CHAPTER 1

WORKPLACE INJURIES AND ILLNESS

INTRODUCTION

1.1 Workplace illness and injuries represent a considerable liability to the ADF—in terms of lost time, treatment, rehabilitation, and in future compensation costs to the individual. As such, identification of illness and injury causes and implementing prevention strategies is paramount to the desired outcome of maximising readiness by providing a fit and healthy force. The data presented in this chapter are derived primarily from the DEFCARE database for Financial Year 1997–98 (FY 97/98), the *COMCARE Annual Report*, and the Military Compensation and Rehabilitation Service Staff.

OVERVIEW

1.2 Table 1–1 provides a summary of various injury and illness statistics obtained from the DEFCARE database for FY 97/98. A total of 5038 and 1067 personnel became casualties reported to DEFCARE within the full-time and part-time forces, respectively. These injuries and illness accounted for over 32 000 working days lost for full-time personnel, which is equivalent to 148 work years. Assuming an average annual salary, allowance, and benefits package of $50 000 per work year, the annual cost impact of lost time exceeds $7 million per year.

Component of the Australian Defence Force	Casualties	Days in Hospital	Sick Days	Light Duty Days	Total Working Days Lost
Permanent	5038	1216	6287	25 141	32 644
Part-time	1067	181	689	1810	2680

Table 1–1: Reported casualties and working days lost for FY 97/98

1.3 Table 1–2 provides a summary of overall injury and illness rates. In terms of injury and illness rates, 9.1 per cent of the full-time force and 3.9 per cent of the part-time force became ill or injured at the workplace at some time during the year and reported this to DEFCARE. When the part-time rate is calculated in terms of full-time equivalents, the rate is 28.5 per cent, approximately three times greater than the full-time component. A study of injuries in the Australian Army from 1987–91[1] by Rudzki indicated that the average incidence rate was 147 injuries/1000 soldiers/year. The incidence rate for the Army Program in FY 97/98 was 127 injuries/1000 soldiers/year or 14 per cent less than the average rate for the period 1987–91. The average working days lost (WDL) per casualty for 1997–98 was 6.5 for full-time forces and 2.5 for part-time forces. The Rudzki study indicated the average WDL per casualty for Army personnel from 1987–91 was 18.7 days or nearly three times higher than values for the ADF in FY 97/98. These data, when considered together, seem to indicate that the Army rates for both injuries and WDL/casualty are considerably higher than the overall ADF average rates depicted in table 1–2 and that this has remained fairly constant over the years.

1 *Injuries in the Australian Army 1987–1991: A Comparison to the US Army Experience*, Defence Force Fellowship, Major Stephan J. Rudzki, 1994.

ADF Component	Injury Rate[a]	Hospitalisation Rate[b]	Sick Rate[b]	Light Duty Rate[b]	Total WDL Rate[b]
Full-time	91	22	113	452	587
Part-time	39	7	25	67	99
Part-time (as full-time equivalents)	285	48	184	483	716
All rates were based on population figures obtained from the ADF Annual Report for 97/98 and are as of 30 June 1998 (Permanent Forces = 55 574; part-time Forces = 27 027; part-time as full-time equivalents = 3744)					

Notes

(a) Rate in casualties/1000 personnel/year.

(b) Rate in days/1000 personnel/year.

Table 1–2: Reported injury and illness rates in the Australian Defence Force

ACTIVITIES ASSOCIATED WITH WORKPLACE INJURIES AND ILLNESSES

1.4 The activity personnel are undertaking at the time of the reported illness or injury is an important factor for determining causation and guiding preventive interventions.

Individual activities

1.5 **Number of casualties by activity.** Table 1–3 and figure 1–1 depict the activities associated with the greatest number of casualties among permanent ADF personnel. The activity associated with approximately 21 per cent of the casualties was unknown. From a statistical standpoint it is unlikely that this lack of specificity in reporting would change conclusions which can be drawn from the data. However, the fact that such basic information is not being captured in approximately one of every five incident reports is a concern and points to needed improvements in the reporting process.

1.6 Of the known activities, physical training was by far the leading casualty producing activity. Three sports (rugby union/league, touch football, and soccer) were also among the ten leading causes of injury and illness. Several work-related activities such as walking, equipment maintenance, stores handling, and ship maintenance were among the ten leading casualty producing activities. Driving and fighting were also among the leading causes of workplace related injury and illness reported to the DEFCARE system.

Rank	Activity	No of Casualties	% of Total
1	Unknown	1073	21.3
2	Physical Training	722	14.3
3	Walking (non-sport and fitness)	267	5.3
4	Rugby, union/league	197	3.9
5	Equipment Maintenance	182	3.6
6	Football, touch	161	3.2
7	Football, soccer	156	3.1
8	Stores handling	154	3.1
9	Driving	149	3.0
10	Fighting	134	2.7

Rank	Activity	No of Casualties	% of Total
11	Ship maintenance	111	2.2
12	Running/jogging	103	2.0
13	Cleaning	100	2.0
14	Australian rules	95	1.9
15	Basketball/netball	91	1.8
N/A	All other activities	1343	26.7

Table 1–3: Activities associated with the highest incidence of injury and illness

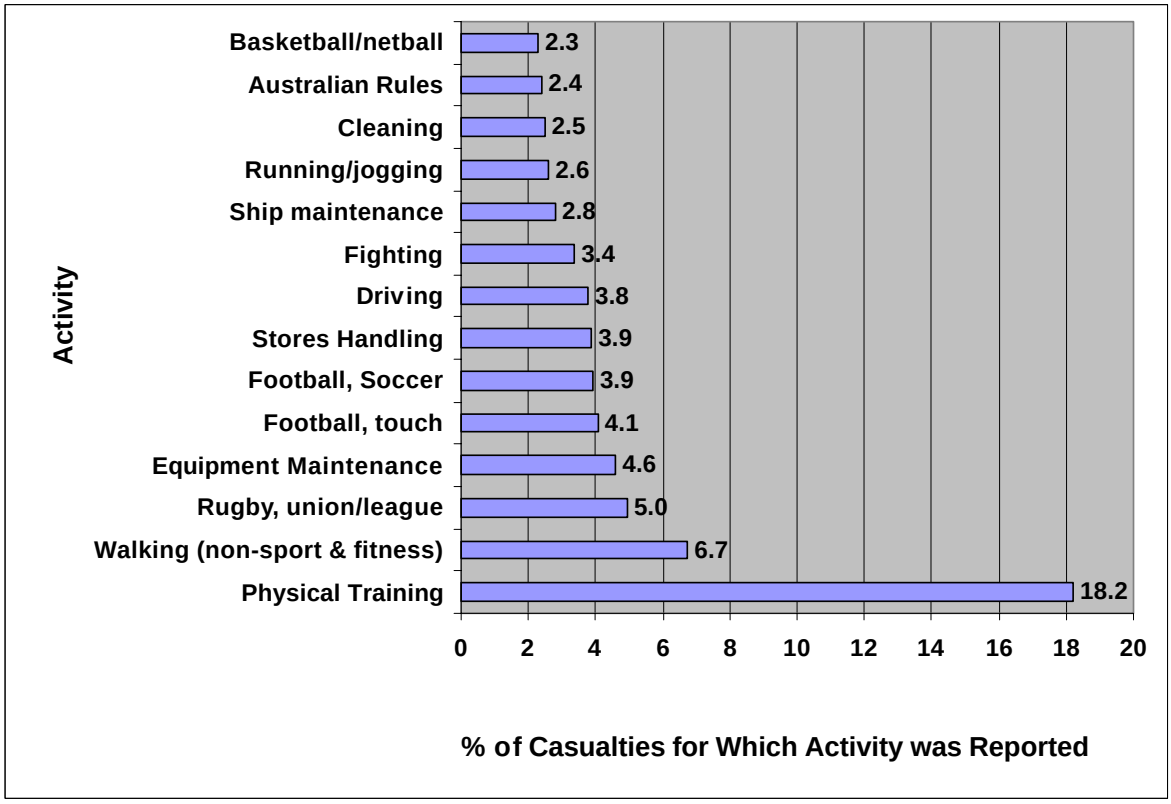

Figure 1–1: Activities associated with highest percentage of casualties

1.7 WDL by activity. One of the major ways in which casualties affect readiness can be measured in lost working days consisting of days in hospital, days off all duties, and days placed on light duties. A total of 32 644 working days were reported to DEFCARE as lost to the ADF in FY 97/98 due to injuries and illness. Table 1–4 depicts activities resulting in most WDL. In terms of overall WDL, physical training is by far the activity of greatest concern. In terms of WDL, sport activities are also seen to have a major impact. Eight of the top fifteen activities resulting in WDL are due to sport. While not among the leading activities in terms of numbers of casualties, shown in figure 1–2 parachuting (71), marching (65), and motor cycle riding (64) are activities that result in a substantial amount of lost work time. It is important to note that the numbers in the table below are total figures and do not represent the risk of injury from a particular activity. An illustration is parachuting—which ranks tenth in the totals listed below. When one considers that the number of personnel who parachute in the ADF is fairly small (eg Army has one full-time combat parachute battalion—3d Bn, Royal Australian Regiment or 3 RAR), the risk of injury from parachuting would be higher than many of the leading activities ranked above parachuting in table 1–4. This is because the top nine activities qualitatively have much larger populations at risk that participate in those activities. Unfortunately it is extremely difficult to accurately quantify the population of personnel participating in many of the leading activities in order to get accurate injury rates.

Rank	Activity	Hospital (days)	Sick (days)	Light Duty (days)	Total
1	Physical Training	139	1227	5340	6706
2	Unknown	224	1156	3625	5005
3	Football, touch	27	582	1984	2593
4	Football, soccer	95	162	1594	1851
5	Rugby union/league	45	385	1401	1831
6	Running/jogging	31	93	1498	1622
7	Walking (non-sport and fitness)	50	216	922	1188
8	Australian Rules	1	197	856	1054
9	Marching	0	303	567	870
10	Parachuting	43	91	721	855
11	Stores handling	59	151	625	835
12	Basketball/netball	27	155	596	778
13	Volleyball	19	82	550	651
14	Cycling	9	139	485	633
15	Driving	65	153	413	631

Table 1–4: Activities associated with the highest number of working days lost

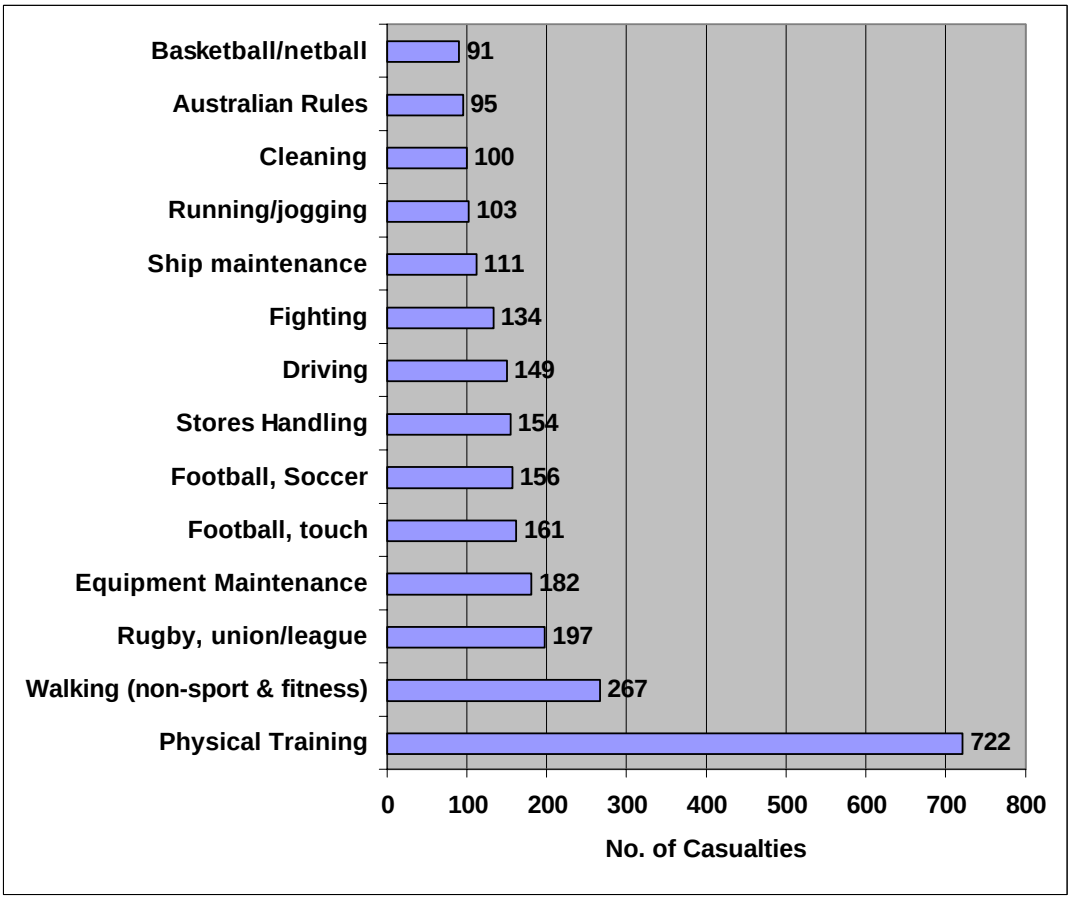

Figure 1–2: Reported activities associated with the highest number of casualties

1.8 Figures 1–3 to 1–5 depict the leading activities associated with days in hospital, sick days, and days of light duty, respectively.

