Hazard
(Edition No. 15)
July 1993

Victorian Injury Surveillance System

Monash University Accident Research Centre

ISSN - 1320 - 0593

This issue of Hazard examines adult sports injury and rollerblading, thus building on previous Hazard reports of children's sports injury and a range of recreational injuries.

VISS now has 130,000 cases on its database, including more than 50,000 adult injury cases thus significantly increasing the potential to identify the nature and sources of adult injury.

Adult Sports Injury

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Introduction

There were 4,170 cases of sports injury to persons aged 15 years and over who presented to the emergency departments of the Western Hospital (2 years) and the Latrobe Regional Hospital, Preston & Northcote Community Hospital and Royal Melbourne Hospital (1 year)*. These injuries represented 11% of all adult injury cases but were relatively minor compared with most other injuries (admission rate 9% compared with a non-sports injury rate of 19%). As a major context of injury sport was fourth to leisure or recreation excluding sport (29%), work (18%) and transport (15%).

In this report sports injury refers to exercise activities which are predominantly competitive. It therefore generally excludes bicycling and recreational activities such as trampolining, skateboarding and rollerblading.

Sports injuries also present to general practitioners, sports medicine personnel, physiotherapists, speciality hospitals and chiropractors and therefore emergency department presentations are presumably only the tip of the iceberg. Dr Gary Egger estimated in his report to the Better Health Commission that sports injuries cost the community $1 billion per year and that approximately half of these could be prevented. (Egger 1990).

VISS Data: Detailed Analysis

Eighty-two percent of victims of sports injury were male, the majority of females having been injured while playing netball or basketball. Two thirds of adult injury cases were in the 15 to 24 year age group.

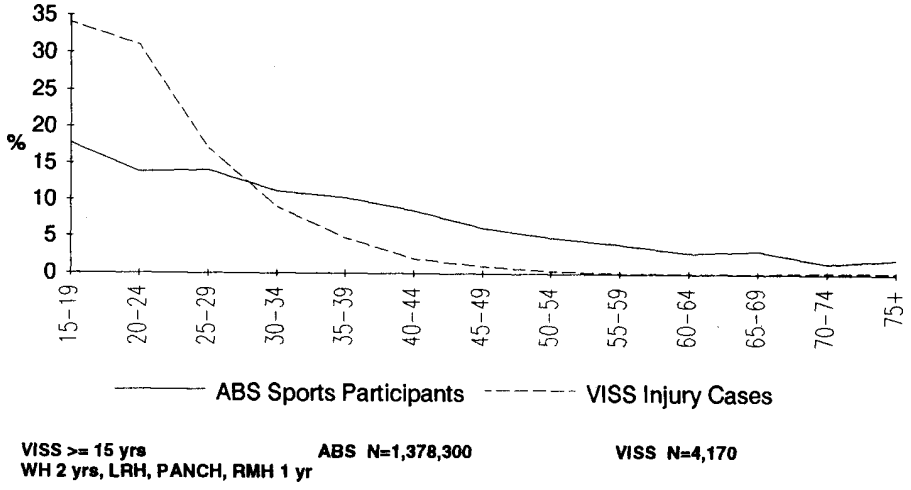
Organized competition or practice accounted for 92% of injury cases where the context was specified, the remainder were backyard or schoolground games.

The age distribution is shown in Figure 1 and it is interesting to note that the proportions for injured players were greater than participants for those aged under 30 years - it appears that the older a sports participant the less likely they are to be injured! Younger players are more likely to play high speed team games eg football, basketball, badminton and netball. Older players more commonly play lawn bowls, golf, tennis and snooker (ABS 1990). Obviously social factors such as an aging population, gender participation rates**and changes in the current

* Western Hospital 1/1/91 to 31/12/92, Latrobe Regional Hospital 1/7/91 to 30/6/92, Royal Melbourne Hospital and Preston and Northcote Community Hospital 1/3/92 to 28/2/93.

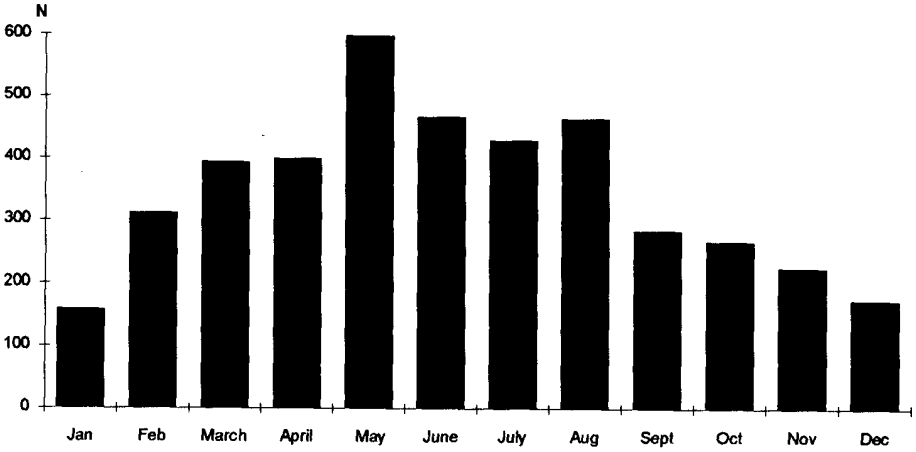
** A study in New Zealand noted women as having a lower risk than men for the same sport. (ACC, Corporate Affairs, New Zealand, 1990).

Age Distribution — Figure 1
Adult Sports Injuries and Participation Rates



VISS >= 15 yrs ABS N=1,378,300 VISS N=4,170
WH 2 yrs, LRH, PANCH, RMH 1 yr

Seasonal Distribution — Figure 2
Adult Sports Injuries



VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

emphasis on health and fitness will interact with any counter-measures in reducing future injury.

Over half (54% of injury cases) occurred at the weekend, particularly Saturday afternoon (26%). The seasonal distribution by calendar month is shown in Figure 2. The winter peak reflects the football and soccer seasons. May is the beginning of this season when players are not so used to the game and the grounds are more likely to be wet and slippery.

The frequencies of presentations and admissions of injured players from various sporting activities are listed in Table 1. The number of injured players presenting for each sport is a function of the relative sport's risk, the sex ratio, the total number of playing hours and the number of participants. Relative risks calculated are reasonably consistent with those cited by other studies. (ASMF Sports Survey, ACT1989/90; Egger 1990; ACC, Corporate Affairs, N.Z 1990).

It appears that the rate of football, soccer and, to a lesser extent, rugby presentations are high because they are contact sports and are played almost exclusively by males. Considering their high participation rates, tennis and squash, have relatively few injured players presenting at VISS emergency departments. Both however, especially squash, are leading causes of sports eye injury presenting to the Royal Victorian Eye and Ear Hospital.

Sports with the highest injury frequencies and/or apparent levels of risk are considered in more detail below.

