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LITERATURE REVIEW ON PREVENTATIVE REHABILITATION FOR RUGBY INJURIES TO THE LOWER LIMB

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Providing coaches, referees, players, and administrators with the knowledge, skills, and leadership abilities to ensure that safety and best practice principles are incorporated into all aspects of contact rugby.

INTRODUCTION

The lower limb is susceptible to injuries as rugby is a fast-moving, high-intensity sport with physical contact.

MOST COMMON RUGBY INJURIES

In rugby the lower limb is the most commonly injured area of the body. For example, the lower limb accounted for 42% of all injuries at the 1995 Rugby World Cup in South Africa [37]. In Argentinian provincial rugby the lower limb accounted for 12% of all injuries and 14% of lower-limb injuries involved the knee [6]. A study of South African Super 12 players in 2005 showed that the pelvis and hip were the most commonly injured area (19%) followed by the knee (13%) and that ligament sprains accounted for 25% and muscle tears and strains 24% of injuries [35]. During matches the knee joint accounted for 12% of injuries, the thigh 8% and the ankle 5%. However, during practice sessions the injury profile was slightly different with the ankle being the most injured part of the body (14%), followed by the thigh at 13% and the hamstring at 11%.

A comprehensive prospective study of injuries to elite Australian rugby union players showed that that 52% of all injuries occurred in the lower limb. Ligament sprains and tears accounted for 26% of all injuries [3]. At an amateur level, the injury profile changes, with muscular injuries (including haematomas) being the most prevalent injury (29%) [20].

Looking at specific injuries, Dallana et al. [14] found that knee injuries accounted for the most number of days absent from play and were made up of mostly anterior cruciate ligament injuries (ACL) (27%) and medial collateral ligament injuries (MCL) (25%).

An evaluation of the New Zealand RugbySmart programme (2005-2006) found that the knee was responsible for 25% of injuries, accounting for 31% of the total costs. The leg (upper and lower, excluding knee and ankle) were responsible for 6% of the injuries (and 7% cost) whereas the ankle accounted for 10% of the injuries (and 9% cost) [25].

A long-term follow-up study [42] showed that 26% of players stopped playing rugby because of injury, and that 35% of these injuries involved the knee. This is supported by other studies which show that knee injuries result in the highest player absence from training and matches [14].

A study examining the incidence and characteristics of rugby injuries amongst USA schoolboys and schoolgirls found that the injury rate was 5.3 injuries per 1000 athletic exposures, with 87% of the injuries occurring in males. The ankle accounted for 13% of injuries [13]. Most lower-limb injuries appear to be acute rather than chronic [3].

LEVEL OF PLAY

There is evidence to suggest that the numbers of injuries increase in relation to an increasing proficiency level of play [21,61,67,28,41,42,71]. Reasons for this could include player size, more physicality in the tackle area, and the fact that the ball is in play for a longer period at an elite level [48]. Bathgate et al. [3] has shown that following the onset of professionalism, the level of injury over a two-year period increased from 47 injuries/1000 to 74 injuries /1000 player hours.

GENDER DIFFERENCES

Women's rugby is becoming increasingly popular so it is important to also track injuries among females, as there is no evidence to show that they follow the same pattern as injuries in men. A study [58] conducted during the 2006 Women's Rugby World Cup showed that 55% of the females sustained at least one injury. Four players sustained two injuries. The majority of the injuries occurred during the matches, as compared to practice sessions. Front row players had the highest rates of injury. Most injuries were during the tackle phase (63%) – a statistic supported by other studies [43].

MECHANISM OF INJURY

To implement an effective injury prevention programme it is necessary to examine the aspects of playing and training that are associated with a high risk of injury.