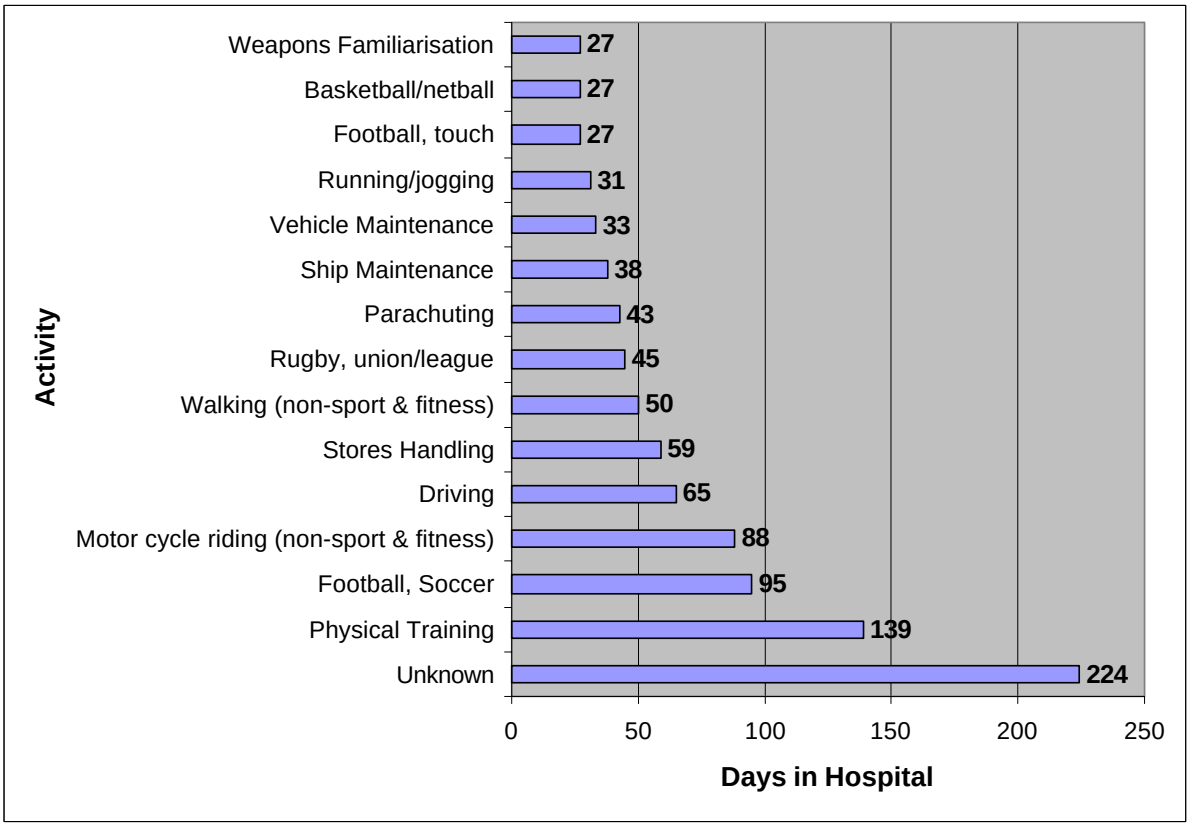

Figure 1–3: Reported activities associated with the highest number of days in hospital

1.9 In addition to being the leading activity associated with casualties and WDL, physical training also results in largest number of days spent in hospital and accounts for 14 per cent of the days in hospital resulting from known activities. Sporting activities such as soccer, rugby union/league, running/jogging, touch football, and basketball/netball, also account for a large number of days spent in hospital. Motor cycle riding and driving are the third and fourth leading known activities associated with days spent in hospital and accounted for 8.9 and 6.6 per cent, respectively of the days spent in hospital where the activity is known. Among work-related activities, stores handling, walking, ship maintenance and vehicle maintenance were also among the leaders in terms of number of days spent in hospital. Among military training activities, parachuting was among the leading activities associated with hospitalisation and accounted for 4.3 per cent of the days spent in hospital where the activity is known.

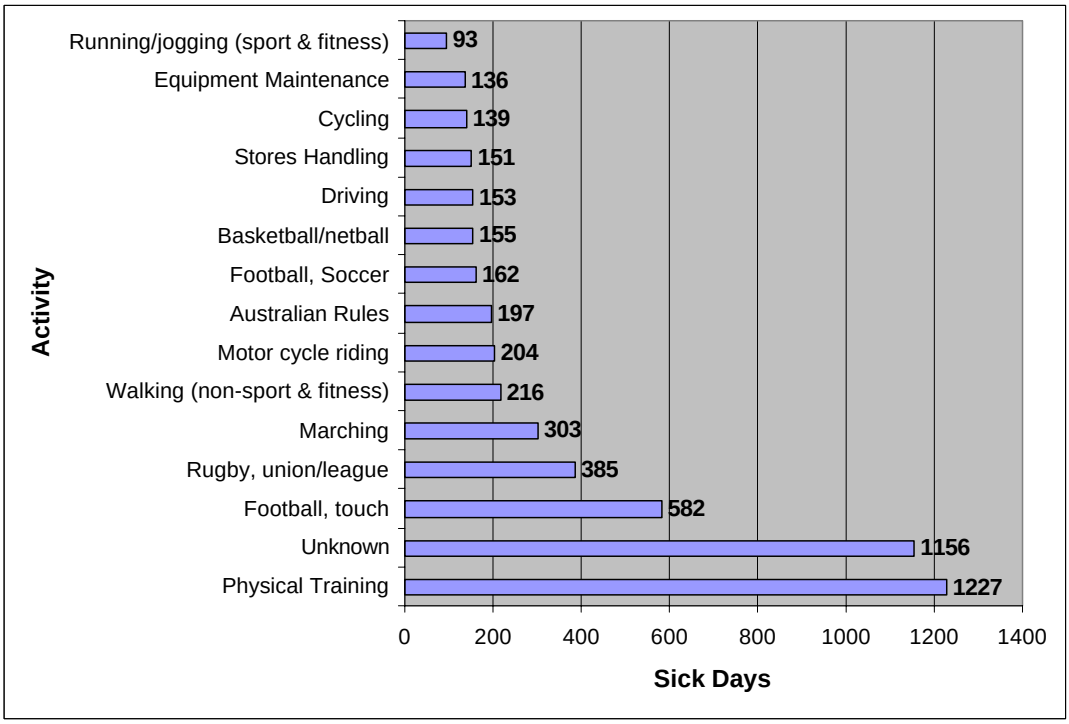

Figure 1–4: Reported activities associated with the highest number of sick days

1.10 Physical training was by far the leading known activity associated with sick days and accounted for 24 per cent of the reported sick days where the activity was known. Several sports activities, including touch football, rugby union/league, Australian Rules football, soccer, basketball/netball, cycling, and running/jogging, were among the leaders in terms of numbers of days sick. Among military training activities other than physical training, marching was the activity associated with the most sick days and accounted for 5.9 per cent of sick days for known activities. Motor cycle riding (four per cent) and driving (three per cent) accounted for a relatively large number of sick days. Walking, stores handling and equipment maintenance were the work-related activities associated with the highest number of days lost due to sickness.

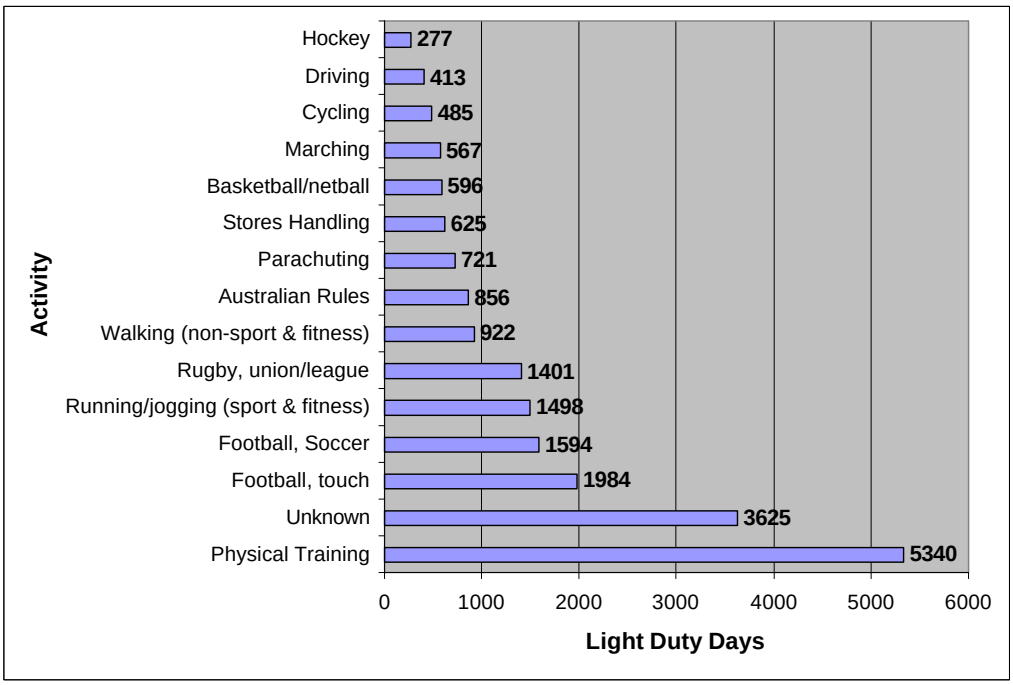

Figure 1–5: Reported activities associated with the highest number of light duty days

1.11 Physical training was by far the activity associated with the largest number of light duty days and accounted for almost 25 per cent of the total for known activities. Sporting activities were among five of the leading seven known activities associated with restricted duty. The leading sport associated with light duty days, touch football, accounted for 9.2 per cent of the total days of light duty. Soccer, running/jogging, and rugby union/league accounted for 7.4, 7.0, and 6.5 per cent, respectively of light duty days for known activities. Other sports among the leading contributors to light duty days included Australian Rules football, basketball/netball, cycling and hockey. Parachuting and marching were the military training activities associated with the largest number of light duty days. As in the case of days in hospital and sick days, driving was among the leading activities in terms of restricted duty days. Walking and stores handling were also work-related activities associated with relatively high numbers of restricted duty days.

1.12 In order to provide an indication of the relative severity of injuries/illnesses associated with various activities in terms of WDL, figure 1–6 presents a comparison of WDL per casualty for the leading activities associated with WDL. The average WDL casualty for known activities was 7.1. The activities associated with the most severe casualties in terms of WDL were touch football and running/jogging, which had an average WDL per casualty approximately 2.5 times the average. For every casualty associated with these activities, approximately 16 days of lost work time was the result. The following activities had an average WDL/casualty approximately twice as high as the average: physical training, marching, parachuting, soccer and Australian Rules football. Several other activities, including rugby union/league, volleyball, basketball/netball, motor cycle riding, and cycling had WDL/casualty rates significantly above the average. Activities such as walking (non-sport and fitness), stores handling, driving, and running/jogging (non-sport and fitness) had rates somewhat lower than the overall average.

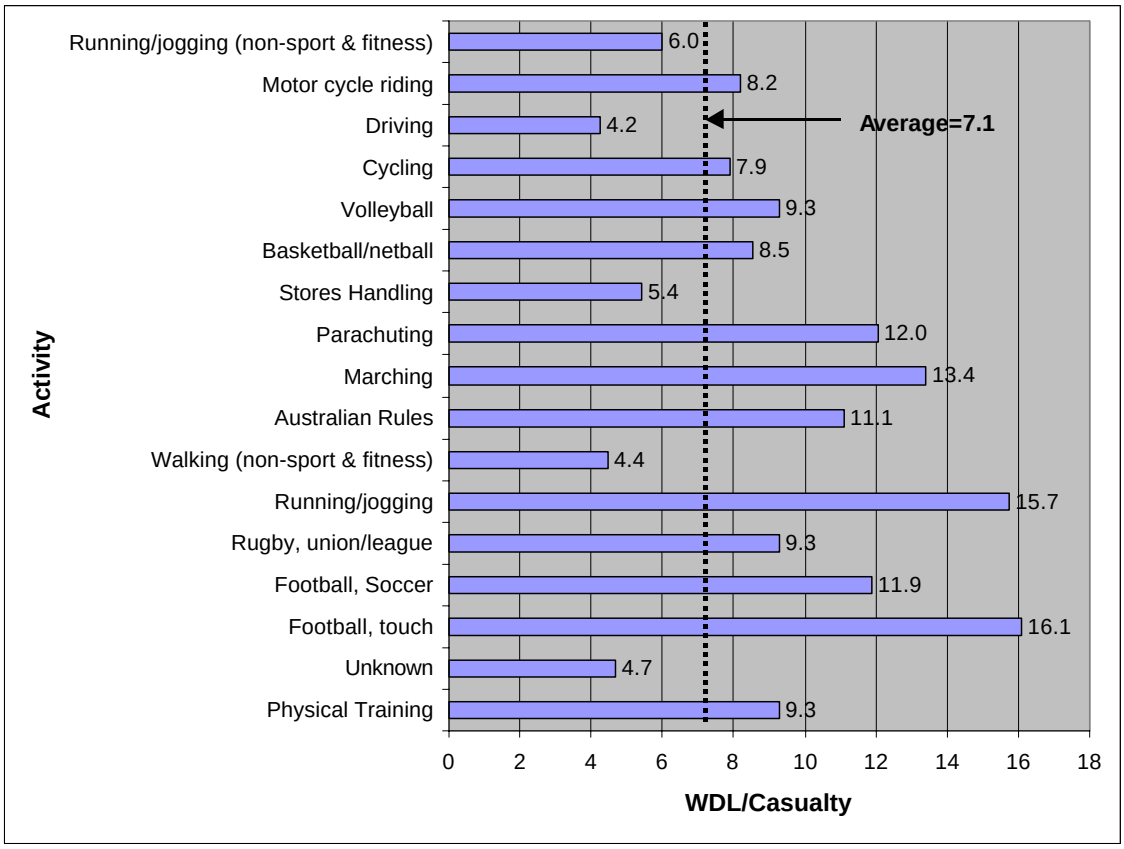

Figure 1–6: Average working days lost per casualty for activities associated with the highest overall working days lost

Activity groupings

1.13 **Number of casualties.** It is also helpful to look at casualty groupings in terms of assessing the impact of various activities on health. Activities were grouped into the following categories: unknown (reports for which the activity was not specified), physical training, sports, military training, work-related, motor vehicle, and other (fighting, drinking alcohol, and skylarking). Figure 1–7 depicts a summary of the percentage of casualties for each known activity group.