Causes of Injury

'Over-exertion/ over-reaching' led to the injury occurring in at least 58% of cases, the 'player in a dangerous position' in 14% and 'falls on the same level' in 11% of cases. See Table 2 for details of the breakdown events for a number of key sports.

Victims were most commonly directly injured by being hit by either a person or an object, usually a ball (37%); by hitting against another player, the ground or an object(29%) or by strain or over-exertion (26%). See Table 3 for direct causes of injury by sport.

Injuries

Sprains and strains, especially to the ankle and knee accounted for 30% of injuries and fractures, especially to the fingers accounted for 25%. Body parts injured were most frequently the ankles, fingers and knees (39% of injuries). Ankle sprains/ strains were the most common single injury, representing 14% of all injuries. See Tables 4 and 5 for comparative statistics.

Comparison with Children

Children's sports injuries, although predominantly to boys, were somewhat more evenly distributed among the sexes than adult injuries. (Eighty-two percent of adult sports injuries were to men and 75% of children's injuries were to boys).

Football represented a higher proportion of sports injury cases for adults than children (36% adult v 31% children) as did netball (9% adult v 6% children). Gymnastics, physical education and track and field were under-represented for adults compared with children. These are usually school activities which form part of classroom instruction (8% of injury cases to adults aged 15 years or

Frequency of Sports — Table 1

Sport	Presentations (VISS) N	%	Admissions (VISS) N	%	Participants (ABS) ('000) *	Estimate of Relative Risk **
Aust. Rules Football	1517	36	162	11	130.9	38
Soccer	602	15	49	8	57.1	35
Basketball	511	12	27	5	139.8	12
Netball	371	9	21	6	159	8
Cricket	370	9	26	7	218.1	6
Rugby	95	2	8	8	8.6	37
Tennis	90	2	5	6	338.4	1
Hockey	79	2	6	8	32.7	8
Martial Arts	70	2	7	10	20	12
Volleyball	68	2	4	6	53.9	4
Baseball	56	1	7	13	19.6	10
Squash	49	1	3	6	189.6	1
Other***	292	7	33	11	200.2	5
Total	**4170**	**100**	**358**	**100**	**1378.3**	**10**

VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

Events Leading to Injury - Percentage Comparison — Table 2

Breakdown Event	Football n=1517	Soccer n=602	Bsk'ball n=511	Netball n=371	Cricket n=370	Rugby n=95
Slipped on	1	3	3	2	4	2
Tripped on	1	3	7	8	1	0
Fell on same level	10	14	14	15	9	11
Over-reached, over-exerted	59	56	64	58	56	56
Person in dangerous posn.	15	11	6	11	26	19
Collision between	10	10	6	5	2	11
Other	2	3	0	1	2	1
Total	**100**	**100**	**100**	**100**	**100**	**100**

VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

Direct Causes of Injury - Percentage Comparison — Table 3

Mechanism of Injury	Football n=1517	Soccer n=602	Basketball n=511	Netball n=371	Cricket n=370	Rugby n=95
Hit against	25	35	34	35	18	25
Hit by	47	30	24	18	58	48
Collision between	9	7	5	3	1	10
Strain, overexertion	17	27	36	43	21	15
Other	2	1	1	1	2	2
Total	**100**	**100**	**100**	**100**	**100**	**100**

VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

greater occurred in school compared with 42% for children).

Injuries were more frequently to the lower limbs for adults (41 % injuries) and the upper limbs for children (50% injuries). Inflammation, swelling, oedema and pain; sprains/ strains and dislocations were more frequent for adults; bruising and fractures for children.

The high proportion of lower limb injuries for adults could be attributed to ankle sprains/ strains (14% adult v 7% children's injuries) and knee sprains/ strains (6% adults v 3% children's injuries). However, finger (18% children v 11% adults) and forearm injuries (10% children v 4% adults) did not occur so frequently for adults.

Australian Rules Football (N=1517)

Football had the highest presentation of injuries with 36% of all sports injuries. The majority of players injured were male (98%). Most injuries occurred in the 15 to 24 year group (20% of injuries). Eleven percent of cases were admitted to hospital.

Football injuries peaked in May with 22% of all injuries occurring in this month.

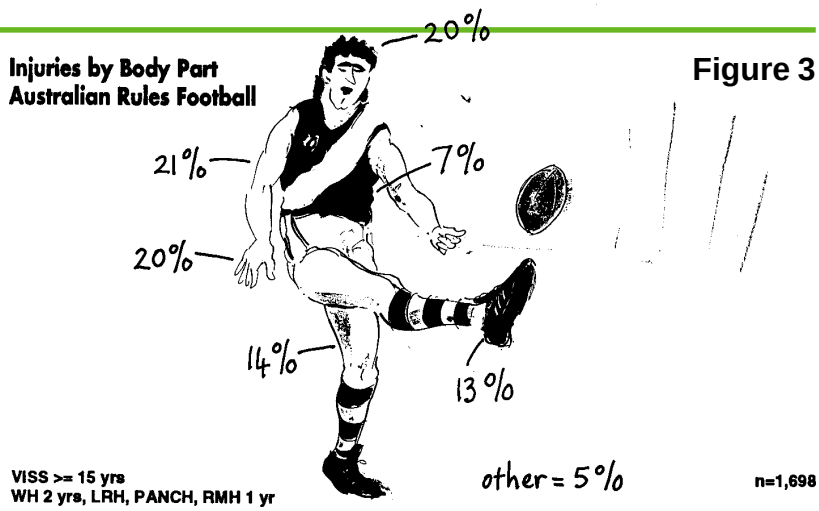
Over-exertion/ over-reaching led to the injury occurring in 59% of cases, falls in 11 % and collisions in 10%.

Forty-seven percent of injuries were directly caused by an object or person hitting the victim. The victim hitting an object, surface or person directly caused 25% (n=383) and of these, 6 cases involved the player either kicking or running into the goal post. Strain/over-exertion accounted for 17% of injuries and collisions 9%.

* ABS Sports Participation Survey, Victoria, 1989

** The rates in column 7 are only a very rough estimate since the ABS figures relate to all of Victoria and the VISS statistics to the emergency departments of VISS hospitals only. The forumla used for column 7 is VISS presentations /ABS participants calculated relative to an index of 1 for tennis (the lowest risk sport).

*** Sports included in 'other' are predominantly: boxing, lacrosse, physical education (schools), track and field, golf, badminton, horseriding, weightlifting and gymastics and bowling (10 pin and lawn).



Nature of Injury - Percentage Comparison — Table 4

Nature of Injury	Football n=1608	Soccer n=630	Baskerball n=535	Netball n=388	Cricket n=398	Rugby n=100
Cuts & Lacerations	7	6	6	2	11	8
Bruising	15	13	10	8	22	15
Inflammation, swelling, oedema, pain	11	12	8	15	17	14
Fracture	30	28	20	15	20	19
Dislocation	8	3	7	3	6	10
Sprain/strain	21	33	45	54	19	26
Concussion	4	1	1	1	2	3
Other	4	4	3	2	3	5
Total	**100**	**100**	**100**	**100**	**100**	**100**

VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

NB: Up to 3 injuries can be recorded per injury case.

