

**VICTORIA UNIVERSITY**

**School of Health Sciences**

***An epidemiology of injuries in sub-elite netball during a competitive  
season – a club perspective.***

**P.McLaughlin**

**B.Nicholls**

**J.T.McMillan**

Word Count: 3,798

Key Words: Netball, Injury

Mailing Address: P. McLaughlin – Level 4, 301 Flinders Lane, Melbourne, Victoria

Date: 06/01/05

## **Abstract**

Netball is one of the most popular team based sports within Australia, particularly among females of all ages and skill levels; consequently, many injuries are incurred within the game setting.

The purposes of this study were to examine (1) the injury incidence rate; (2) the injury profile; (3) the injured player characteristics, and (4) time spent injured in elite competitive netball.

Sub-elite female netball players (78) were recruited from the Booroondara/JHF Power Netball Club during the 2003 competitive season. All participants were volunteers, with parental consent gained for underage participants.

At the first training session of each month all participants completed an injury questionnaire and returned it to the researcher in a sealed envelope. Data gained from the questionnaires were coded, stored and analysed using Microsoft Excel and examined via frequencies, averages and percentages.

Over the course of each teams respective season 19.9% of players were injured (3.1% injury rate per match). Of the injuries incurred 56% were new injuries and 37% were recurrent. When related to each team, it was observed that ankle injuries occurred at the highest incidence in open age competitions, knee injuries were more common in U/17 competition, and finger injuries were most common in U/15 competition. Overall knee and ankle injuries were found to account for 45 % of injuries throughout all age groups.

Based on the results of this study it can be concluded that the injury rates of netball participants seem not to have changed significantly from those previously reported.

## **Introduction**

Netball is one of the most popular team based sports within Australia, particularly among females of all ages and skill levels. Its popularity is also rising amongst men, as seen by the increase in mixed and men's competitions. In 1997, the Australian Bureau of Statistics reported that Netball was the fourth most popular activity amongst adults over fifteen years, and third most popular activity amongst children aged five to fourteen years.<sup>1</sup>

Netball is a dynamic sport requiring many different aspects of fitness, such as strength, speed, agility and co-ordination. It involves high speed, large forces on the body, and sudden changes in direction. Consequently, many injuries occur within the game setting. The Victorian Injury Surveillance System found that netball is responsible for 9% of all sport related injuries, with the majority of these occurring during formal match play.<sup>1</sup> It has been estimated that sports injuries cost the Australian community approximately one billion Australian dollars each year<sup>2</sup>. Furthermore, it has been estimated that each year, one in 17 Australians is injured sufficiently while participating in sporting activities to miss a game or training, to leave the field of play or to seek medical attention.<sup>2</sup>

Data has shown that within the netball setting, the ankle and knee are the most commonly injured body parts, and ligament sprains, contusions and muscle strains are the most common type of injury.<sup>3,4</sup> Most injuries to the lower limb occur as a result of specific netball plays such as defending or attacking, and are caused by collisions or incorrect landing positions.<sup>3,4,5</sup> However to date, the research that has been undertaken in an attempt to identify injury occurrence within netball throughout an entire season is limited. That which has been carried out has either been collected from a hospital-based data

collection point, thus possibly not accounting for minor injuries, or has been carried out within a tournament situation and thus not reflecting a typical netball season.

In order to prevent injuries from occurring it is necessary to identify the nature of the injuries and the underlying mechanisms involved so that appropriate preventative strategies may be implemented.

The purposes of this study were to gain a broad insight throughout sub-elite competitive netball of: (1) the injury incidence rate; (2) the injury profile, including body region and nature of injury; (3) the injured player characteristics, including level of competition, position, cause and activity at time of injury and (4) time spent injured.

## **Method**

### **Subjects**

After inviting all Victorian State League Netball Clubs to participate within the study, only one club, Booroondara/JHF Power, accepted the invitation. As a result sub-elite female netball players were recruited from the Booroondara/JHF Power Netball Club, a Melbourne based representative netball club. During the 2003 season this club fielded eight teams, listed in order of competition level from highest to lowest; Victorian State League open age - Championship & Division 1; Premier League open age - Division 1 & 2; Under-17 (U/17) - Division 1, 2 & 3; Under-15 (U/15)- Division 1.

This club was seen to be representative of a typical sub-elite Victorian netball club, whereby team members were selected through a trial process and elite netball was defined as National League competition and sub-elite was defined as State League and below.