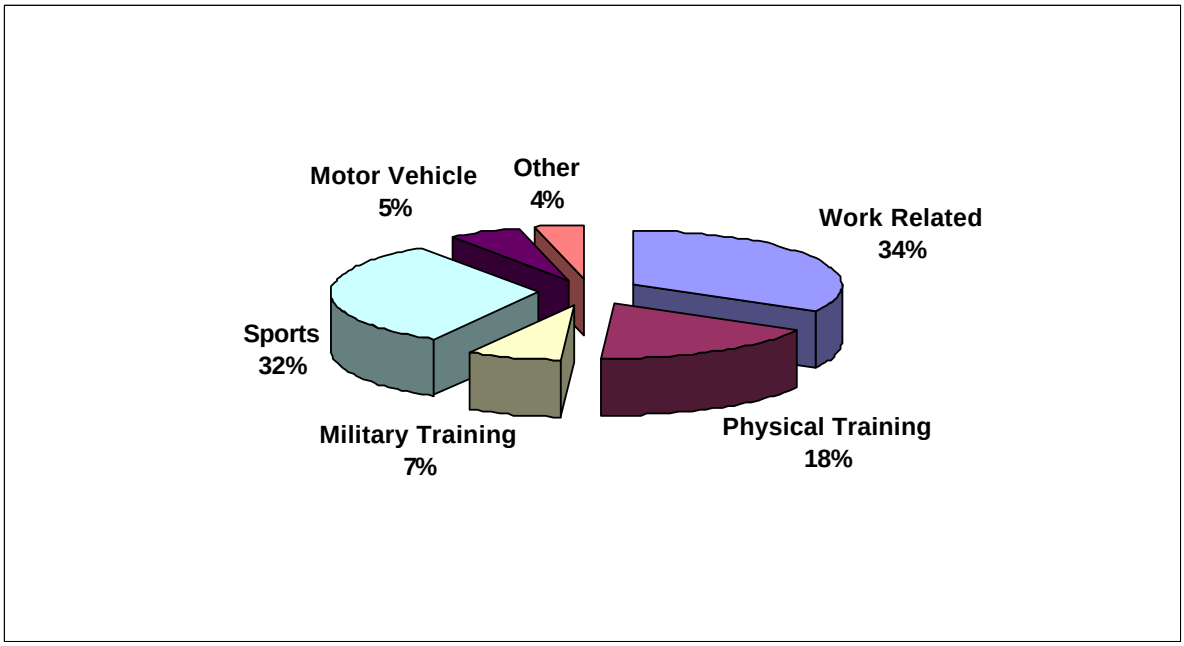

Figure 1–7: Summary of reported casualties by known activity grouping

1.14 The sports and physical training (PT) activity groupings collectively account for half of the total casualties for known activities. All other activity groupings account for the remaining 16 per cent of reported casualties. Although the designation of 'cause' in the Rudzki study includes both activities (eg sport) and mechanisms (eg fall/slip), it may still be instructive to compare data associated with injuries in Army personnel. Rudzki found that sports activities, PT/PT testing, and motor vehicle accidents accounted for 21.4 per cent, 12.6 per cent, and 7.8 per cent of injuries, respectively. Although it would appear that sports injuries make up a higher percentage in the most recent ADF injury data, other categories in the Rudzki report such as 'struck', 'fall/slip', and 'physical exertion' may have been related to sport to some extent. PT also seems to make a greater contribution in current ADF data than for the Army data from 1987–91. Motor vehicle accidents seem to make up a slightly smaller proportion of injuries in the FY 97/98 ADF data than in the Army data from 1987–91.

1.15 **WDL.** Figures 1–8 and 1–9 depict the breakdown of WDL by activity group. The sports activity grouping is by far the largest contributor to working days lost and accounts for most of the total working days lost for known activities (12 957) or approximately 47 per cent. When comparing the WDL percentage to the casualty percentage in figure 1–9, the proportion of WDL (46.9 per cent) is much higher than the percentage of casualties (32 per cent) for the sports grouping, thus injuries and illness resulting from sport are relatively more severe in terms of the impact on lost time. PT accounts for the second largest number of WDL (6706 WDL) and accounts for 24.3 per cent of the total WDL, versus 18 per cent of the casualties. The work-related grouping accounted for only 4023 of WDL (14.6 per cent) compared with 33 per cent of the casualties, thus work-related injuries on average appear less severe in terms of WDL. This analysis clearly indicates that sport and PT injuries are the leading contributors to WDL in the ADF, accounting for 19 663 WDL (over 70 per cent of the total WDL) in FY 97/98. It would seem logical that strategies implemented to prevent injuries from sport and PT would have a high pay-off in terms of readiness and productivity.

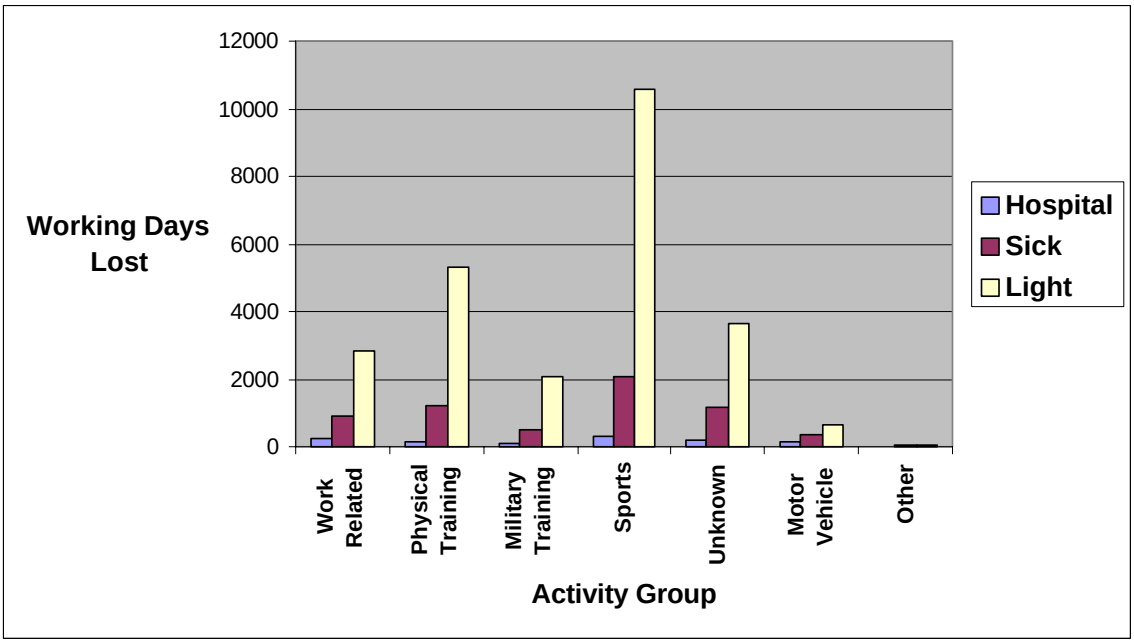

Figure 1–8: Working days lost by activity grouping

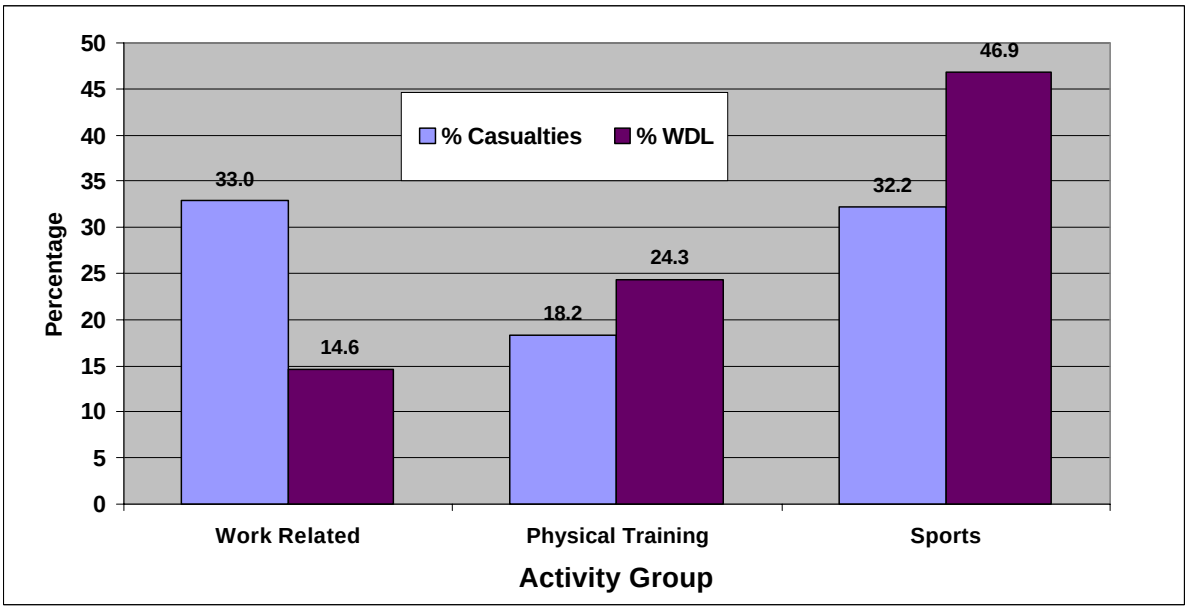

Figure 1–9: Percentage of casualties and working days lost for various activity groups

INJURY NATURE

1.16 The nature of injury/disease refers to the most serious injury or disease sustained for suffered by the worker.

Injury nature group

1.17 **Casualties.** The nature of the injuries and illnesses based on casualties recorded in the DEFCARE database is depicted in figure 1–10. The injury and poisoning group accounts for over 3832 casualties, which composes 76.1 per cent of reported casualties known by injury nature (total of 5038). Diseases of the musculoskeletal system account for 466, or approximately nine per cent of all casualties. For almost seven per cent of injuries the nature was not known. All other injury nature groups combined (all covering various diseases and mental disorders) accounted for a total of eight per cent of casualties and each of these groups individually accounted for less than two per cent of the total casualties.

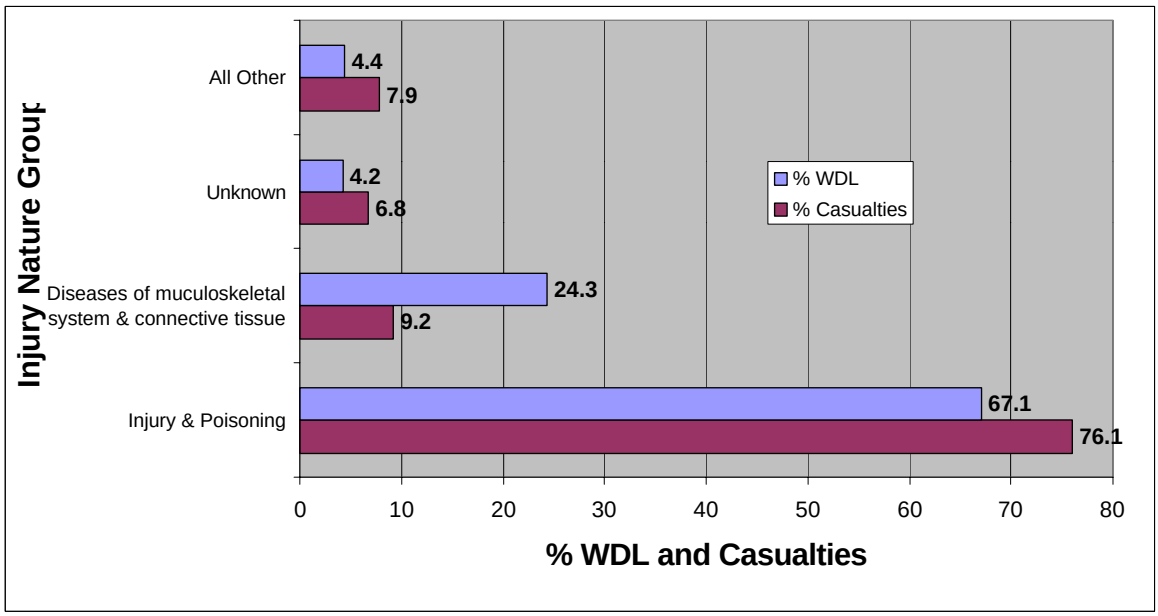

Figure 1–10: Number of reported casualties by injury nature group

1.18 **WDL.** Figure 1–10 also depicts the WDL associated with various injury nature groups. The total number of WDL for all injury nature groups was 32 644 WDL. The injury and poisoning group alone accounts for 67.1 per cent of WDL, representing 21 892 WDL. Diseases of the musculoskeletal system and connective tissue accounted for an additional 24 per cent of WDL (7929 WDL). Since diseases of the musculoskeletal system and connective tissue accounted for only nine per cent of casualties, the WDL among this grouping is proportionately quite high. Casualties where the nature of injury was not reported accounted for approximately four per cent of WDL. All other nature groups accounted for a very small proportion of WDL.

Injury and poisoning injury nature group

1.19 **Casualties.** A more detailed breakdown of casualties and WDL from the injury and poisoning nature group is provided in figure 1–11. Sprains and strains was the injury nature associated with the most casualties accounting for 1489 (39 per cent) of casualties within the injury and poisoning nature group and 30 per cent of all 5038 casualties known by injury nature. Fractures was the next highest category of injury and accounted for 13 per cent of casualties within the injury and poisoning nature group and almost 10 per cent of all casualties. Open wounds, other and unspecified injuries, and contusion and crushing injuries accounted for a further 28 per cent of casualties within the nature group (22 per cent overall).

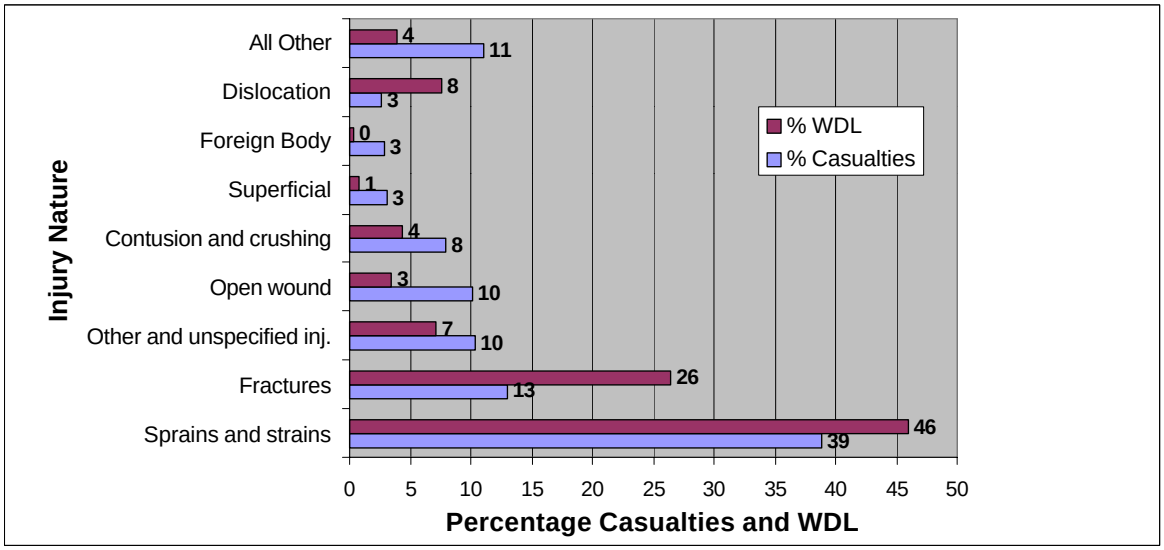

Figure 1–11: Percentage of reported casualties within the injury and poisoning injury nature group

1.20 WDL. Figure 1–11 also depicts the working days lost for various injuries/illnesses within the injury and poisoning injury nature group. Sprains and strains are by far the injury category that results in the most WDL and accounts for 46 per cent of the total WDL for the injury nature group versus 39 per cent of casualties. Fractures accounted for approximately 26 per cent of WDL within the nature group versus only 13 per cent of casualties. Therefore, the WDL on average for each fracture is quite high. Other and unspecified injuries accounted for approximately seven per cent of casualties within the group (approximately five per cent overall). Contusions and crushing accounted for four per cent of the WDL within the nature group (three per cent overall) and all other injuries individually accounted for less than three per cent of casualties within the group.