Injury by Body Part - Percentage Comparison — Table 5

Body Part	Football n=1698	Soccer n=630	Basketball n=535	Netball n=388	Cricket n=398	Rugby n=100
Head	5	2	3	2	3	5
Face & Scalp	15	9	10	5	23	20
Upper arm/shoulder /clavicle	12	6	3	3	6	16
Elbow/wrist/forearm	9	9	10	11	9	7
Hand	20	9	21	13	21	11
Trunk	7	5	2	1	7	11
Upper leg	2	3	0	1	0	3
Knee	8	13	8	14	9	9
Lower leg	4	10	3	3	3	3
Ankle	10	22	33	41	8	5
Foot	3	10	4	6	6	4
Other	5	2	2	1	5	6
Total	**100**	**100**	**100**	**100**	**100**	**100**

VISS >= 15 yrs
WH 2 yrs, LRH, PANCH, RMH 1 yr

NB: Up to 3 injuries can be recorded per injury case.

Most injuries occurred on ovals, 4% in school playgrounds.

Injuries

Injuries were more frequent in the upper body especially to the fingers and shoulders. In the survey *'A Three Year Survey of Victorian Football League Injuries'* it was found that lower limb injuries were more prevalent (Seward et al, 1992). Possible reasons for this different outcome are that Seward's study focused only on elite players, not all injuries present to hospital for treatment and minor injuries are dealt with at sports clinics and at the local or club doctor.

Although thigh contusions are the most common injury in football (Seward et al, 1992), they occur infrequently in the VISS data as not many of these injuries are seen in hospital. This is also true for hamstring injuries, which are the most common injury at training (Seward et al, 1992), and groin strains. Face injuries were the most common injury found in the VISS data.

Face Injuries (n = 205)

Almost all of the face injuries occurred when the player made contact with another player. This included collisions, being elbowed, punched, kicked and kneed. For example, *'collided with another player when attempting a mark '; 'running towards the ball and was elbowed in the jaw'*. Thirty-eight percent of face injuries were to the face & scalp, and 32% were nose injuries, mainly fractures.

Finger Injuries (n = 197)

Over half of the finger injuries were caused by the player making contact with the football (eg. *'going for a mark and ball hit finger', playing football and injured finger when punched ball');* 21% occurred when the player made contact with another player (eg. *playing football, finger bent back whilst tackling another player', 'going/or ball and was kicked in the hand'*) and 10% occurred when the player fell (eg. *'fell over whilst kicking the football, landed on the ground').*

Upper arm/shoulder/clavicle (n = 185)

Over half of these injuries were to the shoulder, especially dislocated

shoulders, and 27% to the clavicle, especially fractures. Most of these injuries were caused when the player made contact with another player. This includes collisions, being kicked, hits or knocks, and tackles. Falls were also a major cause of injury with players tripping, slipping on the ground or falling when going for the ball.

Ankle injuries (n = 166)

Sixty-three percent of ankle injuries were sprains/strains. Most of these injuries occurred when a player went for a mark and landed awkwardly or fell. For example, *'went for a mark and landed awkwardly on ankle' or 'fell over and twisted ankle'*. Some of the falls could be attributed to the player slipping or tripping, being involved in a tackle, colliding with another player or jumping up for the ball.

Head Injuries (n = 84)

Although head injuries were only 6% of football presentations, a third of these injuries were admitted to hospital, highlighting the severe nature of such injuries. Most of the head injuries were concussion and a third of these were admitted. The majority of head injuries were caused when a player was struck by, or collided with, another player. For example, *'playing football, was hit on side of head by opponent's fist and fell to the ground'; 'collided with another player, clash of heads '*.

Figure 4

Prevention

1. Seward recommends that ankles should be strapped for training and during games to prevent injuries. Players with a past history of serious ankle injuries should be re-strapped at half time or wear lace-up ankle braces. (Seward, 1992). This countermeasure has not been evaluated.
2. Mouthguards should be worn at training and at matches to prevent dental injuries.
3. The remarkable protection provided by modified rules for junior football should be examined for elements which could be incorporated into the adult game.
4. Rule changes should be imple–mented to prevent significantly injured players remaining on, or returning to, the playing field.
5. Effective padding of the goal and point posts.
6. Removal of extraneous objects from the playing area.
7. Further research is required to determine the effectiveness of helmets, gloves, bicycle shorts and high or low cut boots as protective devices in Australian rules football.

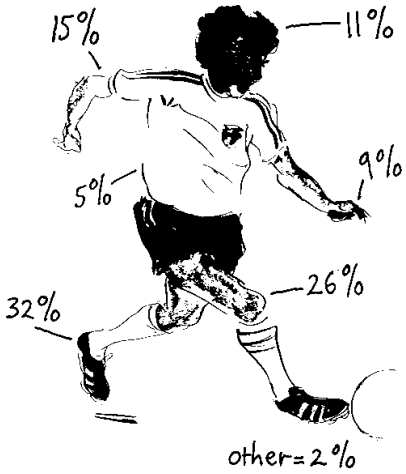
Soccer (N = 602)

The majority of soccer injuries occurred to males (96%). Forty-two percent of injuries presented were in the 15 to 19 year age group and 29% in the 20 to 24 group. Of those presenting to hospital, 8% were admitted for further treatment and most of these were for lower leg injuries.

Indoor soccer accounted for 14% of all soccer injuries. Almost all of the injured females were playing indoor soccer. Players were 3 times as likely to get ankle sprains in indoor rather than outdoor soccer. Consequently there are more lower limb injuries in indoor compared to playing outdoors. Outdoor soccer injuries peaked in March, May and August (during winter months) whereas indoor soccer injuries peaked in September and October.

Over-exerting/over-reaching led to 56% of injuries occurring, falls 20% and collisions 11 %. Most injuries were directly caused when the player hit against an object person (35%), an object or person hitting the player caused 30% of injuries, strain/ over-exertion 27% and collisions 7%.

Soccer Injuries by Body Part **Figure 5**



VISS >= 15 yrs n=630
WH 2 yrs, LRH, PANCH, RMH 1 yr

Injuries

Most injuries occurred in the lower extremities of the body, mainly ankle and knee sprains /strains, and fractures to the tibia /fibula. The injuries often occurred when there was player contact, eg being kicked or collisions.

Ankle injuries (n = 142)

The majority of ankle injuries were sprains /strains. Almost a third were from playing indoor soccer. Most of the ankle injuries occurred when the player was kicked in the ankle by another player, when the player fell or when the player landed awkwardly after jumping or running. Four injured players stated that they were wearing ankle protection.