After ethical approval was granted from the Victoria University Human Research Ethics Committee participants were recruited on a volunteer basis. Underage participants were required to complete consent forms to enable participation and implied consent was assumed for the remainder of subjects when questionnaires were returned. During the 2003 competitive seasons of State League, Premier League and U/17 and U/15, a total of 78 netball players took part in the study. All volunteers were able to participate in the study as the only inclusion criterion was that they be a member of the Booroondara/JHF Power Netball Club and the only exclusion criterion that existed was a lack of parental consent from underage participants.

### Data Collection

At the first training session of each month all participants received an injury questionnaire directly from the authors. Table 1 lists questions addressed in the questionnaire.

**Table 1.** Questions Addressed in Questionnaire

<i>Personal Characteristics</i>	playing position, grade of competition, age
<i>Injury occurrence within the past month</i>	
<i>Training sessions per week</i>	
<i>Matches per week</i>	
<i>Activity at time of injury</i>	training, warm-up, competition, other
<i>Reason for Presentation</i>	new injury, aggravated injury, recurrent injury, illness
<i>Body region injured</i>	
<i>Nature of injury</i>	abrasion, sprain, strain, laceration, bruise, inflammation, fracture, dislocation, overuse, blisters, cardiac, respirator, loss of consciousness, unspecified
<i>Cause of injury</i>	struck by another player, struck by ball, collision with player, collision with fixed object, fall on same level, jumping, fall from height, overexertion, overuse, slip, temperature related, stress, other
<i>Explanation of Injury in players own words</i>	
<i>Contributing factors</i>	unsuitable footwear, playing surface, equipment, foul play, none
<i>Protective Equipment used</i>	
<i>Return to Play</i>	immediate unrestricted activity, able to return with restriction, unable to return
<i>Length of restriction</i>	

The questionnaire was developed by Netball Victoria and has been used for their own injury surveillance records since 2001. While no published articles have documented results using this questionnaire, cross-referencing validity was used when considering questionnaires used by Hopper<sup>3</sup>, Hopper et. al<sup>6</sup>, Finch et. al<sup>7</sup>, Hume and Steele<sup>4</sup>, Stevenson et. al<sup>8</sup> and Morgan and Oberlander<sup>9</sup>. Upon completion of this one page questionnaire, it was placed in a sealed envelope, and returned to the researcher.

### **Analysis of Data**

Two hundred and twenty-one questionnaires were collected over the entire season. However some participants failed to complete a number of questions and thus a number of responses were described as unavailable (N/A). In addition when responding to some questions requiring an estimation of time, respondents gave a range of times, in which case the maximum time reported was used.

Data gained from the questionnaire were coded, stored and analysed using Microsoft Excel. Analysis involved examination of frequency, averages, percentages and rates of injuries were calculated per 1000 participations.

### **Results**

During the 2003 Victorian State League, Premier League, U/17 and U/15 competitions, JHF Power had a total of 78 participating players that were surveyed regarding injury occurrence. Due to all 78 players never attending all training sessions when data collection took place a total of 221 questionnaires were received back by the conclusion of the seasons.

## Injury Rates

Throughout the competitive season all teams from Booroondara/JHF Power participated in a total of 2,628 participations were examined, 1,134 matches and 1,494 training sessions. Over this time 19.9% of participants were injured (Table 2). This equates to an injury rate of 16.7 injuries for every 1,000 participations. However, when compared with the injury rate calculated for each individual level of competition Table 2 shows the highest incidence was recorded for U/15 (37.9) followed by State League (17.3), Premier League (12.5) and U/17 (11.4).

**Table 2.** Injury Occurrence During 2003 Season

	U/15	U/17	Premier League	State League	Total
Injured	10	8	7	19	44
Uninjured	20	62	43	52	177
Total	30	70	50	71	221
% of players injured over season	33.3	11.4	14.0	26.7	19.9
Injury per 1,000 participations	37.9	11.4	12.5	17.3	16.7

Injury occurrence does not vary greatly according to player position as shown in Table 3, where defenders (GK/GD) account for 30% of injuries, center court players (WD/C/WA) 27% and goalers (GS/GA) 25%. However respondents failed to stipulate what position they played for 18% of the reported injuries, which may have influenced the results.