Musculoskeletal and connective tissue injury nature group

1.21 Casualties. The vast majority of the 466 casualties in this group are related to disorders of muscle tendons and other soft tissues (389 casualties or 83 per cent within the musculoskeletal and connective tissue injury group and almost eight per cent overall). Dorsopathies account for an additional 50 (11 per cent) casualties within this injury nature group and one per cent overall.

1.22 WDL. Approximately 74 per cent (5900 WDL of 7929 total WDL) from this injury nature group (18 per cent overall) comes from disorders of muscle, tendons and other soft tissues. A further 19 per cent of WDL within this injury nature group (4.6 per cent overall) is associated with dorsopathies (lower back pain).

Injuries and illnesses reported most frequently

1.23 Casualties. The most frequent injuries and illnesses most frequently reported to the DEFCARE system are depicted in figure 1–12. Sprains and strains of joints and adjacent muscles accounts for 1489 casualties, almost 30 per cent of all reported injuries/illnesses and is by far the most prevalent type of injury/illness. The second leading injury/illness category is fractures, which accounted for 497 casualties, nearly 10 per cent of all casualties. Other and unspecified injuries; disorders of muscle, tendons and soft tissue; and open wounds not involving traumatic amputation, each comprised close to eight per cent of all casualties. The nature of injury could not be determined in almost seven per cent of reports to the DEFCARE system. Furthermore, contusions with intact skin surface and crushing injuries accounted for an additional six per cent of all casualties. Somewhat more than two per cent of all casualties were related to each of the following categories of injury nature: superficial injury; burns; and poisoning and other toxic effects of substances. The injury natures in figure 1–12 account for 86.2 per cent of all casualties.

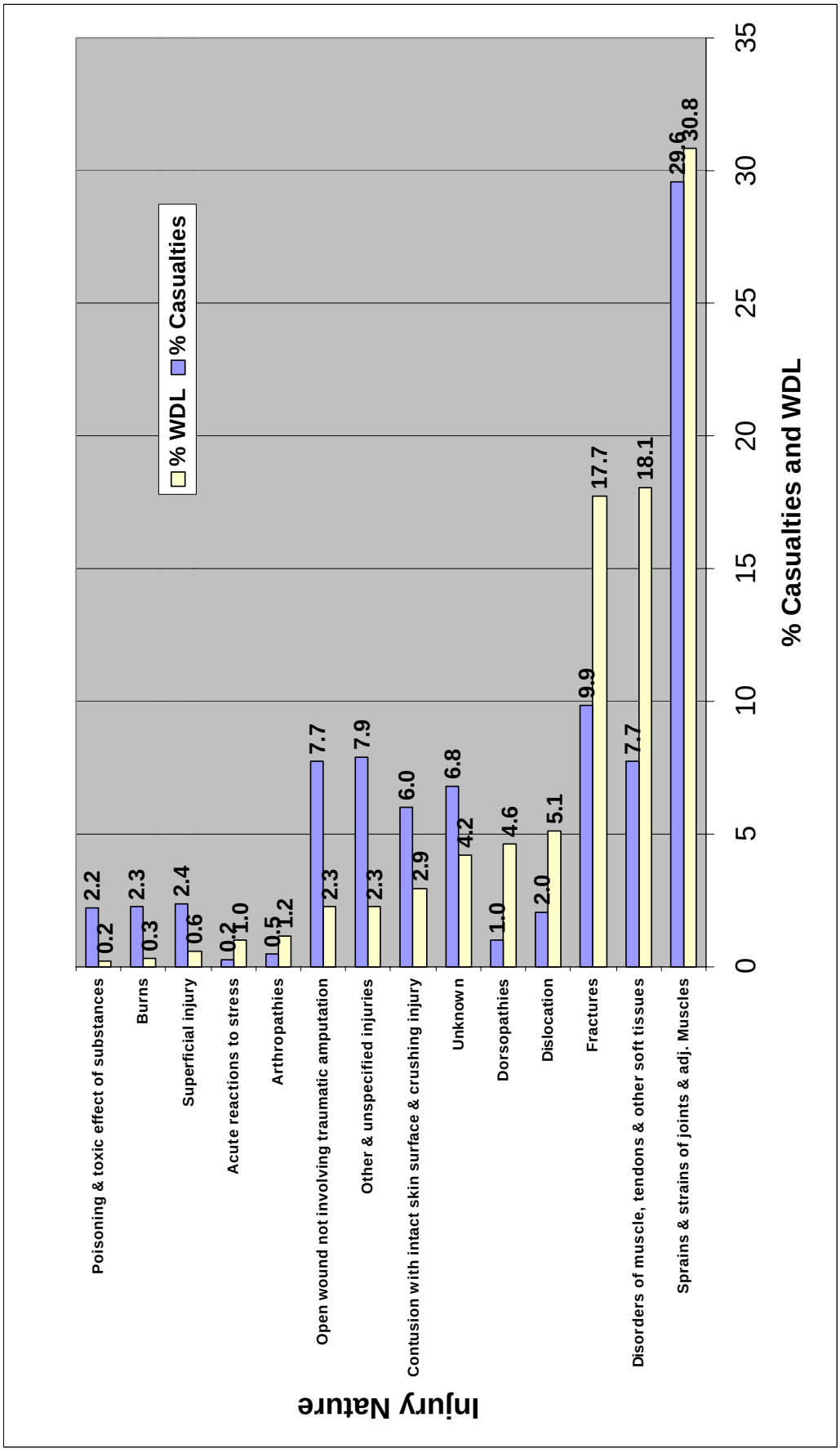

Figure 1–12: Top reported injuries and illnesses associated with per cent casualties and per cent working days lost

1.24 WDL. The injuries and illnesses associated with the most WDL are also depicted in figure 1–12. The injuries and illnesses with the highest proportion of casualties are not always those which are associated with the most WDL. Sprains and strains of joints and adjacent muscles is the leading injury nature associated with WDL. This injury nature accounts for almost 31 per cent of the WDL. Disorders of muscles, tendons and other soft tissue were the second leading injury nature associated with WDL and accounted for approximately 18 per cent of all days lost. Since this injury nature comprised somewhat less than eight per cent of all casualties, the severity of injury as measured by WDL is proportionately much greater for disorders of muscles, tendons and other soft tissues. Similarly fractures accounted for almost 18 per cent of WDL and only approximately 10 per cent of casualties. Dislocations and dorsopathies were not amongst the most numerous injury natures in terms of casualties reported; however, they were the fourth and fifth leading injury natures associated with WDL, comprising 4.6 and 4.2 per cent of WDL respectively. Arthropathies and acute reactions to stress were also among the highest producers of WDL, yet were amongst the lowest ranking injury natures in terms of numbers of casualties.

1.25 Figure 1–13 provides an analysis of days in hospital, sick days, and light duty days, respectively, for the injury natures associated with the highest overall WDL. Sprains and strains of joints and adjacent muscles; fractures; disorders of muscles, tendons and other soft tissues; and dorsopathies were by the leading injury natures associated with the highest proportion of days spent in hospital, sick days, and light duty days.

1.26 In an effort to give an indication of the severity of injury natures figure 1–14 depicts WDL per casualty for the injury natures associated with the highest WDL. The average WDL/casualty ratio for all reported casualties was 6.5. Dorsopathies and acute reactions to stress average of 30 and 27 days of lost work time per casualty, respectively. Additionally, the WDL/casualty ratio for arthropathies, dislocations, and disorders of muscle, tendons and soft tissues is approximately 2.5 times the average. The WDL/casualty average for fractures is almost twice the average. For the leading injury nature associated with casualties and WDL, strains and sprains of joints and adjacent muscles, the WDL rate is just slightly above 6.5 WDL/casualty. All other injury natures associated with the highest overall WDL had rates which indicated that the severity of casualty was less than the average.

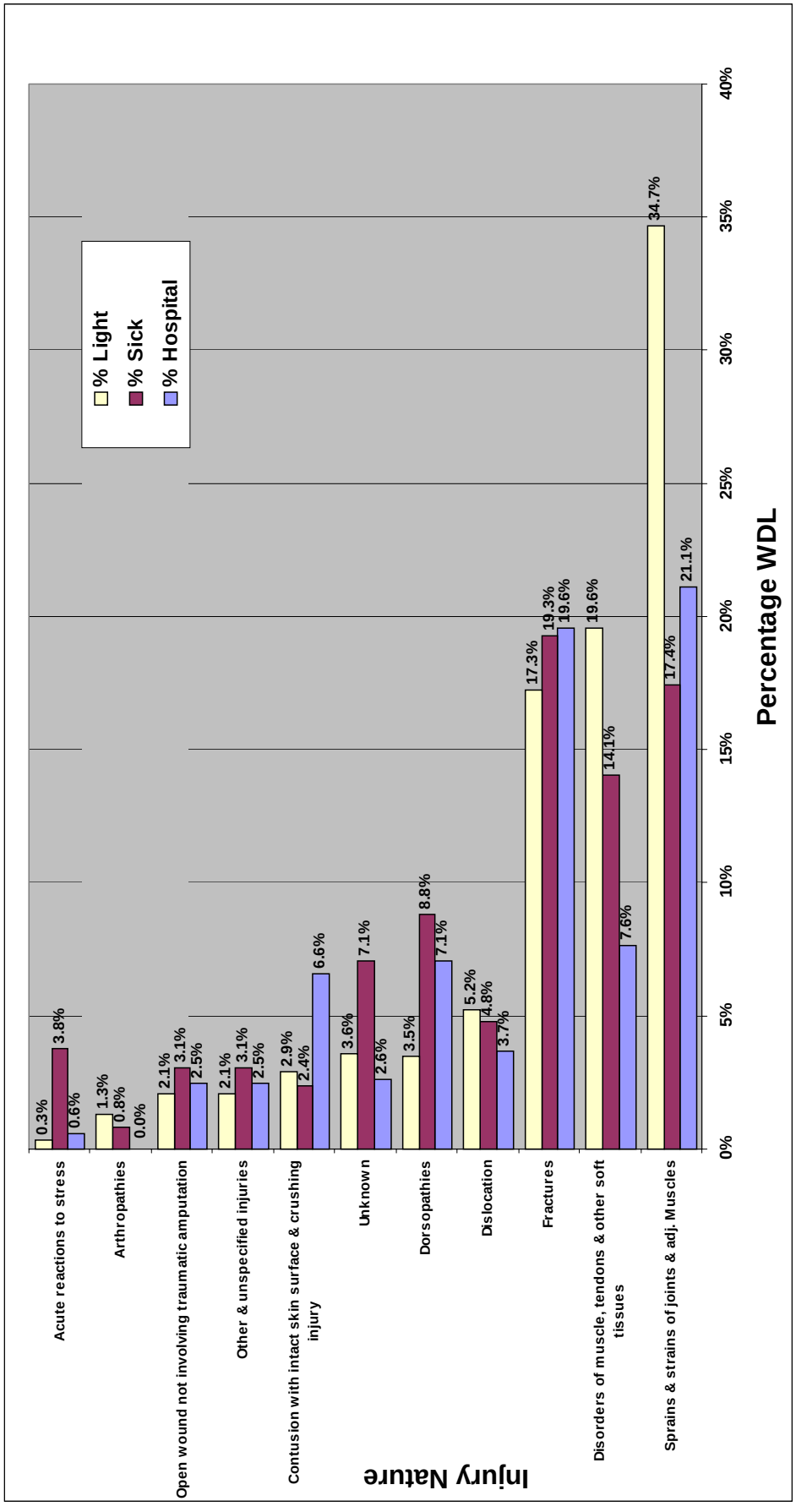

Figure 1–13: Hospital days, sick days, and light duty days associated with the injury natures contributing to the highest overall working days lost

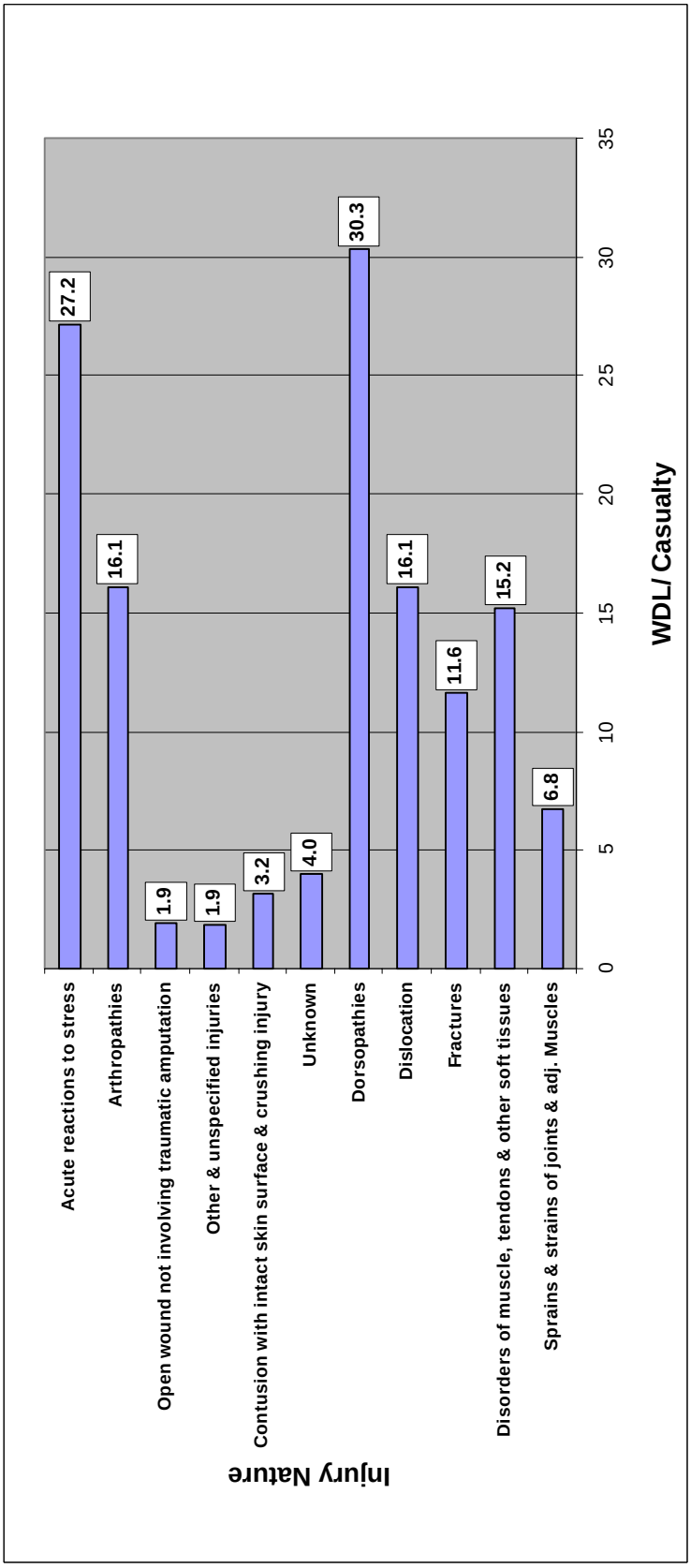

Figure 1–14: Average of working days lost per casualty for injury nature groups associated with the highest total working days lost

1.27 Conclusions from injury nature analysis. The injury and poisoning injury nature group and the musculoskeletal and connective tissue injury nature group accounted for the highest proportions of both casualties and working days lost, respectively. Within the injury and poisoning injury nature group, sprains/strains and fractures were the leading producers of both casualties and WDL. These injuries were also the most frequently reported to DEFCARE. Within the musculoskeletal and connective tissue injury nature group, the vast majority of both casualties and WDL were produced by disorders of muscles, tendons, and other soft tissues. Consequently, implementing current strategies and conducting future research focusing on the prevention of biomechanical injury promises to offer a significant payback in terms of improved health, increased readiness, and productivity.