Knee injuries (n = 84)

Most knee injuries occurred when the player made contact with another player, ie. during a tackle, collision or by being kicked/struck. Sprains /strains accounted for two-thirds of the injuries and almost all of these occured during an outdoor soccer match. No knee injuries required admission to hospital.

Lower leg injuries (n =61)

Lower leg injuries had the highest number of admissions for soccer injuries, 44% of all soccer admissions. Over half of these injuries were fractures to the tibia/fibula.

Most of the injuries occurred when a player was kicked, eg. *'running to catch ball, kicked in shin by another player'*. Players were also kicked during a tackle, eg. *playing indoor soccer, received a kick during a rough tackle by opponent'*.

Prevention

1. Shin guards may offer some protection when worn at training and during games to reduce lower leg injuries. The effectiveness of these should be evaluated.
2. Education of coaches and trainers. According to Egger this is below the level of other football codes. (Egger, 1990).
3. Investigation of the effectiveness of strapping to reduce ankle sprain/strains.

Basketball (n=511)

Almost half of these injuries were to the 15-19 year age group, ie the players were relatively young. Basketball injury cases were 70% men reflecting that this sport is more evenly balanced between the sexes than other sports. Injuries were more evenly spread throughout the year than other sports.

Sixty-three percent of cases occurred on a non-school basketball court and 15% at school. Eighty-eight percent were involved in organised competition or practice.

The events leading to injury were more likely to be over-exertion/over-reaching (64%) and falls (24%), especially those on the same level and trips, than for other sports.

Injuries

Injuries were predominantly to the ankle (33%) and were almost entirely sprains /strains. In fact, **ankle sprains /strains represented 28% of all injury cases.** Sprains/strains, dislocations and fractures to the fingers, accounted for 18% of injuries. Arm and wrist fractures represented the most severe injuries.

Ankle sprains/strains (n = 143)

These occurred more often to the younger players and therefore frequently occurred in schools (27% ankle sprains /strains in schools v 15% other injuries in schools). They were usually a result of over-exertion (73%) or tripping (11 %). Typical scenarios were *'landed o foot awkwardly after jumping for ball'* and *'tripped over another person's foot and fell over'*.

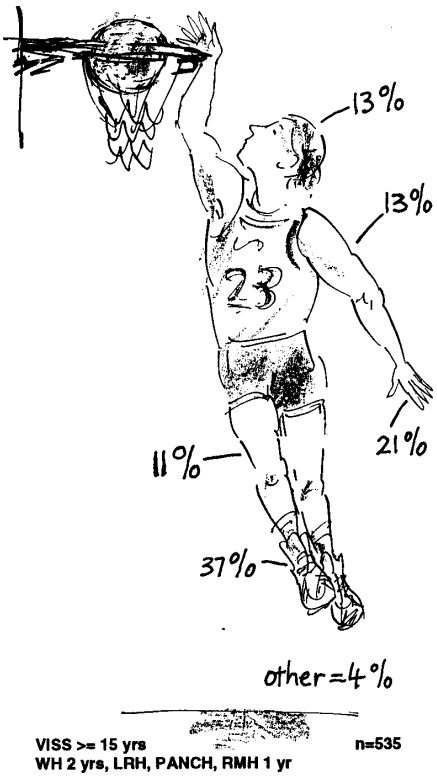
Elbow/wrist/forearm Injuries

These 59 injury cases were almost all caused by falls, particularly on the same level. Typical scenarios were *'fell backwards, landing on extended wrists'* and *'knocked over by another player, landed on arm.'*

Finger Injuries

There were 79 finger injuries, almost all caused by the ball being caught incorrectly. Typical scenarios were *'ball forced fingers on the left hand to bend awkwardly'* and *'rebound ball hit end of finger'*.

Basketball injuries by Body Part **Figure 6**



Prevention

1. Wearing of highcut shoes to reduce ankle injury.
2. Investigation of the effectiveness of bracing and taping ankles to reduce injury, especially for those who have been previously injured.
3. An optimum warm-up period of between 5 and 9 minutes and no longer than 30 minutes.
4. Investigation of the correction of landing techniques to reduce ankle injuries.
   (ASMF, 1993)

Netball (0=371)

One third of injured players were in the 20-24 year age group and almost all injuries occurred in organised competi–tion or practice.

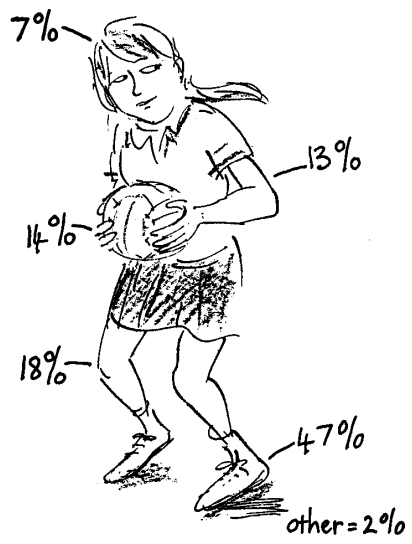
Eighty-five percent of netball injuries were to women. Men's injuries were concentrated in the 20-24 age group (48% of male injuries) and most occurred at indoor cricket centres where mixed teams are a fairly recent pheno-menon. Men tend to have higher injury rates than women for netball, as for most sports (ACC 1990), with the conse-quence that as netball increases in popularity amongst men, injuries can be expected to rise.

Indoor court injuries were more likely to be sprains/ strains to the ankle or knee and less likely to be inflammation of the knee.

Injuries

Injuries were predominantly to the ankle (40%) and knee (14%), particularly sprains/ strains and inflammation/ swelling /oedema/ pain. Hand injuries represented 13% of injuries, especially finger fractures and sprains /strains. The more severe injuries, although small in number (admission rate was 5%) were to the ankle. The predominance of these injuries is supported by other studies although the relative proportions differ: (20% knee, 40% ankle) (Eggers 1990), (ankle 30%, hand 21 %, knee 18%) (ASMF 1989/90).

Netball injuries by Body Part **Figure 7**



VISS >= 15 yrs n=388
WH 2 yrs, LRH, PANCH, RMH 1 yr

Ankle Sprains/strains

Of the 148 players who suffered ankle injuries, 123 (83%)suffered sprains/ strains.

These ankle sprains/strains were most often caused by a fall (28%) eg *'fell over on side of foot';* by landing awkwardly or incorrectly (20%) eg *'went to jump for ball but came down hard on foot';* by falling or tripping on another player (13%); by twisting an ankle (n= 11%) or by being pushed over by another player (n=8%). These injuries were not severe, only one player was admitted to hospital.

Another study of ankle injuries found landing, a sharp twist or turn and treading on another player's foot were the main mechanisms of ankle injury in both netball and basketball. (ASMF 1993).