**Table 3.** Injury Occurrence Related to Playing Position

	U/15	U/17	Premier League	State League	Total	%
Goalers	2	2	1	6	11	25%
Centre Court	4		4	4	12	27%
Defence	4	3		6	13	30%
N/A		3	2	3	8	18%

### Activity at Time of Injury

The type of activity at the time of injury that players were participating in is shown in Table 4. The activity that incurred the most injuries was training (44.4%), closely followed by match play (42%). Of the injuries incurred 56% of these were new injuries and 37% were recurrent. This distribution was consistent when looking at each team, except U/17 whose highest injury occurrence was recurrent injuries (Table 5).

**Table 4.** Type of Activity at Time of Injury (%)

	U/15	U/17	Premier League	State League	Total
Training	40	50	57	40	44.4
Warm-up	0	0	0	5	2.3
Match	50	38	43	40	42
Other	10	12	0	15	11

**Table 5.** Reason for Presentation (%)

	U/15	U/17	Premier League	State League	Total
New Injury	90	12	57	55	56
Exacerbated	0	0	29	5	7
Recurrent	10	88	14	40	37
Illness	0	0	0	0	0
N/A	0	0	0	0	0

### Injury Profile

During the competitive seasons of the participants a total of 44 injuries occurred. The anatomical locations of all netball injuries are shown in Table 6. The most frequent site of injury was the ankle followed by the knee. Of interest, 16% of all injuries incurred were classified as “other” and included posterior thigh, posterior leg, Achilles tendon, foot, hand, arm, wrist and eye.

When examining these results relating to each team, it may be observed that while ankle injuries occurred at the highest incidence in both open age competitions of State and Premier League, knee injuries (50%) were most frequent in the U/17 team, and finger

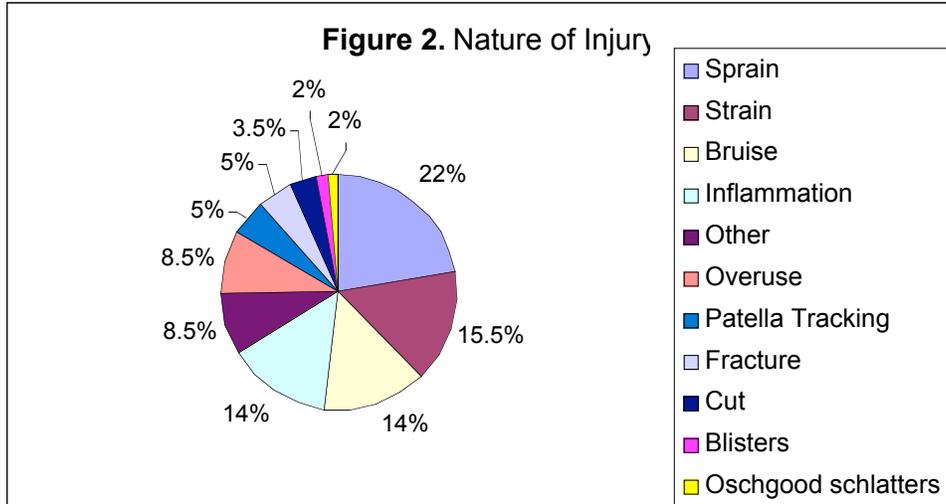
injuries (45%) are the most common injury amongst U/15 competitors with the next most common injury occurring to the knee (9%).

**Table 6.** Body Region Injured (%)

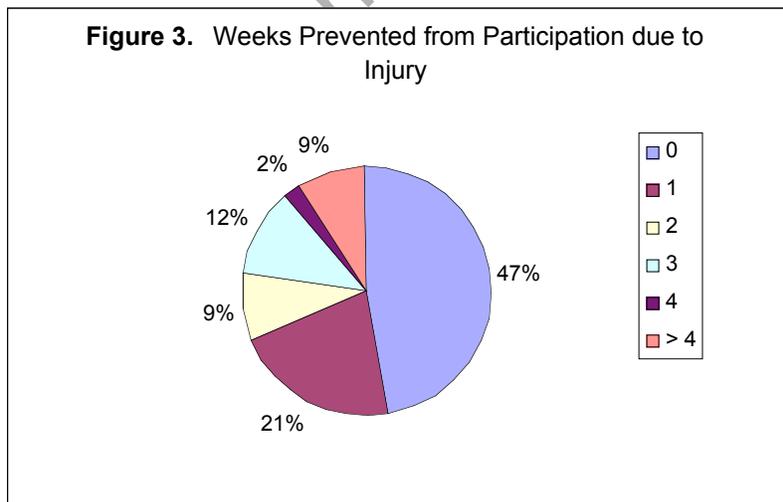
	U/15	U/17	Premier League	State League	Total
Ankle		13	29	37	23
Knee	9	50	14	11	21
Low Back		25	14	11	11
Finger	45				11
ITB			29	5	7
Tibia	9	13	14		7
Hip				11	4
Posterior Thigh	9				2
Posterior Leg	9				2
Achilles				5	2
Foot				5	2
Hand	9				2
Arm	9				2
Wrist				5	2
Eye				5	2