INJURY LOCATION

1.28 The bodily location of injury/disease refers to the most serious original injury or part of the body affected by disease. The portion of the body affected by an injury or illness may be useful in determining what preventive interventions may be most helpful.

Injury location group

1.29 Casualties. Table 1–5 and figure 1–15 summarise the location of injuries and illnesses reported to DEFCARE by injury location group. By far the leading injury location group affected by occupationally related illnesses and injury was lower limbs. A study of injuries in the Australian Army from 1987–91 by Rudzki, indicated that lower limb injuries were the most commonly reported in the Australian Army and accounted for 39.6 per cent of all injuries. The injury location group affected by the next highest number of casualties was the upper limbs followed by the trunk and head. Rudzki also reported that upper limb, trunk (spine/pelvis plus chest/abdomen), and head/neck/eye injuries constituted 19.4 per cent, 20.6 per cent, and 11.6 per cent of Army casualties, which agrees fairly closely with the DEFCARE data for FY 97/98 presented in table 1–5.

Location Group	Casualties	%
Lower limbs	1586	31.5
Upper limbs	1095	21.7
Trunk (includes back)	745	14.8
Head	574	11.4
Unspecified locations	414	8.2
Systemic locations	249	4.9
Multiple locations	237	4.7
Neck	115	2.3
Psychological system	23	0.5

Table 1–5: Summary of casualties by injury group

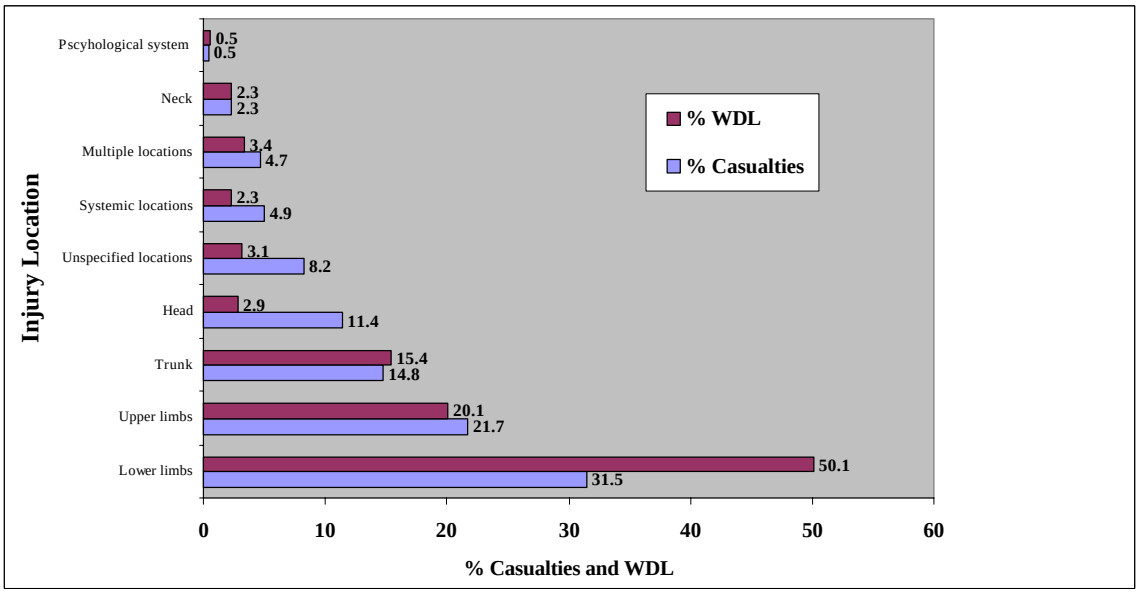

Figure 1–15: Percentage casualties and working days lost by injury location group

1.30 WDL. Figure 1–15 also provides a breakdown of WDL by injury nature group. Approximately 50 per cent of the total WDL is associated with lower limb injuries. The percentage of WDL is much higher than the percentage of casualties for lower limbs, indicating that lower limb injuries are relatively severe in relation to WDL. The Rudzki study indicated that the average WDL from lower limb injuries in Army personnel was 50.7 per cent from 1987–91, which corresponds very closely to the ADF figures for FY 97/98. The average WDL/casualty for lower limbs was 10.3 while the average overall WDL/casualty is 6.5. A further 20 per cent and 15 per cent of WDL is associated with upper limbs and the trunk, respectively. The proportion of WDL to casualties correlates fairly closely for these injury nature groups. All of the other injury nature groups individually account for less than four per cent of all WDL. It is perhaps also noteworthy that trunk injuries result in the most overall days spent in hospital of any of the injury nature groups (420 days).

1.31 Conclusions from injury location analysis. Within the injury location group, lower limb, upper limb, and trunk injuries were the leading producers of both casualties and WDL. Lower limb injuries, in particular accounted for the majority of WDL. Consequently, implementing current strategies and performing future studies focused on the prevention of injury to lower limbs, upper limbs, and trunk promises to offer a significant payback in terms of improved health, increased readiness, and productivity.

MECHANISM OF INJURY

Mechanism of injury grouping

1.32 The mechanism of injury/disease is the action, exposure or event which is the direct cause of the most serious injury or disease, that is, how exactly was the injury or disease sustained and what particular chemical, product, process or equipment was involved (eg hit head on cabin of forklift truck, lacerated knee when landing on ground, arm hurt after long period of typing). The mechanism of injury is important for determining how the injury occurred.

1.33 Casualties. Table 1–6 summarises injuries reported to DEFCARE in FY 97–98 in terms of casualties and WDL associated with each mechanism group. Figure 1–16 presents the data graphically. Falls, trips and slips of a person and being hit by moving objects each account for approximately 21 per cent of all casualties. The other and unspecified mechanism group and the body stressing group accounted for 18 per cent and 16 per cent, respectively, of the total casualties.

Mechanism Group	Casualties	Days in Hospital	Sick Days	Light Duty Days	Total WDL
Falls, trips and slips of a person	1080	266	1344	6607	8217
Being hit by moving objects	1047	237	967	4648	5852
Other and unspecified mechanisms	927	224	1398	4596	6218
Body stressing	821	293	1648	6853	8794
Hitting objects with a part of the body	508	119	560	2160	2839
Chemicals and other substances	361	52	38	40	130
Heat, radiation and electricity	156	3	20	58	81
Biological factors	61	14	72	48	134
Sound and pressure	50	4	16	50	70
Mental stress	27	4	224	81	309

Table 1–6: Summary of casualties and working days lost by mechanism group

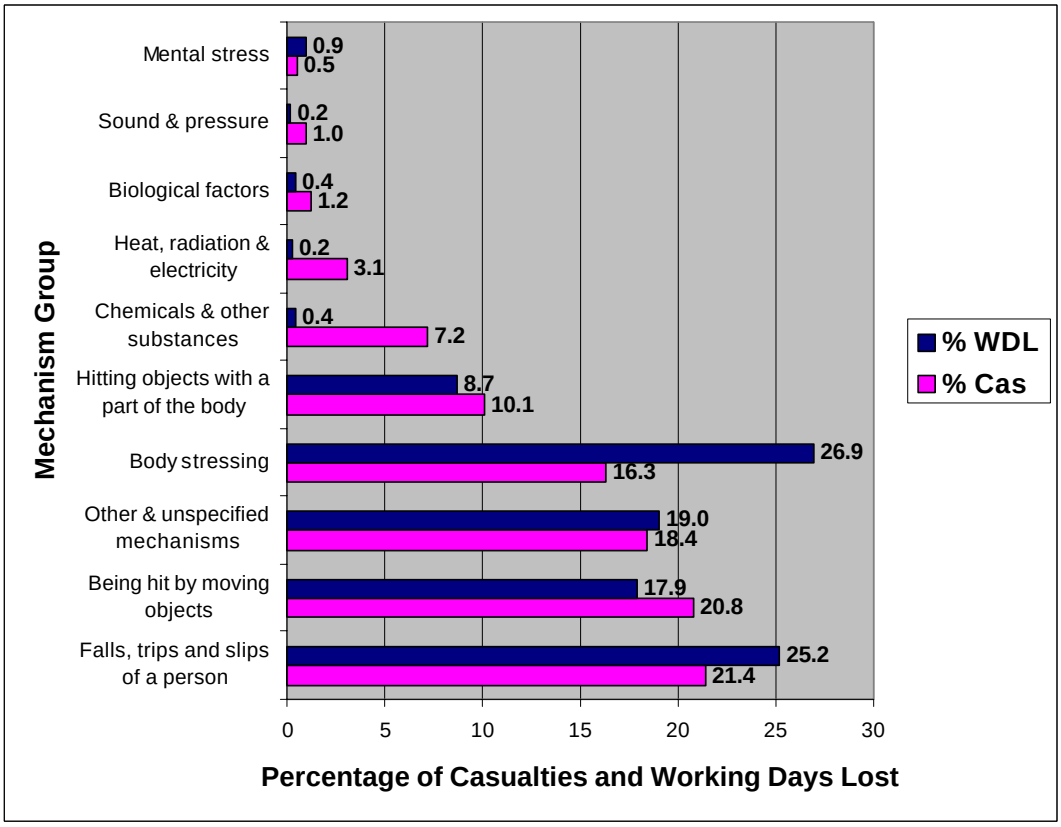

Figure 1–16: Percentage of casualties and working days lost by mechanism group

1.34 WDL. In terms of working days lost, body stressing and falls trips and slips of a person each were involved in approximately one-fourth of all casualties. Other and unspecified mechanisms and being hit by moving objects were involved in 19 per cent and 18 per cent of all casualties reported to DEFCARE. Hitting objects with a part of the body was the mechanism group involved in approximately nine per cent of reported cases involving casualties. All other mechanism groups accounted for less than one per cent each of the total WDL.

1.35 Severity of injury by mechanism of injury grouping. In order to assess the severity in terms of WDL of casualties in which each mechanism group is involved, figure 1–17 presents working days lost per casualty. Body stressing and mental stress each had a higher than average ratio of WDL to casualties and, on average, each casualty associated with these mechanism groups resulted in 11 lost working days. Falls, trips and slips of a person and other and unspecified mechanisms each had a WDL/casualty ratio above 6.5.

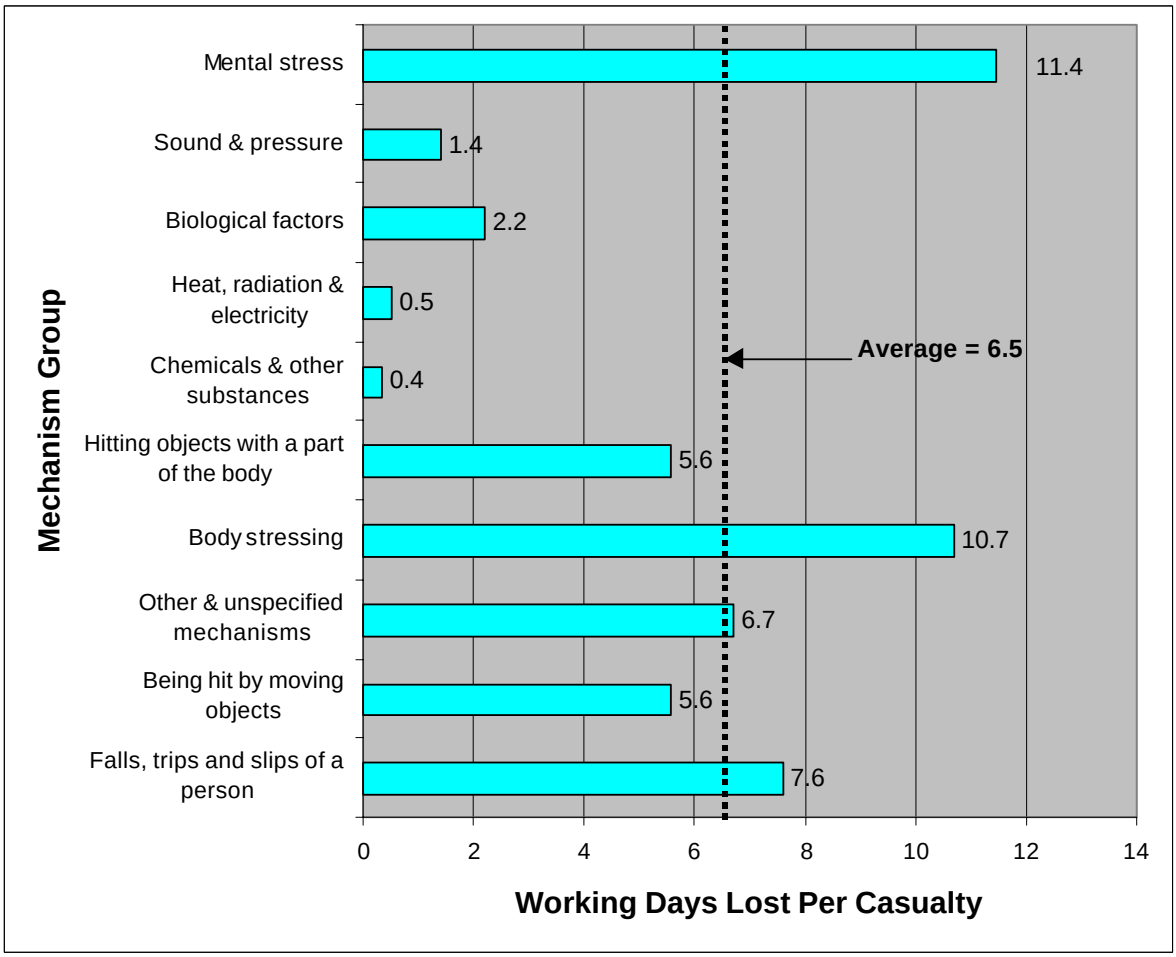

Figure 1–17: Working days lost per casualty by mechanism group

Individual mechanisms

1.36 Casualties. The individual mechanisms contributing to the largest number of casualties and WDL are depicted in figure 1–18. The mechanism could not be determined in over 12 per cent of cases involving casualty reports to DEFCARE. Of known mechanisms of injury, falls from the same level contributed to the highest number of casualties (10.8 per cent), followed by being hit by moving objects (8.4 per cent), being hit by a person (8.3 per cent), falls from a height (7.9 per cent) and hitting stationary objects (7.3 per cent). The highest contributors to WDL included falls on the same level (12.8 per cent), being hit by a person (11.2 per cent), and muscular stress with no objects handled (9.4 per cent).

