this study using the Nordbord testing system™ was to determine whether eccentric hamstring torque in pre-season and in-season was lower for those players who sustained a hamstring injury during the playing season.

METHODS: A total of 67 players were tested in both preseason and in season. Prior to testing each player was provided with a injury questionnaire that detailed their injury history which also included details of the testing procedures. The Nordic hamstring exercise was used to determine maximal hamstring eccentric torque using the Nordbord testing system™ which has a moderate to high retest reliability of (ICC=0.83-0.90) (Opar et al, 2013). Following a 5-10 minute dynamic warmup and visual demonstration players were strapped into position, limb length measured, then performed 1 set of trial repetitions at 80% maximum effort. Following this, a set of 3 maximal repetitions were performed (Opar et al, 2013). For this study a hamstring injury was classified as acute pain in the posterior thigh and one which involved time loss of 7 days or more to training or games. The involved side was detailed and data was

analysed with respect to maximal absolute and relative force and torque. Univariate relative risk with a confidence interval of 95% was performed and grouped according to bilateral hamstring imbalances, previous injury, age and absolute and relative torque using SPSS software package V.18.0 (SPSS Inc, Chicago, Illinois, USA).

RESULTS: In the injured group in pre-season there was no difference between the involved (125+/-25Nm) and uninvolved (125+/-31Nm) sides in torque measures (p>0.05), however there was a significant difference in season between the involved (mean 124Nm, CI 95%, 99-136Nm) and uninvolved side following injury (Mean 132Nm, CI 95%, 107-144Nm, P<0.05) (Table 1).

Table 1. Nordic hamstring exercise Torque variables from hamstring strain injured and uninjured Gaelic footballers.

		Absolute hamstring eccentric Torque (Nm)		Relative hamstring eccentric Torque (Nm.kg)	
Group	Limb	Pre-season	in-season	Pre-season	in-season
Injured	Injured	124±25	124±27	1.54±0.35	1.56±0.40
	Non injured	125±31	132±35*	1.58±0.46	1.70 ±0.46*
Non injured	Average of left and right	126±28	134±22	1.55±0.33	1.63±0.31

*Significant difference P>0.05

A previous hamstring injury produced a 32.88 RR.

TABLE 2. Univariate RR of previous injury.

	N	% of HSI in group	RR (CI 95%)	P-value
injured group	19	68.4	32.88	>0.05*
non injured group	49	2.08		

DISCUSSION: The findings from the study indicate that 1) players which have previously suffered a hamstring injury prior to the pre-season and those who go on to become injured during the season do not differ in both pre-season and in-season strength compared to un-injured players 2) those suffering a previous injury are at a significantly increased the risk of HSI.

Pre-season strength testing does also not distinguish players who previously suffered hamstring injury, however it has been reported by Opar et al. (2015) that a limb that sustained a HSI was weaker compared to uninjured limbs among athletes at the start and preseason (Opar et al., 2015). Players demonstrate similar eccentric strength levels in both pre-season and in-season regardless of HSI status. Eccentric strength levels in pre-season do not differ for those than suffer HSI through the season. The results of the current study conflict with those of recent studies in which it was previously reported that limbs that sustained a hamstring injury were significantly weaker than those who did not become injured (Arnason et al., 2004; Opar et al. 2013 ; Opar et al. 2014). However, the values reported in the current study for club Gaelic footballers are lower that those reported for elite Gaelic footballers, 4.4N.kg^{-1} (Roe et al., 2018) and similar to those reported for Australian football (3.2±1.3N.kg^{-1}), elite rugby union (3.7±0.7N.kg^{-1}), sub-elite rugby union (4.0±0.9N.kg^{-1}), elite cricket (3.7±1.0N.kg^{-1}) and sub-elite cricket (3.7±1.0 N.kg^{-1}) (Bourne et al., 2015; Chalker et al., 2016; Opar et al., 2015; Timmins et al., 2016). Match play consists of intermittent intervals of multidirectional running and elite players are said to cover 8889m with 18% at high speed pace >17km/h (Malone et al., 2016). It is reported that a professional Australian football player covering a distance of >653m at ≥24km h^{-1} weekly have a 3.3 times higher chance of sustaining a hamstring injury in comparison to their peers (Ruddy et al., 2016). The differences between elite and club Gaelic footballers may reflect the physiological demands of inter county and club football as inter county players have generally greater levels of conditioning (Mc Intyre, 2005). Furthermore players who had eccentric strength levels in pre-season below 120Nm were 1.7 times more likely to sustain a HSI with players who had strength levels below 130Nm during the season were 1.2 times more likely to sustain a hamstring injury. These are similar to values previously reported In professional Australian footballers with eccentric strength of <256 N at the start of preseason and <279N at the end of the preseason, having had a 2.7-fold and 4.3-fold greater risk of HSI (Bourne et al., 2015). In club Gaelic footballers eccentric knee flexor strength is similar to other sports while there is a pre-requisite to have a eccentric knee flexor strength of 120Nm in preseason and 130Nm as weaker players were not more likely to experience an injury compared to the stronger players (Bourne et al., 2015) however pre-season testing does not differentiae between injured and uninjured groups.

Previous injury is a strong risk factor (Opar et al., 2015). This is in agreement with the current study in which the risk of prior injury in the current group is 33 mores likely to sustain an HSI. This is also in line with previous observations in rugby union (Brooks et al., 2006), Australian football (Warren et al., 2010) and on return to play a player is 230% more likely to sustain a future injury compared to un-injured players (Roe et al., 2016).

CONCLUSION: Preseason and in-season eccentric strength testing does not differ regardless of HSI injury status but a eccentric strength above 120Nm is recommended for HSI prevention and particularly in players that have had previous HSI as they are at greater risk of injury.

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