Knee Injuries

These 50 injuries were predominantly sprains /strains (n=25) and inflammation (n= 14). In the descriptions of how the injuries occurred 14 described their knee as being twisted and 5 as the knee collapsing or giving way. Examples were *'tripped by opponent, fell twisting knee. '* and *jumped for ball, knee buckled on landing '.*

The ASMF study found netballers sustained 5 times more major and severe knee injuries than basketballers. Players who had previously sustained knee injuries were 5 times more likely to incur them again.

Netball has a reputation for anterior cruciate ligament (ACC) ruptures of the knee. These often require reconstruction and lengthy rehabilitation at considerable cost. The ASMF study estimated that the rate of ACC rupture was 0.4 per 1000 participants (ASMF 1993). Unfortunately VISS coding does not allow for such injuries to be accurately identified.

Finger Injuries

Forty players experienced finger injuries. Almost three quarters of these were caused by the ball hitting the fingers or thumb. Finger fractures followed by sprains/ strains were the most common injuries.

Prevention

1. Investigation of the relationship between the cut of the shoe and ankle injuries.
2. Investigation of the correction of landing techniques to reduce ankle and knee injuries.

Prevention measures 2 and 3 for basketball also apply to netball. (ASMF 1993)

Cricket (n=370)

One third of these injuries were to the 20-24 year age group and 91% were to males. Not surprisingly the majority occurred in the warmer months, particularly the November to February period (64% of cases). Eighty-six percent occurred in organized competition or practice.

Sixty percent were actually injured by a moving object -a bat, ball or other player, 21% by strain or over-exertion. Of the 210 players hit by a moving object 85% were hit by the ball ie **58% or all injured players were injured directly by the ball. Finger fractures, face and scalp bruising,** finger dislocations, face and scalp cuts and lacerations and concussion were the most common injuries resulting from the ball. Typical examples were *'hit the ball which shot up and hit face', 'went to catch the ball, ball hit thumb'.* Only 6 players were injured by the bat.

Injuries

Overall the most frequent injuries were to the face (23% injuries) and the hand (21 %). Although ankle sprains/ strains (n=25) were the single most common injury, sprains/ strains occurred less frequently and the nature of injury was more varied than for other sports.

Head and Face Injuries

The body part most frequently injured was the head and face (26% of injuries) and this proportion was higher than for any other sport. The face/cheek/ forehead/scalp accounted for 39% of these injuries, the eyes 23%, nose 12%, mouth (external) 9% and concussion 7%.* Head and face injuries were as severe as for cricket injuries generally with an admission rate of8%. The admissions were mostly for concussion and face fractures.

As for cricket injuries overall 87% of head and face injuries were caused directly by the ball. This compares with children's injuries where 56% were from the bat and only 34% from the ball (Hazard 9, 1991). Typical injury scenarios were *'ball hit top edge of bat and deflected and hit fore-head';'fielding at silly point, batsman struck ball into face'* and *'hit by fast ball under helmet'.*

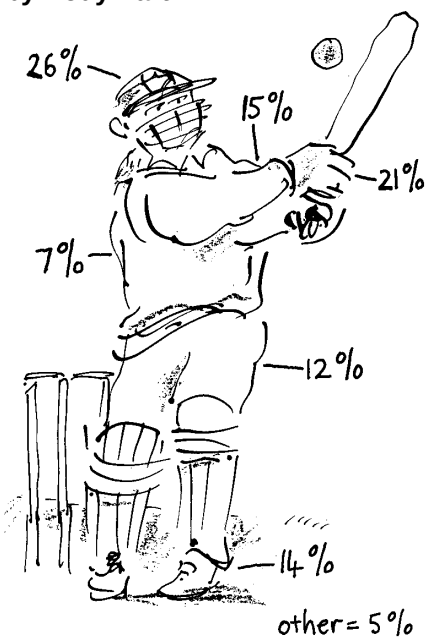
Unfortunately the VISS coding options available to doctors do not further break-up the face/cheek forehead/scalp category and this division would be helpful in establishing the need for full face shields. However even without this clarification, there does appear to be an argument for the mandatory wearing of helmets with shields.

Hand Injuries (n=81)

The majority (68%) of these were finger injuries, particularly finger fractures (27%), finger dislocations(13%) and finger sprain/ strains (13%). These were almost all cases of the player miscatching the ball.

* Eye injuries are most likely underestimated due to the location in the VISS collection area of the Royal Victorian Eye and Ear Hospital. See the section towards the end of this article on this hospital.

Cricket Injuries by Body Part **Figure 8**



VISS >= 15 yrs n=398
WH 2 yrs, LRH, PANCH, RMH 1 yr

Indoor Cricket (n=93)

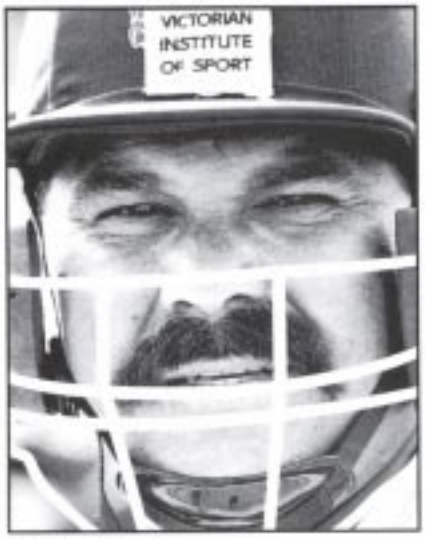
One quarter of all cricket-related injuries arose from indoor cricket. Women represented a larger proportion of indoor than outdoor cricket victims (14% indoor v 7% outdoor). This reflects the mixed nature of indoor games. Indoor cricket players were twice as likely to be injured by strain or over-exertion and were more likely to be injured by a fall on the same level (13% v 7%). Outdoor players were more likely to slip (5% outdoor v 1% indoor) and to be hit by the ball (52% outdoor v 38% indoor).

Indoor cricket injuries were more serious (12% indoor v 5% outdoor admission rate). The difference in the severity can probably be attributed to the harder surfaces of indoor flooring compared with grass. Grass, especially when wet, no doubt contributed to the higher slip rate for outdoor cricket.

Safety Equipment

Eleven percent noted having worn a safety device. The types worn were a combination of batting gloves, pads, boxes and helmets.

Figure 9



Courtesy of the Age

Prevention

1. Compulsory wearing of helmets with face shields for batsmen and fielders close to the wicket.
2. Since injuries from the ball represent such a large proportion of injuries, investigation of new developments such as the low impact cricket ball should be encouraged, particularly for outdoor cricket.
3. Gloves and other protective gear should be worn for informal games as well as competition.
4. Adequate fitness preparation. Cricket is seen as a sport which does not require a lot of effort and is therefore often played by unfit players. The sudden twists and turns required make unfit players prone to injury. (Egger, 1990)

Rugby (Union & League) (N = 95)

Thirty-five percent of presentations were from people aged between 20 and 24, 25% were in the 15 to 19 year age group, 20% in the 25 to 29 and 12% in the 30 to 34. Eight percent of presentations were admitted.