When analysing these injuries further the majority of ankle injuries were reported by participants to be ankle sprains (70%), with strains, bruising and swelling accounting for the remainder of ankle injuries. In comparison knee injuries most commonly included patella tracking disorders (33%), with sprains, bruising, inflammation, strains and Osgood-Schlatter's disease evenly making up the remainder of knee injuries. Of the finger injuries occurring 60% were fractures and 40% were bruises resulting from balls hitting the tips of player's fingers.

Figure 2 shows the overall incidence of the nature of different injuries occurring throughout the 2003 competitive seasons. Sprains (22%) were the most common injury with strains accounting for 15.5% and both bruising and inflammation accounting for 14% each. The remaining 34.5% of injuries included overuse injuries, fractures, blisters, cuts, patella tracking, Osgood-Schlatter's and other injuries.



When considering the severity of these injuries it is important to examine the time that players were unable to participate as a result. Figure 3 demonstrates that 47% of injured players were able to continue participation without restriction, 21% were prevented from participation for one week, 9% were unable to return to participation for 2 weeks, 12% for 3 weeks and the remaining 11% were unable to return to participation for 4 or more weeks.



The mechanism of injury found to cause the greatest harm to all participants throughout the 2003 netball seasons was awkward landings (28%), followed by overuse injuries (24%) as displayed in Table 7.

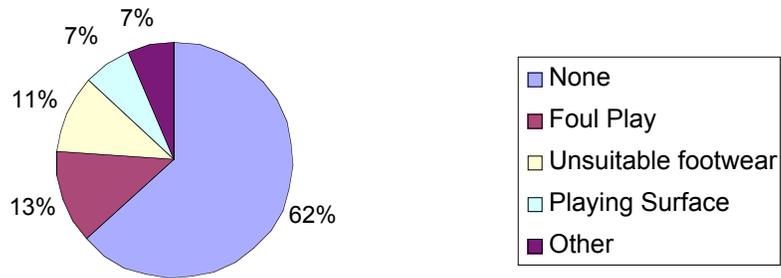
However when considering each competition level separately Table 7 shows that the results do vary. State League and Premier League results do follow the overall trend. However 50% of injuries occurring to U/17 participants occurred as a result of overuse injuries, with the remainder of injuries to this group were spread evenly across awkward landings, being struck by a player, falls on the same level and other mechanisms. In contrast, U/15 participants were predominantly injured when struck by the ball (45%) or through awkward landings (18%).

**Table 7.** Mechanisms of Injury Team Breakdown (%)

%	U/15	U/17	Premier League	State League	Total
Fall/awkward Landing	18	12.5	43	31.5	28
Overuse	9	50	29	21	24
Overexertion	9			21	11
Struck by Ball	45				11
Other	9	12.5	14	10.5	11
Struck by Player		12.5	14	10.5	9
Collision with object				5.2	2
Fall on same level		12.5			2
Jumping	9				2
Collision with player					
Slip					
Temperature					
Stress					

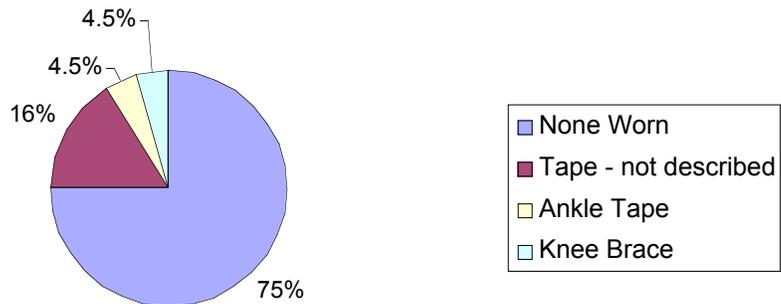
The issue as to the involvement of other factors contributing to the occurrence of these injuries is displayed in Figure 5, where 62% of participants believed that there were no external factors contributing to the occurrence of their injury, 13% believed that foul play from another competitor led to their injury and unsuitable footwear and playing surfaces accounted for 11% & 7% respectively.