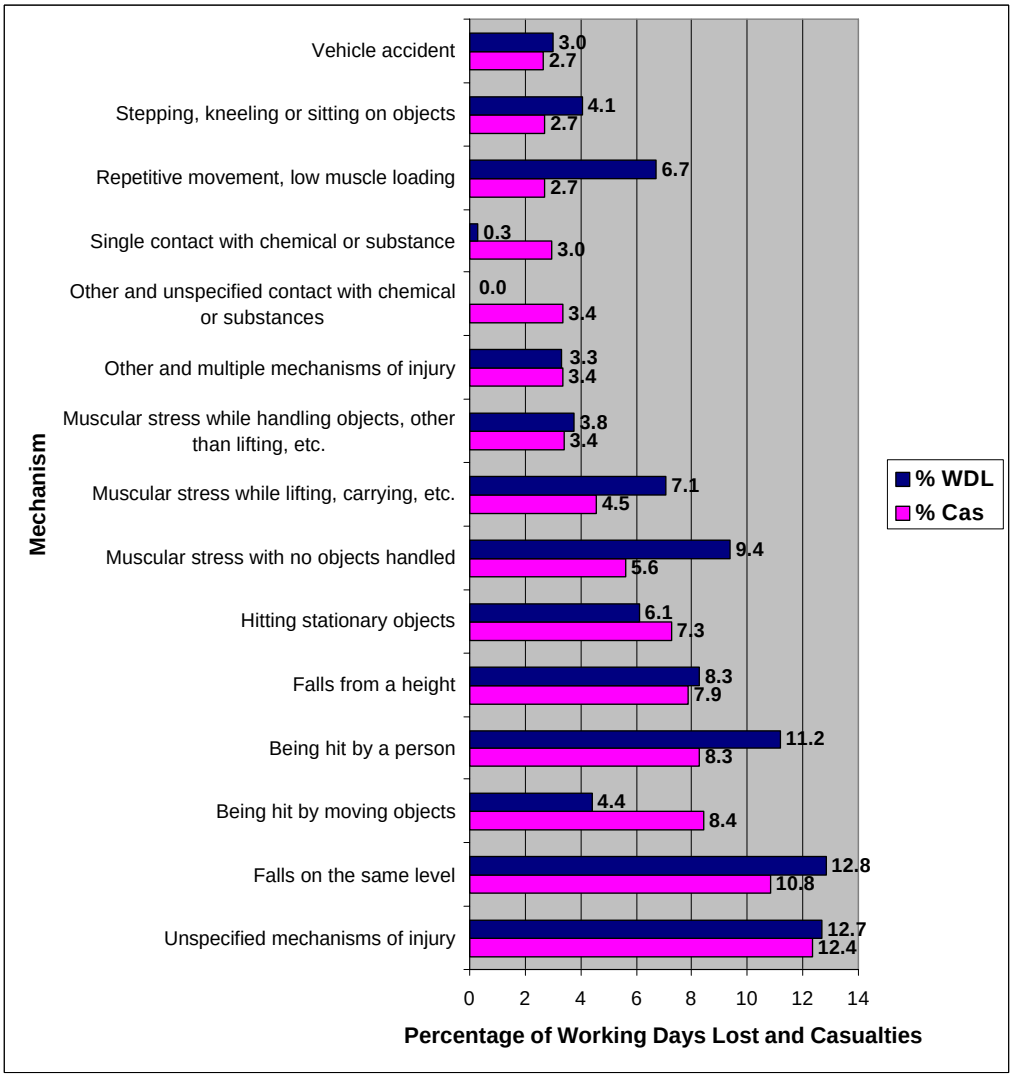

Figure 1–18: Proportion of casualties and working days lost associated with individual mechanisms of injury

1.37 WDL. An analysis of injury severity in terms of WDL per casualty indicates that the most severe individual mechanism was repetitive movement with low muscle loading, which accounted for over 16 WDL/casualty, 2.5 times the average ratio of 6.5 WDL/casualty. Muscular stress with no objects handled; muscular stress while lifting, carrying, etc; and stepping, kneeling or sitting on objects each led to approximately 10 working days lost per casualty.

DETAILED ASSESSMENT OF ACTIVITIES ASSOCIATED WITH HIGHEST WORKING DAYS LOST

1.38 As previously discussed, the five leading activities associated with lost working days are: PT, touch football, soccer, rugby union/league, and running/jogging (sports). A more detailed assessment of each of these activities is provided below.

Physical training

1.39 Injury nature—casualties. Figure 1–19 provides a breakdown of the per cent of PT casualties and WDL by injury nature. Sprains and strains of joints and adjacent muscles accounts for nearly half of all PT injuries. Disorders of muscle, tendons and other soft tissues and fractures are the next most common injuries and account for 12 per cent and 10 per cent, respectively of all PT casualties. No other single injury nature is related to more than five per cent of casualties. This trend is consistent with the previous analysis of injuries by injury nature and indicates that PT injuries follow the same general trend and are a major contributor to these types of injuries.

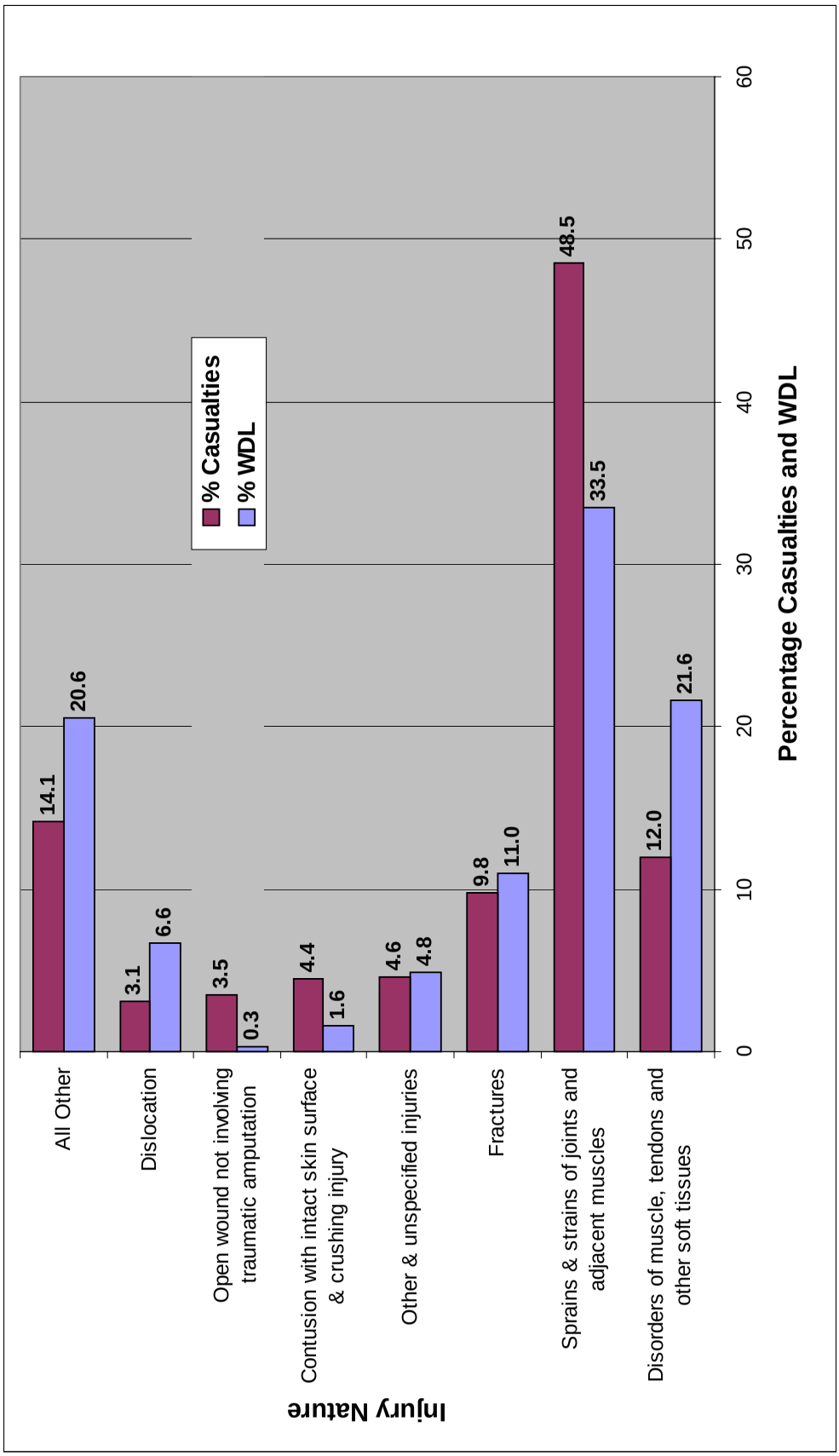

Figure 1–19: Proportion of casualties and working days lost by Injury nature for physical training injuries

1.40 Injury nature—WDL. Figure 1–19 also summarises the percentage of WDL associated with various injury natures. Sprains and strains of joints and adjacent muscles was the injury nature associated with the highest WDL and accounted for approximately one-third of all reported WDL due to PT. Disorders of muscles, tendons and other soft tissues accounted for over 21 per cent of all WDL. Since disorders of muscles, tendons and other soft tissues only accounted for 12 per cent of PT casualties, this type of injury tends to more severe in terms of WDL. This type of injury resulted in 18 WDL per casualty in comparison to the overall average of 6.5 and the average for PT-related injuries of over 9. Fractures accounted for 11 per cent of WDL and each fracture resulted in an average of 11 WDL per casualty, which is somewhat above the average for all PT injuries. Dislocations accounted for a further 6.6 per cent of all WDL for PT injuries and each dislocation resulted in an average of 21 WDL, which is more than twice the average for PT injuries and over three times the overall average. No other injury nature accounted for more than five per cent of casualties. Again, this follows the same general trend for WDL noted previously and suggest that PT injuries are a significant contributor to both the types of injuries and the severity, as measured in WDL.

1.41 Injury location—casualties. The percentage of PT casualties associated with each injury location group is provided in figure 1–20. Injuries to lower limbs accounted for almost 50 per cent of all PT casualties. Upper limb and trunk injuries were affected in 20 per cent and 18 per cent, respectively, of all reported casualties. No other injury location group accounted for much more than five per cent of PT casualties. Table 1–7 compares the location of PT injuries for the ADF in FY 97/98 to figures reported in the Rudzki study. It can be readily seen that there is a very close correlation, which indicates that the location of injuries has not changed much over time. The largest difference is in trunk injuries. A further analysis of trunk injuries indicates that spine (back)/pelvis injuries were considerably lower for ADF personnel in FY 97/98 versus Army personnel from 1987–91. This may indicate that changes in the manner in which PT is conducted (eg not doing situps with fingers interlocked behind the head), may have been responsible for decreasing back injuries. A total of 744 casualties and 7361 lost working days were attributable to PT injuries according to the DEFCARE FY 97/98 data.

1.42 Injury location—WDL. The percentage of WDL for each injury location group was roughly proportional to the percentage of casualties. Each lower limb injury resulted in an average of over 11 WDL, which is slightly above the average for all PT injuries and nearly double the overall average of 6.5 for all injuries. Significantly, injury location trends for PT injuries follow the general trends previously shown for all injuries. This indicates PT injuries are an important contributor to both casualties and WDL for lower limb, upper limb, and trunk injuries and that strategies implemented to reduce or prevent injuries to these locations should be an integral part of unit and individual PT.