Over half of the injuries were caused by players over -exerting or over-reaching, falls caused 13% and collisions 11 %.

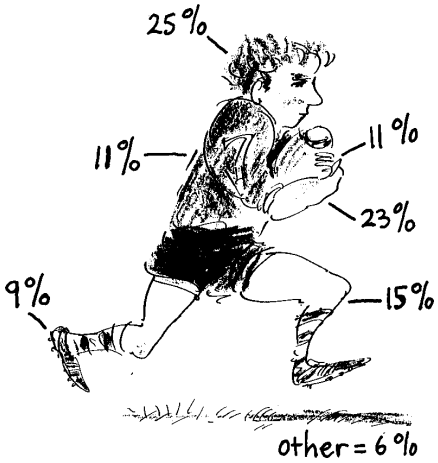
Being hit by a person or object accounted for 48% of injuries. The player hitting an object/person caused 25% of injuries, strain/ over-exertion 15% and collision between players 9%.

Injuries

The majority of the rugby injuries were sprains /strains, mainly to the knee, and fractures, especially the fingers. Most injuries (20%), were to the face (including eyes, nose, scalp, etc) where being hit or kicked was the main cause of the injury. Involvement in tackles and collisions with other players were the other causes of face injuries.

Upperarm /shoulder /clavicle injuries accounted for 16% of rugby injuries. Most of these injuries were to the shoulder, mainly dislocations. Most of the rugby injuries occurred during a tackle.

Rugby Injuries by Body Part **Figure 10**



VISS >= 15 yrs n=100
WH 2 yrs, LRH, PANCH, RMH 1 yr

Prevention

1. Wearing of shoulder pads and mouth guards should be made compulsory.

Other Sports

The most frequent injuries for the sports which presented with lesser frequencies were:

Tennis - Ankle sprain/strains, knee sprain /strains, wrist fractures mainly

from over-exerting during play and falling.

Hockey - Cuts & lacerations to the face and scalp mainly from being hit by the hockey ball or stick.

Martial Arts - Nose fractures, dislocations to the shoulder and knee. Most of these injuries occurred when the victim was kicked or punched by an opponent whilst sparring. These usually occurred during karate but there were some tae kwon do, kick-boxing and ju-jitsu injury cases.

Volleyball - Ankle sprain/strains. These injuries occurred mostly when a player, landed awkwardly after jumping up to hit the ball, or they fell during play.

Baseball/Softball - Ankle sprains/strains. Most of these sprains/strains occurred while the player was running towards a base.

Squash -Ankle sprain/strains, face and scalp cuts and lacerations, eye injuries. Most ankle injuries occurred while the player was running for the ball. Being hit by the racquet caused most of the face and scalp injuries and the ball caused most of the eye injuries.

Royal Victorian Eye and Ear Hospital

Eye injuries represented 2% (n=81) of all sport-related injuries on the VISS database. This is likely to be a gross underestimate of the actual situation since the RVEEH is located close to the collection area for VISS and many of the eye injury cases are likely to be taken to that hospital.

In an analysis of a RVEEH 2 year data set (Nov 1989 to October 1991) there were 700 cases of sport-related eye trauma (5% of all RVEEH eye trauma) including 154 admissions. **Sport related injuries were more severe than non-sport eye injuries** (22% sport related v 6% other admissions). The majority of these admissions were for hyphaemas (81%) and 19% of eyes were legally blind at the time of initial presentation. None of the sports participants had worn appropriate eye protection at the ti~ of injury. (Fong)

The frequency of eye injury by sport presenting at RVEEH showed that squash (17% of injuries) presented most often, followed by Australian Rules football (16%), netball /basketball (12%), tennis (8%), indoor and outdoor cricket (each 7%) and badminton (3%). Tennis, badminton and particularly squash were over-represented for eye injuries in relation to VISS presentations (VISS 2% tennis, 1% squash, 0.2% badminton). (Fong)

Prevention

1. Eye guards **with** lenses should be worn for squash and badminton (squash has 3.5 times the number of players compared with badminton) and helmets **with** face shields for cricket. Protective eye wear is mandatory in the United States and Canada for ice hockey, squash and racquet ball and has resulted in dramatic reductions in eye injuries (Fong). Protective eye wear is currently being encouraged in junior squash development programs and an Australian Standard exists as of September 1992 for racquet sports (AS 4066).
2. Further research is required to determine whether rule changes or improved enforcement of existing rules would reduce eye and other facial injuries in football.

Figure 11

Dental Injuries

The Dental Hospital is located in the VISS collection area and a large proportion of dental injury cases would attend here in preference to a VISS hospital.

In 1989, the National Health and Medical Research Council stated that dental injuries were the most common type of facial injury that occurred during contact sports, and the majority of injuries could have been prevented if a professionally fitted mouthguard had been worn. (National Health and Medical Research Council, November 1989)

Figure 12

Properly fitted mouthguards provide protection by:

1. Decreasing the risk of injury to the front teeth by 90%.
2. Preventing cuts to lips and cheeks from the sharp edges of the teeth.
3. Decreasing the risk of serious injury to back teeth when the mouth is forcibly shut by a blow.
4. Reducing the risk of jaw fracture, especially in the area of the jaw joint.
5. Acting as a "shock absorber", reducing the risk of concussion. The plastic mouthguard absorbs and disperses the energy of a blow.

Prevention

The best type of mouthguard is one that is professionally fitted and made from an impression of the player's mouth. Such mouthguards are more comfortable to wear, fit better and do not make speaking and breathing difficult. (Dental Health Services).

Mouthguards should not only be worn during a game, but also when training because injuries will also occur during training. Studies have shown that a high percentage of football players in Victoria wear mouthguards while playing, but very few (less than 15%) do so when training. (Dental Health Services).

Broader Context

It is not possible within the ICD 9 (International Classification of Diseases) system used by Victorian public hospitals to determine statewide hospital admissions resulting from sports injury. Only two major categories of general sports injury can be identified. These are "fall on same level from collision, pushing or shoving, by or with other person in sport" and ""striking against or struck accidentally by objects or persons in sport". Together, these categories contribute a yearly average of 1845 cases of adult hospital admissions in Victoria (Langlois, 1992). However, this information is neither sports specific nor comprehensive.

Extrapolating from the VISS data, where 9% of adult injury hospital admissions (excluding adverse effects of treatment) result from sports injury, it is estimated from statewide admissions reported by Langlois (1992) that 3178 adults are admitted to Victorian public hospitals each year as the result of sports injury. Based on the same data sources, it is estimated that31, 729 adults present to hospital emergency departments and are not admitted statewide each year in Victoria.