**Figure 5. Contributing Factors to Injury Occurrence**



Of interest Figure 6 displays that 75% of the injured competitors used no form of protective equipment to reduce injury risk, 16% of competitors stated that they used preventative taping, but did not report where they used this, 4.5% used preventative taping of their ankles and 4.5% used knee braces.

**Figure 6. Protective Equipment Use**



## Discussion

The current study confirms netball as being a relatively safe sport to participate in with an injury rate of 16.7 per 1,000 participations. This is better understood by taking into account that an average State League participant will partake in 54 participations of netball play/training per season and an average Premier League / U/17 / U/15 participant partakes in 28 participations of play/training per season.

The method used has enabled the profile of injuries ranging from minor non-debilitating injuries through to major injuries preventing participation for four or more weeks over different levels of competition from U/15 through to open age State League squads.

Although reliant upon athlete self-diagnosis this provides a broad based picture of the impact that netball injuries have on participation.

Comparisons of the injury rates and profiles between the levels of competition found that the players with highest injury rates were the U/15 participants. This contradicts injury occurrences previously found in research conducted by Hopper et. al<sup>6</sup> who found netball injury rates increased as the standard of competition increased. What should be noted however, is that within the current study, when the lowest level of competition was excluded, the trend found by Hopper et. al<sup>6</sup> did exist, as the next highest injury occurrence rate existed within State League (17.3 per 1,000 participations), followed by Premier League (12.5 per 1,000 participations) and then U/17 (11.4 per 1,000 participations) competitions.

The highest injury rate within U/15 participants (37.9 per 1,000 participations) in the current study may be attributed to these players having less playing experience, as they are the youngest age group and the lowest level of competition examined. In addition the

issues of reduced development of specific skills/co-ordination and reduced development of strength and fitness levels when compared to the older and more experienced groups may also be hypothesised to impact on injury rates however these were not measured.

These factors are important when considering 45% of injuries to the U/15 age group participants occurred to fingers as a result of being struck by a ball.

However when examining the injury rates of the remaining competitions, State League competition had the next highest injury rate followed by Premier League and then U/17.

This injury occurrence trend may be attributed firstly to season length whereby State League players (17.3 per 1,000 participations) participate in a longer season of 18 weeks, when compared to the Premier League (12.5 per 1,000 participations) which is 14 weeks long and the U/17(11.4 per 1,000 participations) competition occurred over 13 weeks.

Secondly matches within the State League competition involve four, fifteen-minute quarters which is longer than the Premier League and underage competitions, which occur over four, ten-minute quarters. Further to these time factors, it is hypothesised that the higher injury rate within State League netball may be related to matches being played at higher intensities and speeds due to increased skill levels and playing experience, when compared to the teams in the lower divisions and younger age groups.

When comparing the injury rates of the current study to injury rates previously reported it is difficult, due to differences in methods of injury surveillance. Hopper<sup>3</sup> found an injury rate of 3.6 per 1,000 participations, which is much lower than the current studies findings of 16.7 per 1,000 participations. The findings of Hopper et. al<sup>6</sup>, concluded that the direct probability of a netball player's risk of injury to be 5.6% per person per match. However in studies conducted by Hopper and colleagues<sup>3,6</sup> data was gathered via athletes

self-reporting to a physiotherapist, thus it can be assumed that only the more serious injuries were included and minor injuries were not accounted for.

Hume and Steel<sup>4</sup> found an injury rate of 23.8 per 1,000 playing hours, in order to compare this to the current study, injuries per 1,000 participations were transformed to injuries per 1,000 playing hours which equated to 11.3 per 1,000 playing hours. This was much lower than that found by Hume and Steel<sup>4</sup>, however their study was conducted during a 3-day tournament, in which players were participating in a higher number of games over a small amount of time, thus the issue of fatigue and overuse may have impacted upon their results and not give an accurate injury rate that can be used for estimating injury risk during a typical netball season.