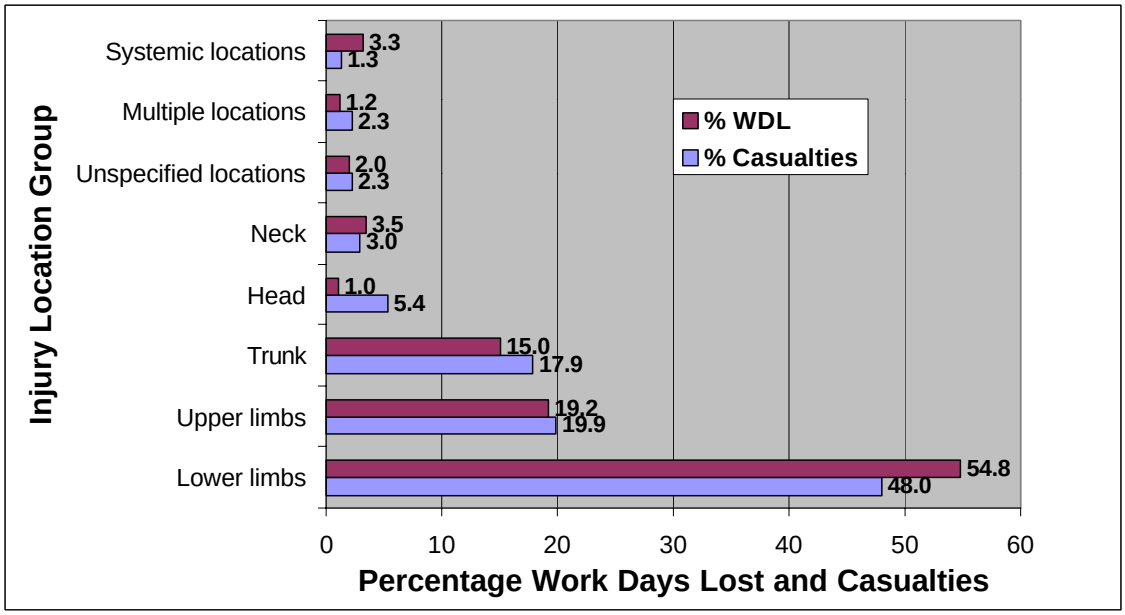

Figure 1–20: Proportion of casualties and working days lost by injury location group for physical training injuries

Location Group	% of Casualties (FY 97–98 ADF)	% of Casualties (1987–91 Army[1])
Lower limbs	48.0	47.9
Upper limbs	19.9	20.6
Trunk	17.9	23.8
Head/Neck/Eye	8.4	6.2
Other	5.9	1.4
Spine/Pelvis	13.6	20.8
Chest/Abdomen	3.4	3.0

Table 1–7: Location of physical training injuries—comparison of 1987–91 Army data with FY 97/98 Australian Defence Force data

1.43 Lower limb injuries. Approximately one-third of casualties from all lower limb injuries are associated with both knee and ankle injuries. All other lower limb locations each accounted for less than 10 per cent of all PT casualties. Knee injuries make up 35 per cent of casualties and 40 per cent of WDL associated with lower limb injuries occurring during PT. The average reported WDL for knee injuries was almost 13 days per casualty. Ankle injuries produced the second highest percentage of casualties (114 or 32 per cent) and WDL (740 WDL or 18 per cent of total). The average WDL per casualty for ankle injuries was 6.5, thus ankle injuries were less severe in terms of WDL than the average PT injury. Lower limb—multiple locations and lower leg injuries accounted for 14 per cent and 12 per cent of all PT-related lower limb injuries. In total, lower limb injuries from PT accounted for 357 casualties and over 4000 lost working days.

1.44 Upper limb injuries. A summary of casualties and WDL for upper limb injuries related to PT is provided in figure 1–21. Shoulder injuries comprise the largest proportion of casualties and approximately 60 per cent of all WDL among upper limb injuries. The average shoulder injury results in 16 WDL. Finger injuries account for over 16 per cent of casualties and 7.5 per cent of WDL (4.4 WDL/casualty) related to upper limb injuries. Wrist injuries result in the second most WDL of upper limb injuries and each injury results in an average of 11 WDL.

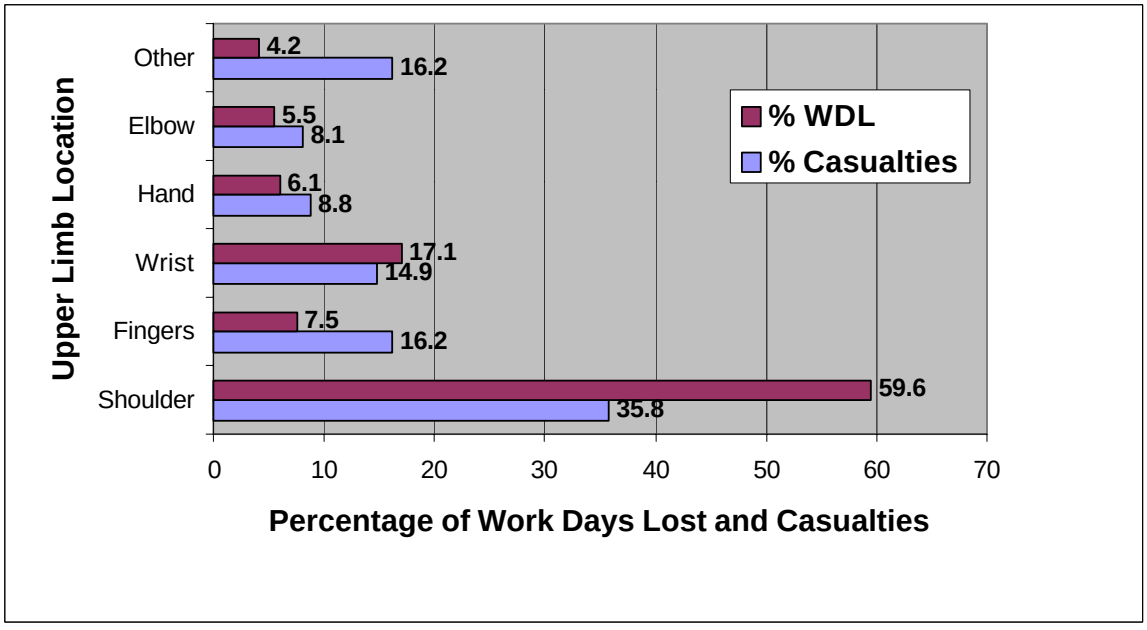

Figure 1–21: Summary of casualties and working days lost for upper limb injuries related to physical training

1.45 Trunk injuries. Lower back injuries make up almost half of all injuries to the trunk and almost two-thirds of WDL related to trunk injuries. The average WDL for lower back injuries is 12 days. Unspecified back injuries comprise over 20 per cent of both trunk injuries and associated WDL.

1.46 Injury mechanism. The mechanism group associated with PT injuries is summarised in figure 1–22. Body stressing was the mechanism group associated with over one-third of all PT injuries and resulted in over 42 per cent of WDL for PT injuries. Falls, slips and trips was the next most prominent mechanism contributing to PT injuries and accounted for 29 per cent of all PT casualties and 25 per cent of WDL. Being hit by moving objects was also a significant contributor to PT injuries and accounted for 15 per cent of injuries and 14 per cent of WDL. The other and unspecified mechanisms group accounted for 15 per cent of casualties and over 14 per cent of WDL for PT injuries.

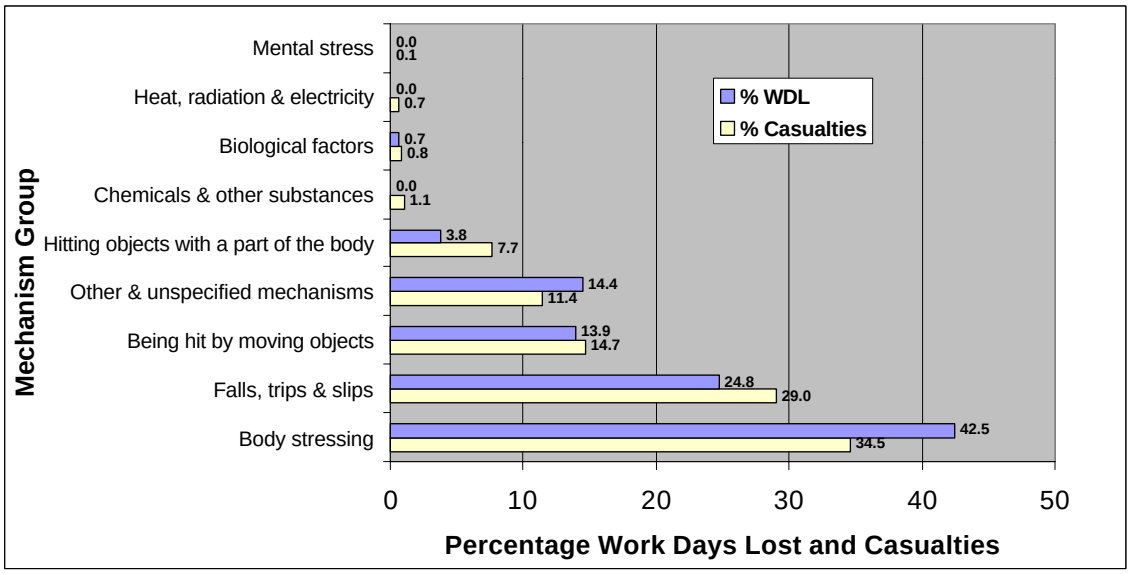

Figure 1–22: Summary of casualties and working days lost by injury mechanism group for physical training injuries

1.47 Agency. An analysis of agencies involved in PT casualties and WDL indicates that the environmental agency which contributed the most to casualties and WDL during PT was 'traffic and ground surfaces other'. Buildings and other structures and wet, oily or icy traffic and ground surfaces were the next most prominent contributors among environmental agencies to WDL. The condition of surfaces used for PT clearly plays a prominent role in PT injuries. Reports submitted to DEFCARE did not contain sufficient information to establish what the agency was for 18 per cent of casualties, which contributed to a total of 22 per cent of WDL for PT injuries. Equipment-related issues were involved in 21 per cent of PT injuries and the agency was personnel-related in over 22 per cent of PT casualties and 28 per cent of WDL.

1.48 Summary. PT injuries were most likely to comprise sprains and strains; disorders of muscles, tendons and soft tissues; and fractures. These injuries mostly occurred to lower limbs and a large percentage also involved upper limbs and the trunk. Knee, ankle, shoulder, finger, and back (particularly lower back) injuries were most common. Injuries were most likely to result from body stressing; falls, slips and trips; and being hit by moving objects. Agencies such as surface conditions and equipment are also factors contributing to PT injuries.

Touch football

1.49 Injury nature—casualties. Figure 1–23 provides a summary of the nature of injuries associated with touch football, the activity associated with the second highest WDL. Sprains and strains of joints and adjacent muscles was by far the injury most frequently reported. Disorders of muscle, tendons and other soft tissues was the second highest injury nature associated with touch football. Eleven per cent of touch football casualties suffered fractures and approximately six per cent suffered dislocations. Touch football injuries reported to DEFCARE accounted for 172 casualties and 3341 work days lost during FY 97/98.

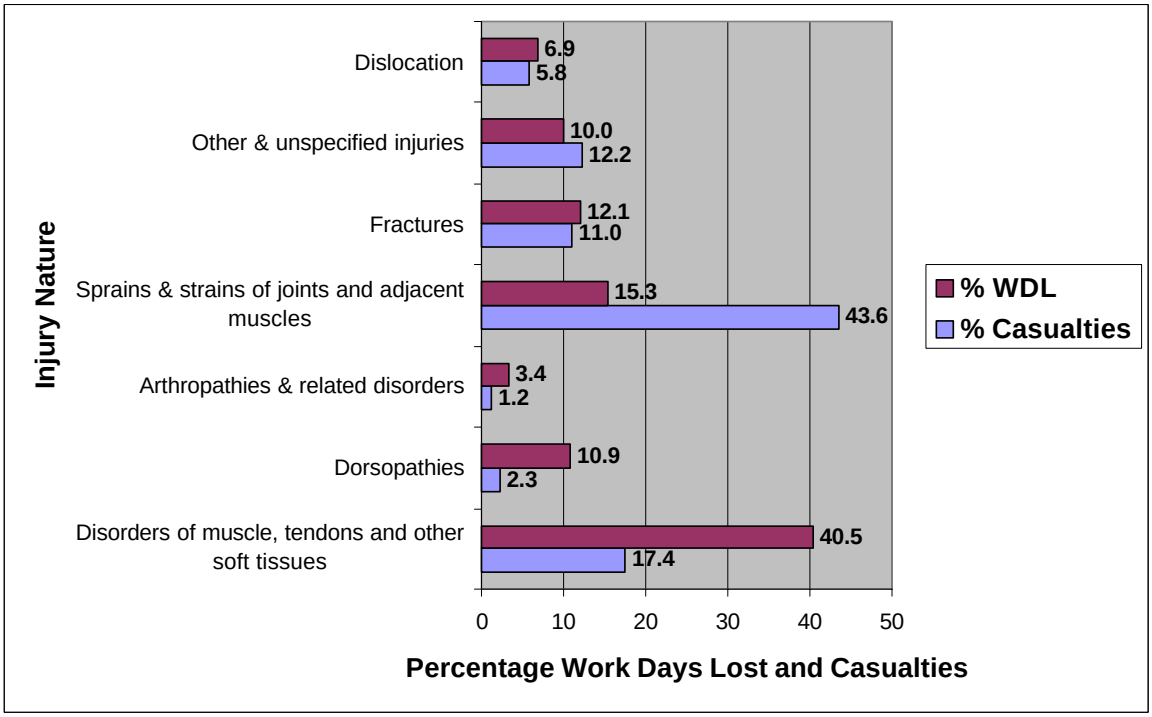

Figure 1–23: Proportion of casualties and working days lost by injury nature for touch football injuries

1.50 Injury nature—WDL. Each casualty from touch football resulted in an average of over 16 WDL as compared with the average for all reported casualties of 6.5 WDL. Disorders of muscle, tendons and other soft tissues accounted for over 40 per cent of WDL from injuries sustained during touch football and the average of 45 WDL per casualty was particularly high for this injury nature. The average WDL from sprains and strains of joints and adjacent muscles was 6.8 days per casualty and this injury nature accounted for over 15 per cent of all WDL associated with touch football. Fractures, dorsopathies, and other and unspecified injuries each accounted for over 10 per cent of WDL from touch football.

1.51 Injury location—casualties. As depicted in figure 1–24 lower limbs was the injury location group associated with the most touch football casualties. Injuries to upper limbs accounted for approximately one-quarter of all reported touch football casualties. Approximately 10 per cent of touch football injuries involved the trunk. All other location groups accounted for less than four per cent of touch football casualties.