Fortunately death from sporting injury is a rare event. There was one sport - related death, from soccer, on the Coroner's database 1989/ 90. This brain stem death was a result of a mid-air collision and fall onto the head and shoulders. (State Coroner's Office, 1991).

General Prevention

The Accident Compensation Commission (NZ) has calculated men to have a higher injury rate than women for every sport. Perhaps men can learn from women the secrets of this lower propensity for injury!

- Warm-up, pre-season training.
- Teaching of skills.
- Send-off rules for unduly violent or dangerous play.
- Protective gear eg helmets, eye protection, padding of helmets, posts and surrounds. Shock absorbent playing surfaces. Modify rules eg netball, Australian Rules football.
- Appropriate first aid.
- Not playing if injured.
- Improved data collection methodologies. Comprehensive review of available countermeasures.
- Evaluation of countermeasures.

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Rollerblading Injuries

Dr Doug Heller

Injuries associated with the use of rollerblades or in-line roller skates appear to be the latest "fad epidemic", following hard on the heels of the rise in skateboarding and rollerskating injuries witnessed in recent years.

In-line skates have been used as an aid to prepare for skiing and this illustrates that they are fast! They are also increasingly popular as a leisure "toy": 50,000 pairs were sold in Melbourne last Christmas and they are available for hire at skating rinks and at specialist shops. Rollerbladers can be seen in action in a wide variety of settings, from designated bowls and ramps to the footpath and highway.

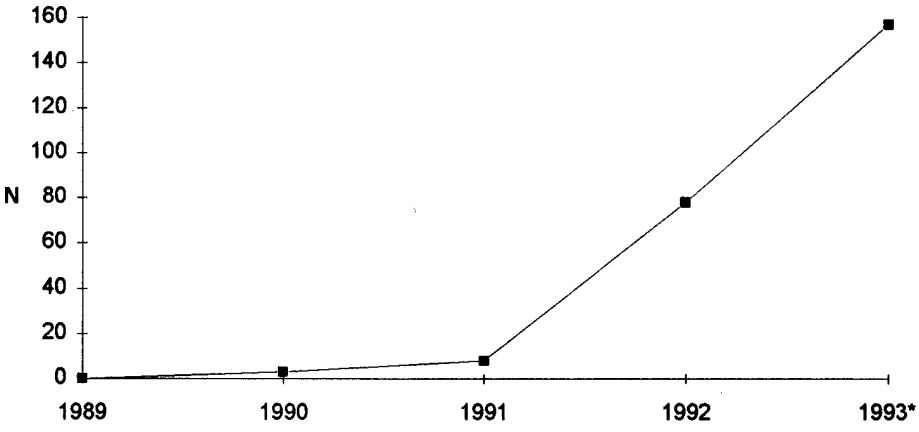
A number of councils have moved to restrict places where rollerblades may be used, for example the use of an existing local law, 1/ 89 Control of Toy Vehicles, to prohibit their use in certain parts of Malvern. Councils are concerned, not only by the risk to the rollerblader, but particularly by that to pedestrians who may be involved in any collision.

VISS Data

In 1989 VISS hospitals recorded no cases of rollerblading injury but in 1992 there were 113.[1] Due to the expansive nature of the VISS collection, the trend for under 15 year olds only including the projected figure for 1993 is shown in Figure 1.

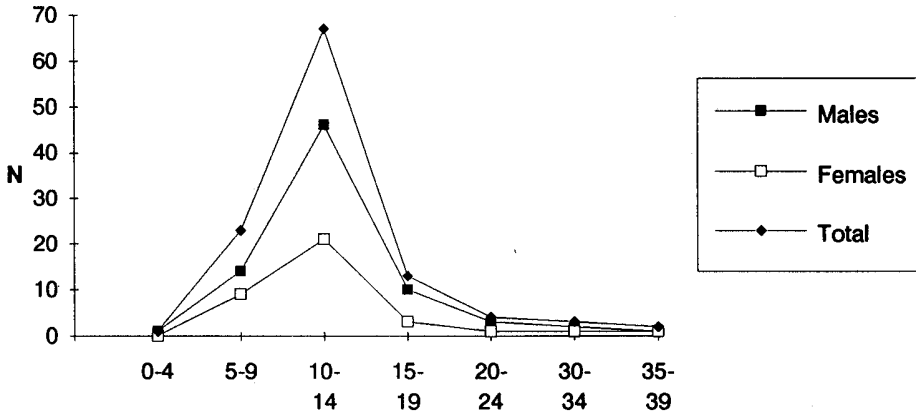
The age and sex distribution for 1992 (all ages) is shown in Figure 2. Most (59%) of these cases occurred in 10-14 year olds, representing 1.4% of all injuries in that age group. Interestingly two were in the 35-39 group although there were no cases over forty.

Trend in Rollerblading Injuries - Children **Figure 1**



VISS < 15 yrs RCH,WH,PANCH * Projected figure.

Age and Sex Distribution Rollerblading Injuries **Figure 2**



VISS All ages1992 RCH (< 15 yrs), WH,PANCH,LRH (All ages), RMH (Adults)

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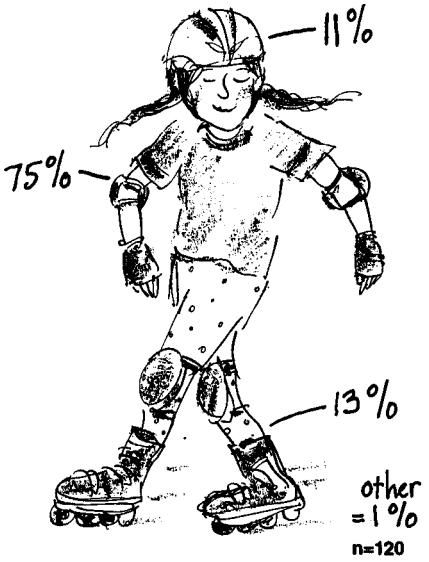
[1] VISS collection 1989 RCH, WH, PANCH (Children), 1992 - RCH (children) WH, LRH, PANCH, (all ages), RMH (adults)

Rollerblading Injuries by Body Part **Figure 3**



VISS 1992 RCH (chn), WH, LRH, PANCH (All Ages), RMH (Adult)
NB: Up to 3 injuries can be recorded per injury case.

Telephone Follow up Survey Rollerblading Injury Cases - RCH (n=24) **Table 1.**

Question	Response		
How long had you been using roller blades before the injury?	First time 11	< 6 months 7	> 6 months 6
Are you still using them?	Yes 15	No 9	
Were they	Borrowed 6	A present 15	Bought by self 3
How did you learn?	Trial & error 18		Friend/sibling 6
Where did you learn, mainly?	Street/path 7	Rink 2	Home 15
Where do you go now to rollerblade , mainly?	Street/path 7	Rink 5	Home 3
What type of protective gear did you wear before the injury?	Elbow 6	Knee 7	Wrist 0 Helmet 6
What type of protective gear did you wear after the injury?	Elbow 8	Knee 16	Wrist 14 Helmet 10

Injuries

The pattern of injuries appears to be similar to that seen with skateboards with the upper limbs being most vulnerable. Fifty-eight percent of all injuries were fractures, most commonly of the forearm and wrist (43% of all injuries). There were only 5 fractures involving the lower limbs and there was one skull fracture. Other injuries included cuts and lacerations (5%), bruising (9%) and sprains (15%). Sixteen percent of injury cases were admitted to hospital, a figure comparable to that for skate board injuries and most of these were fractures. See Figure 3 for body parts injured.