Phase of play:

Tackles, rucks and mauls appear to be the phase of play where most injuries occur. In a study of South African rugby players it was found that 40% of injuries occurred during tackling and 11% during mauls. In the 1995 Rugby World Cup [37], 56% of injuries occurred during the tackle phase of play, 23% during rucks and mauls, 11% during open play and 9% as a result of foul play. A study of the Australian team (1994-2000), [3] showed that most (59%) injuries occurred during a tackle and 20% occurring during open play. This was slightly lower than the study on Argentinean rugby players which showed that 33% of injuries occurred in open play [6]. Foul play is also responsible for causing injuries [5,37].

Injuries by position:

This varies from study to study. Some studies have found that there is no difference in injury rate between the backs and forwards [23,36]. However, an Argentinean study showed that the flanker appears to the most injured player (16%) [6]. An Australian study showed that the lock was the most injured forward whilst the fly half No 10 was the most injured back [3].

Time during match when most injuries occur:

Fatigue contributes to injuries as most injuries occur in the second half of the match [6,56], specifically the 3rd quarter (40%) [3,20].

Previous injury:

A previous injury appears to be a high risk factor for another injury [43,56]. Interestingly, in a review of injured players it was found that a majority of players completed the full match in which they were injured and 39% of players played against medical advice at some time in their careers [23].

RESEARCH ON PREVENTATIVE STATEGIES

Evidence for effectiveness of prevention

The New Zealand RUGBY SMART programme is perhaps the leader in preventative strategies and includes research and the follow-up in a long-term preventative programme. This extensive nationwide initiative sought to reduce the number and severity of injuries in community rugby by providing evidence-based information about injury risk and injury prevention strategies to coaches and referees. This programme was delivered to 10,000 coaches and 2000 referees nationwide. It was launched in 2001 and a recent evaluation has shown a decrease in injury claims per 100 000 players [25]. Claims from knee and leg injuries had decreased by 2005, although the change in ankle injury claims was negligible.

The important take home messages that arose from evaluation of the programme were:

- Workshops can be used to communicate injury prevention information on a nation-wide basis.
- Community-focused injury prevention can be successful.
- The content needs to be suitable for audiences, with plain take-home messages.
- Evaluation of the efficacy of the programme should be included.

A study undertaken in South Africa [18] on schoolboy rugby found that a basic preventative training programme, in addition to normal training, reduced what they labelled intrinsic (chronic) but not extrinsic injuries (caused by an outside force) in 15- to 16-year-old boys. The main limitation of this study was that the experimental group was the A or first team and the control group was the B or second team which perhaps caused bias in the interpretation of the data.

A review study of adolescent sport [1] was concluded that injury prevention strategies that focused on pre-season conditioning, functional training, education, balance and sports-specific skills that are

continued throughout the season are effective. Many other studies, although small and non-randomised, also showed that it was in fact possible to reduce the incidence of knee and ankle injuries through preventative rehabilitation programmes [9,2,52,70,34]. Hewett et al [31] used a pre-season programme to develop flexibility, strength, power and landing mechanics and found that this had a beneficial effect on injury profile.

One study however did find that there was an increased risk of rugby injuries for those who attended pre-season training for longer periods. However, the data in this study was self-reported and relied on memory recall and the injuries were not properly diagnosed. [43]. Similarly, a study in New Zealand found that players who engaged in more than 40 hours of strenuous activity per week missed more playing time through injury than those who were less active [55]. This suggests that training load must be monitored so that players do not incur overload injuries.

Warm-Up

Three studies have examined the effect of warm-up on injury rate. The first study on handball players found a reduction in knee and ankle injuries after a comprehensive warm-up programme [52]. A prospective cohort study [46] found that a structured warm-up programme consisting of strength work, stretching, plyometrics and drills, was more effective than a traditional warm-up in reducing the rate of ACL injuries in female soccer players. Lastly, it was shown in a male cohort that education, a warm-up and cooldown after exercise resulted in a reduction in soccer injuries [38].