McKay et. al<sup>5</sup>, found an injury rate of 17.3 per 1,000 participations, which was slightly higher than the current study however they conducted their examination over 2 years, where trained observers viewed matches for injuries, compared with the current study which only considered one years participation, but more importantly relied upon retrospective feedback regarding the previous months performance, which may have resulted in fewer minor injuries not being reported. Despite this, both studies demonstrate a relatively low rate of injury when compared to other sports such as basketball (18.22 per 1,000 participations)<sup>5</sup>, soccer (35.3 per 1,000 hours of play)<sup>9</sup>, rugby union (53 per 1,000 hours)<sup>10</sup> and rugby league (139 per 1,000 hours)<sup>10</sup>.

The activities in which injured participants were participating in at the time of injury were split evenly between training and formal match play, which contradicts previous research conducted by McGrath and Ozanne-Smith<sup>1</sup> who reported via the Victorian Injury Surveillance System that 83% of injuries occurred during formal competition. However

no other literature was found to take into consideration training sessions and their impacts on injuries within netball. A link has been previously established between injuries and training session by Gabbett<sup>11</sup> who examined rugby league.

During the current study it was found that the main injury occurring across all competitions levels was a sprain (22%), strain (15.5%) bruise (14%) and inflammation (14%) and the most common sites of injury were to the ankle (23%) or knee (21%). The predominance of both sprains/strains and ankle/knee injuries were also reported by Hume & Steele<sup>4</sup>, McKay et. al.,<sup>5</sup> and Hopper et. al.<sup>6</sup>. However when each competition level was examined individually it was found that the U/17 and U/15 participants did not follow this overall trend. The U/17 participants more often injured their knees (50%) back (25%) and then ankles (13%), and the U/15 participants more often injured their fingers (45%) and then knees (9%). As discussed the majority of knee injuries were patella-tracking disorders and the majority of finger injuries were fractures, thus the issue of training and development of skills and fitness appropriate for age groups must be considered to prevent predisposition to injury. This is further reinforced by 50% of U/17 participants attributing their injuries to overuse. It should be noted however that the current study relied upon athlete self-diagnosis, as a result accuracy regarding the types of injuries occurring may be compromised, however these findings were supported by previous research conducted by Hume & Steele<sup>4</sup>, McKay et. al.,<sup>5</sup> and Hopper et. al.<sup>6</sup>. Finch et. al.<sup>7</sup> found fractures to be of higher frequency than the current study however the data collection point for this research was the emergency departments of public hospitals and may not have taken into account minor injuries to which medical advice may not have been sought.

The current research shows the most common mechanisms of injury over the competitive season as being awkward landings (28%), overuse (24%), overexertion (11%) and being struck by the ball (11%). Again the definition of overuse and overexertion injuries when used by the athlete for self-diagnosis may compromise the accuracy of the data however these findings are in agreement with previous research conducted by McGrath and Ozanne-Smith<sup>1</sup>, Hume and Steele<sup>4</sup>, McKay et. al.,<sup>5</sup> and Hopper et. al.<sup>6</sup>.

While collisions and overexertion injuries are difficult to prevent, these findings may assist coaches in preventing injuries via training methods to improve co-ordination in order to prevent falls, incorrect landings or being struck by the ball and in addition revising training schedules to prevent overuse injuries. However the current research failed to take into consideration extra-curricular activities that participants may have been involved with, such as involvements with other sporting teams and clubs and how these extra training and match schedules may have impacted upon injury occurrence.

When further considering the mechanism of injury within the current research to the open age competitors in the State and Premier League competitions, the majority of injuries to these players occurred as a result of falls or awkward landings. This is important given that 75% of the injured players surveyed during this study did not use any form of preventative taping or braces.

When considering severity of injury, it is interesting to note from the current study that 47% of injuries that occurred were not severe enough to prevent the participant from continuing. As discussed the majority of participants reported not wearing any form of protective equipment, thus it may be hypothesised that these minor injuries could have been prevented had protective braces/taping techniques been used. It also raises the

question, whether these minor injuries, while not preventing the participants from continuing play, may be predisposing the athlete to a more serious injury in the future. The recommendation to use preventative taping and bracing has been previously made by researchers Hume and Steele<sup>4</sup>, McGrath and Ozanne-Smith<sup>1</sup>, but the current research shows neither coaches nor participants are acting upon this advice and perhaps through further promotion of preventative equipment the injury rates may be lowered and participation rates improved.