Location

Forty-nine percent of injuries were incurred in areas used by transport, nearly half of these on footpaths, the remainder occurred on public or private roads and driveways or parking areas. Relatively few injuries occurred in "safe" areas such as playgrounds, parks and skating rinks. In the home two injuries were sustained in the family room and one in the kitchen!

It shas been suggested that rollerblades might be used as a substitute for a bicycle as a means of transport and for recreational use. Of the 113 injuries, 2 were reported as being incurred whilst being used for transport rather than recreation.

There were no cases of a pedestrian being injured by a rollerblader although one injury occurred when two rollerbladers collided.

The event that led to injury most often was losing control of the rollerblades (63%) and a fall with outstretched arms onto a hard surface. One rollerblader was run over by a truck, fortunately sustaining only an ankle strain/sprain and this was the only case involving another vehicle. Generally the surface was concrete of varying evenness.

Telephone Follow up Survey

A telephone survey of 24 of the young people involved in rollerblading injuries who had presented to the Emergency Department of the Royal Children's Hospital revealed some interesting findings. (Table 1.) There are two main groups at risk:

1) Those who have just started to rollerblade and who simply lose control and fall, often at relatively low speeds. They do not wear wrist protectors.

2) Those who are experienced and confident who are trying out a new stunt, often on a ramp at considerable speed. A significant proportion of this latter group has worn safety equipment in the past but taken it off at the time of the injury.

Twenty-four percent of those recorded as having an injury in 1992 were wearing safety equipment of some sort, but interestingly, only 14% of those whose injuries were serious enough to warrant hospital admission did so. Many (25%) of those questioned had borrowed their skates and had learnt by trial and error, usually in the home, on the driveway or on a footpath. A few (8%) had gone to a rink for their first rollerblading experience but none had used an accredited coach. Of those who were

still using rollerblades (and only one had stopped as a direct result of their accident, although quite a number had simply lost interest) 47% did so in the street although a few were now limiting their activities to skating rinks/bowls.

Although there is now evidence that rollerblading is leading to a significant number of injuries it is not possible to quantify the risk as we do not know how many people are using blades and how often; 113 people were recorded as attending VISS hospitals in 1992 with a rollerblading injury, compared with 115 skateboarding and 206 rollerskating injuries but this does not mean that rollerskating is twice as dangerous as rollerblading or skateboarding.

We can, however, conclude that the commonest injury presenting to hospital is a fracture of the lower arm (43%), that people who have had an injury generally do not wear protective gear (76%), that they learn by trial and error without the supervision of trained instructors and that they rollerblade in what are sometimes unsuitable localities.

Rollerblading Experience

What could the beginner do in order to reduce their chance of injury beyond simply borrowing a friend's blades and going out onto the street to learn by trial and error? It is possible to hire rollerblades at a number of skating rinks in Melbourne but the protective gear has to be bought, something which the beginner may find financially unattractive. It is then often a question of going out

into a mixed session on the rinks with rollerbladers and skaters of differing abilities and having a go!

Alternatively, there are a number of shops that hire both rollerblades and safety equipment and which offer tuition. However, there are only two shops in Melbourne which have coaches accredited by the Roller Sports Association. The drawback here may be cost as hiring the equipment and paying for lessons can be relatively expensive. One of the benefits is that there is someone experienced to rollerblade alongside with the novice who can catch them if they begin to fall. Perhaps a compromise is to have a friend who is experienced and responsible accompany the beginner during their first few sessions.

Whichever method is used it is important to consider the quality of rollerblade used as

some have wheels and bearings which can make learning harder and which stop rolling when they hit quite minor irregularities in the surface, leading to a fall. The boot also needs to be properly fitted so as to provide firm support for the ankle.

Recommendations

Rollerblading is an exhilarating pastime and a good way of developing coordination. It is important not to discourage an activity which can be a source of healthy activity for a broad age-group, however, as this pastime becomes more popular safety considerations are likely to become of greater concern. To date there has been little in the way of published research but it is possible to make some preliminary recommendations based on the available evidence and drawing on the literature with respect to skateboarding, ice and rollerskating with which it shares some features.

1) It seems likely that, like skateboarding, rollerblading is particularly dangerous near traffic and intimidating to pedestrians so selection of suitable areas to rollerblade in is important. These could include skating rinks and bowls, parks, playgrounds and possibly bicycle tracks.

2) Young children should not use rollerblades. Considerable skill is needed and children under five are unlikely to have the necessary strength and coordination and thus will be at particular risk of injury.

3) The use of safety equipment needs to be encouraged and its effect monitored, possibly with a view to mandatory use. Helmets and wrist protectors would seem to be a sensible minimum amount of safety equipment, with knee and elbow guards desirable.

4) Those injured are commonly first time users and some kind of initial training in a protected environment, for example in a separate beginners area if at a skating rink, may be of benefit.

5) Public outlets that hire roller blades should also have available suitable safety equipment for hire and use of this should ideally be made a condition of hire for all age groups.

6) Outlets that sell rollerblades should be in a position to give suitable advice on fitting, offer initial tuition and recommend the use of safety equipment.

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* Special edition

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General Acknowledgements

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Royal Children's Hospital

Western Hospital

Preston and Northcote Community Hospital

Latrobe Regional Hospital (Traralgon and Moe)

Royal Melbourne Hospital

The contributions to the collection of VISS data by the directors and staff of the Emergency Departments of these hospitals, other participating clinicians, Medical Records Departments, and ward staff are all gratefully acknowledged. The surveillance system could not exist without their help an co-operation.

Coronial Services

Access to coronial data and links with the development of the Coronial's Services statistical databse are valued by VISS.

National Injury Surveillance Unit

The advice and technical back-up provided by NISU is of fundamental importance to VISS.

How to Access VISS Data:

VISS collects and tabulates information on injury problems in order to lead to the development of prevention strategies and their implementation. VISS analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISS Co-ordinator or the Director by contacting them at the VISS office.

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Project Funded by
Victorian Health Promotion Foundation

VISS is a project of the Monash University Accident Research Centre.

Hazard was produced by the Victorian Injury Surveillance System (VISS) with the artistic and graphics assistance of Janet Green, Monash University - Caulfield and Ann James - Books Illustrated

This .pdf version re-created by Glenda Cairns.