SPECIFIC TRAINING TO REDUCE SPECIFIC INJURIES

Recently studies on proprioception and balance have contributed to the fine-tuning of preventative training programmes. Emery et al [16] implemented a home-based proprioceptive training programme and found that this improved static and dynamic balance in adolescents and reduced the rate of injury. A study on female handball players [70] using ankle-rotating discs found that those players who supplemented their strength training were less likely to be injured than controls who were merely doing strength training. Another study on rugby players showed that proprioceptive training was more effective in preventing injuries than strength training alone [1].

Much research has now focused on preventative strategies to reduce the risk of ACL injuries. One randomised study on senior men elite soccer players showed a substantial decrease in the rate of injury to the ACL as a result of a static balance training programme using a balance board [9]. A trial incorporating over 1040 female soccer players used a sports-specific training intervention before athletic activity. The intervention was used in place of a traditional warm-up and included education, stretching, strengthening, plyometrics and sports specific agility drills. In the first year there was an 88% decrease in

ACL injury in the intervention group compared to the control, and over the two-year period this particular intervention programme showed a 75% reduction rate compared to the control group [46]. Meyer et al [48] studied "high risk ACL" female athletes based on knee abduction loads. These athletes were exposed to neuromuscular training over 7 weeks. After the intervention it was found that these "high-risk" athletes decreased the magnitude of this "abduction load". Although there were relatively few subjects in the study and the measurement tool was not validated for predicting ACL injury, it does show that neuromuscular training does indeed improve the biomechanics of the knee. Other studies support these findings [32,10].

Proprioception would also govern the correct position of the knee during flexion. The focus on the alignment of the hip, ankle and knee and, more importantly, the knee over the toe has been shown to be important in knee ligament injuries [16,54].

The hamstring muscle group has also been shown to be an important accessory stabiliser to the ACL in the knee joint complex. Results from intervention studies suggest that including hamstring strength training in a programme can help prevent ACL injuries. Although the studies had a small number of subjects they do indeed suggest the inclusion of hamstring strength training in a preventative programme [34,62].

Hamstring strains are the most common injuries in most sports [54,60] and account for the most playing time missed. However, as pointed out earlier, the knee ranks higher in rugby, possibly as a result of the tackle which contributes to the high risk of injury. After reviewing all the information on the prevalence of injuries, if injuries caused by tackles were removed, the hamstring would probably be the most commonly affected muscle group. Evidence for preventing hamstring strains through exercise rehabilitation does exist. A rehabilitation program consisting of progressive agility and trunk stabilisation exercises was found to be more effective than a program emphasising isolated hamstring stretching and strengthening in promoting return to sports [62]. This study found a significant difference in re-injury rate in the agility and trunk stabilisation group (0%) compared to a control group (55%). After 1 year of return to sports, the re-injury rate was significantly greater in the control group (70%) who completed the hamstring stretching and strengthening program, as compared to 8% who completed the progressive agility and trunk stabilisation program.

Similar findings about the value of balance and proprioceptive training are shown in relation to ankle injuries. Looking at purely functional ankle instability measured by postural sway, Kidgell et al [41] found that this was improved by both mini trampoline training and dura disc training. Male and female volleyball players who did balance board training had a reduction in the rate of ankle sprains and a reduction in recurrence of ankle sprains [68]. Sheth et al [63] performed an interesting electromyography study on muscle

reaction time and found that proprioceptive training improved reaction time in simulated ankle sprain situations.

The evidence would suggest that it is important that these preventative training programmes are continued throughout the season. Adult volleyball players showed a significant reduction in ankle sprains by continuing programmes through the season [2,65,70]. The same was found in soccer players with a 50-70% reduction in groin injuries as well as a reduction in ACL injuries [9].

CONCLUSION

The lower limb accounts for a high proportion of injuries in rugby. Much time and money is spent on getting players back on the field. Preventative training for the lower leg reduces the rate of injury of injuries and speeds up recovery. This training should be well planned so that the player is not overtrained, and should be continued through all the phases of a rugby season for best results. Preventative intervention should be comprehensive and include warm-up, hamstring eccentric training and proprioceptive and balance training.

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