The general results of the current research reflect the same trends as reported previously in regards to the nature and region of injuries incurred through participation in netball. All studies have found lower limb injuries to ankle and knee to account for the majority of injuries, ranging in frequency from cumulatively 28% to 92.6%. The major advantage of the current data presented is that it was collected monthly throughout the competitive seasons, enabling data to be attained from the players. This method was especially useful in collecting data concerning injuries for which players did not deem it necessary to seek further attention from a medical officer. However this method did rely on the players reporting their injuries based on their own self-diagnoses and these may not have been accurate, especially when concerning the younger athletes.

While the results of this study tend to reflect those trends previously found in other research, it was only conducted from one club within the Victorian Netball Association and thus may not represent the absolute size or scope of netball injuries throughout the entire community. The findings of this study may be generalised to players of a similar level and used as a guide in providing descriptive information regarding injury rates, mechanisms, nature, severity and use of preventative equipment. Clearly further studies

are required to examine professionally diagnosed injuries, all levels of competitions, age groups and playing conditions so that the problem of injuries can be fully understood in relation to acute onset, chronic onset and training relationships.

### **Conclusion**

Based on the results of this study it may be concluded that the injury rates of netball participants seem not to have changed greatly from those previously found, although training sessions were found to impact on injury occurrence. The occurrence of injury is spread evenly over the different playing positions for all teams, but is highest at the youngest level of competition and then from most experienced to least experienced. The regions most commonly injured have not varied from those previously found however the majority of injuries (47%) are not severe enough to prevent continuation of play despite negligible (25%) use of preventative tape/bracing (25%).

As a result through suitable promotion to clubs, coaches and players the following initiatives may assist in the prevention and reoccurrence of injuries to netball; Use preventative equipment including ankle/knee bracing/taping; Age related training drills are required to develop appropriate co-ordination, strength and proprioception to enable correct ball handling and landing skills; Monitoring training frequencies of athletes is needed to prevent overuse injuries.

## **Acknowledgements**

The authors would like to express their appreciation to Netball Victoria; to the Borroondara/JHF Power Netball Association; to the Victoria University. A special thanks to all netball players who without their participation, this study would not have been possible.

(c) 2004  
Victoria University

## References

1. McGrath A.C. and Ozanne-Smith J. (1997), Attacking the goal of netball injury prevention: A review of the literature., *Monash University Accident Research Centre*, <http://www.general.monash.edu.au/muarc/rptsum/es130.htm>.
2. Egger, G. (1990) Sports injuries in Australia: Causes, costs and prevention, Centre for Health Promotion and Research
3. Hopper, D. (1986) A survey of netball injuries and conditions related to these injuries, *Aust J Physiother*, 32: 231-239
4. Hume P.A. & Steele J.R. (2000) A preliminary investigation of injury prevention strategies in netball: are players heeding the advice?, *J Sci Med Sport* 3 (4):406-413
5. McKay, G.D., Payne, W.R., Goldie, P.A., Oakes, B.W., & Stanley, J.J. (1996) A comparison of the injuries sustained by female basketball & netball players. *Aust J Sci Med Sport*, 28(1): 12-17
6. Hopper D, Elliott B, Lalor, J. (1995) A descriptive epidemiology of netball injuries during competition: a five year study, *Br J Sports Med* 29 (4):223-226
7. Finch, C., Valuri, G., & Ozanne-Smith, J. (1998) Sport and active recreation injuries in Australia: evidence from emergency department presentations, *Br J Sports Med*, 32: 220-5
8. Stevenson M.R, Hammer P, Finch C.F, Elliott B, Kresnow M. (2000) Sport, age and sex specific incidence of sports injuries in Western Australia, *Br J Sports Med*, 34:188-194
9. Morgan, B.E and Oberlander, M.A. (2001) An examination of Injuries in Major League Soccer, *American Orthopaedic Society of Sports Medicine*, 29 (4) 426-430
10. Seward, H., Orchard, J., Hazard, H., & Collinson, D. (1993) Football injuries in Australia at the elite level. *The Medical Journal of Australia* 159: 298-301
11. Gabbett, T.J., (2004) Influence of training and match intensity on injuries in rugby league. *J Sports Sci* 22: 409-417

## **BIBLIOGRAPHY**

Gabbe B & Finch C.F, (2001) A profile of Australian football injuries presenting to sports medicine clinics, *J Sci Med Sport*, 4(4):386-395

(c) 2004  
Victoria University