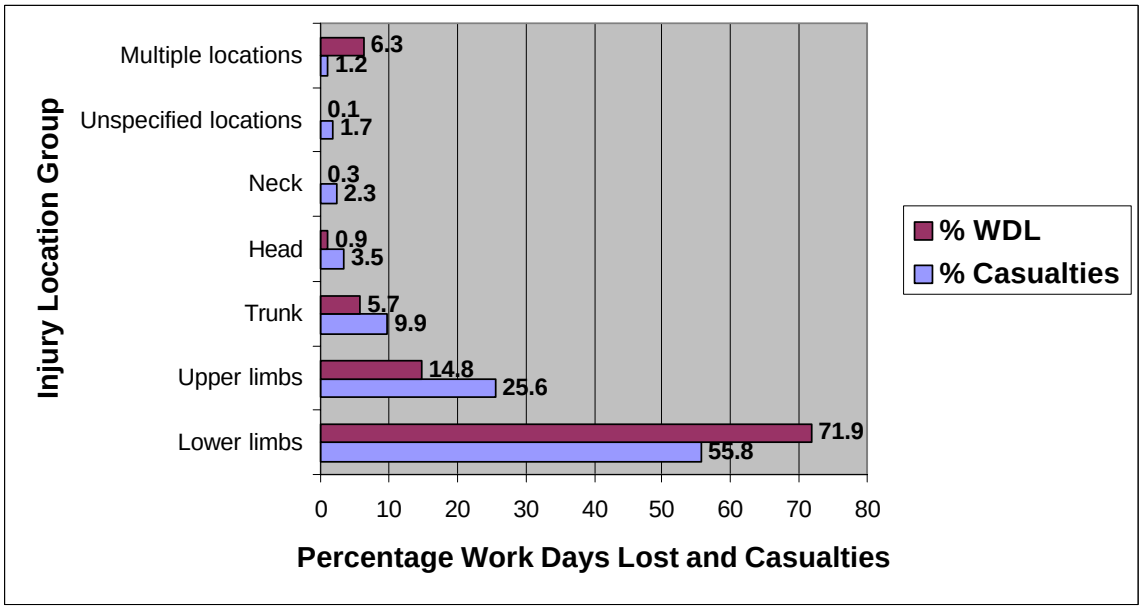

Figure 1–24: Proportion of casualties and working days lost by injury location group for touch football injuries

1.52 Injury location—WDL. Lower limb injuries accounted for over 70 per cent of WDL from touch football. Upper limb injuries produced the second highest percentage of WDL from touch football, 15 per cent. Trunk injuries and injuries with multiple locations each accounted for approximately six per cent of WDL. All other injury nature groups individually accounted for less than one per cent of WDL.

1.53 Lower limb injuries. A further analysis of lower limb injuries from touch football indicates almost half of all lower limb injuries from touch football are related to the knee and over one-third more are related to the ankle. Knee and ankle injuries account for 57 per cent and 11 per cent, respectively, of all WDL associated with touch football injuries. The average WDL from knee injuries related to touch football was 41 days per casualty. Lower leg injuries account for an additional four per cent of WDL and no single other lower limb location accounted for as much as one per cent of WDL. Injury surveys for sport in general have identified the knee and ankle as the two most common sites of injury accounting for a combined total of over 25 per cent of all sports injuries.

1.54 Upper limb injuries. Shoulder injuries accounted for over 10 per cent of all touch football injuries and over 40 per cent of all upper limb injuries associated with touch football. One-quarter of all upper limb injuries and over six per cent of all injuries during touch football were related to fingers. Shoulder injuries and hand injuries accounted for almost four per cent of WDL associated with touch football. The average WDL per shoulder injury was seven days.

1.55 Injury mechanism. As depicted in figure 1–25, the mechanism involved in approximately one-third of all touch football injuries was falls, trips and slips. Body stressing was the second leading mechanism associated with touch football and accounted for 22 per cent of injuries. Ironically, being hit by moving objects, other and unspecified mechanisms, and hitting objects with a part of the body each accounted for approximately 15 per cent of 'touch' football injuries. Body stressing was also the leading mechanism related to WDL. Each injury in which the mechanism was body stressing resulted in an average of 33 WDL, and over 37 per cent of WDL related to touch football were attributed to body stressing. A further 31 per cent of WDL were associated with falls, trips and slips. Hitting objects with a part of the body and being hit by moving objects were associated with seven per cent and four per cent of WDL, respectively.

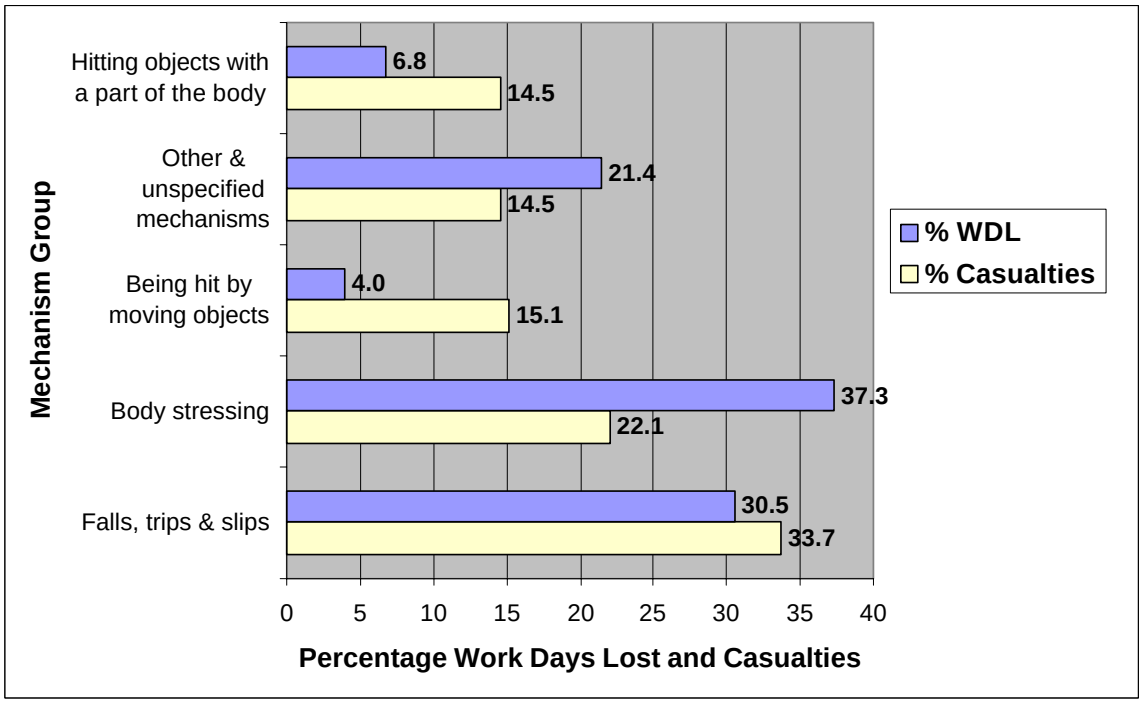

Figure 1–25: Mechanism group associated with touch football injuries

1.56 Agency. The majority of touch football injuries were associated with environmental agencies (39 per cent) and animal, human and biological agencies (eg other person or condition of the affected person) (30 per cent). Most touch football injuries which involved environmental agencies are related in some respect to the condition of the playing surface, including: traffic and ground surfaces other; wet, oily or icy traffic and ground surfaces; holes in the ground; vegetation; and traffic and ground surfaces with hazardous objects. As previously noted, environmental agencies contributed to 52 per cent of touch football injuries. Ground surface conditions, especially wet ground surfaces, appear to have been major contributors to WDL.

1.57 Summary. Sprains and strains and disorders of muscle, tendons and other soft tissues are the most likely injuries to result from touch football. Fractures and dorsopathies also have a substantial impact on WDL. A majority of injuries are associated with the lower limbs, especially knees and ankles. However, injuries to upper limbs are also quite common with shoulders and fingers most often affected. Falls, trips and slips and body stressing are associated with the highest number of casualties and WDL; however, being hit by moving objects and hitting objects with a part of the body also commonly lead to casualties. Environmental agencies play an important role in touch football injuries, with issues involving ground surfaces playing a prominent role.

Soccer

1.58 Injury nature—casualties. Soccer was the activity associated with the third highest number of working days lost. As depicted in figure 1–26, sprains and strains of joints and adjacent muscles accounted for almost half of all injuries during soccer. Fractures accounted for an additional 20 per cent of casualties and disorders of the muscle, tendons and other soft tissues accounted for a further 11 per cent of soccer injuries. A total of 158 casualties accounting for 1854 WDL were reported to DEFCARE in FY 97/98.

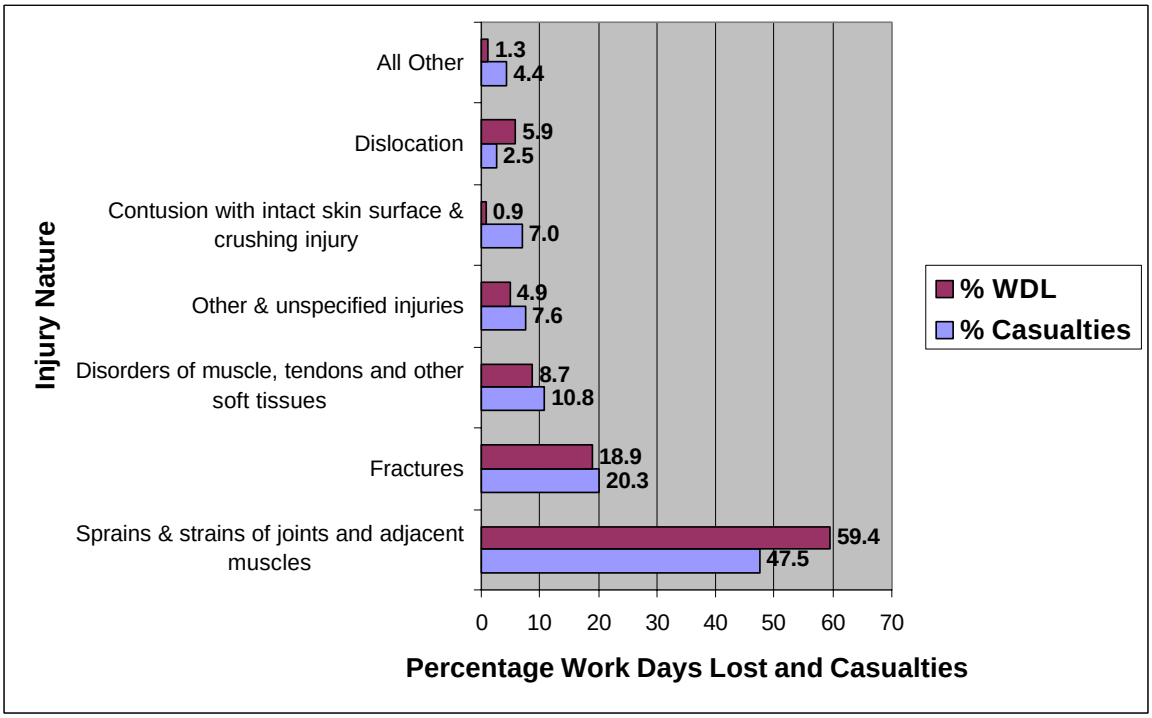

Figure 1–26: Proportion of casualties and working days lost by injury nature for soccer injuries

1.59 Injury nature—WDL. The average WDL from all soccer injuries was approximately 12 days. The average WDL from sprains and strains of joints and adjacent muscles was 15 days and this type of injury accounted for 59 per cent of all WDL due to soccer. Fractures contributed to 19 per cent of WDL. Disorders of muscle, tendons and other soft tissues and dislocations accounted for nine per cent and six per cent of WDL from soccer, respectively. The overall trend for casualties and WDL is similar to both PT injuries and touch football injuries.

1.60 Injury location—casualties. The vast majority (69 per cent) of soccer injuries affected the lower limbs. Upper limbs and the trunk were affected in an additional 13 per cent and seven per cent of soccer injuries, respectively. Other injury location groups each accounted for less than four per cent of soccer injuries.

1.61 Injury location—WDL. The percentage of WDL by injury location was generally proportionate to the percentage of casualties with the exception of systemic locations in which one injury resulted in 148 WDL.

1.62 Lower limbs. Approximately 46 per cent of all soccer injuries involved the knees and ankles. Injuries to the lower leg accounted for an additional nine per cent of all soccer injuries. Knee injuries accounted for 38 per cent of all WDL from soccer injuries. Ankle injuries accounted for 19 per cent of all WDL due to soccer injuries. Other lower limb injuries accounted for less than five per cent of WDL due to participation in soccer, as shown in figure 1–27.

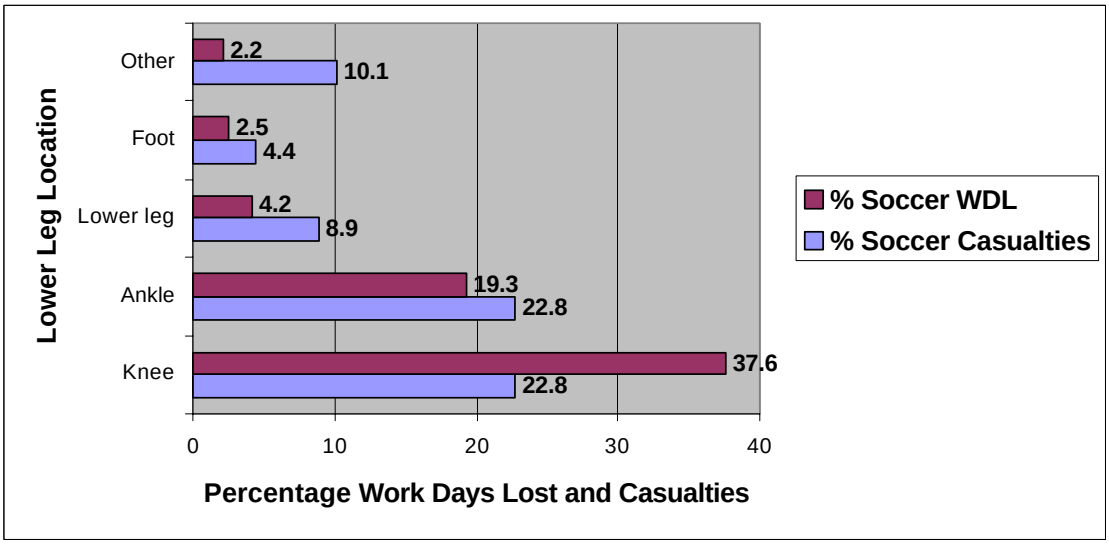

Figure 1–27: Proportion of casualties and working days lost associated with specific location of lower limb injuries for soccer

1.63 Mechanism. Figure 1–28 summarises the mechanism group associated with soccer injuries. Being hit by moving objects (eg other participants) was involved in almost half of all soccer injuries. Other mechanism groups, which contributed significantly to soccer casualties included: falls, slips and trips (19 per cent); hitting objects with a part of the body (15 per cent); and body stressing (12 per cent). The percentages of WDL associated with being hit by moving objects and hitting objects with a part of the body were nearly the same as the percentages of casualties for those mechanism groups. Falls, slips and trips, which accounted for 19 per cent of casualties, only contributed to five per cent of WDL. Injuries associated with body stressing and other and unspecified mechanisms tend to be relatively more severe. Each contributed significantly to WDL in excess of their contribution to the total number of casualties.

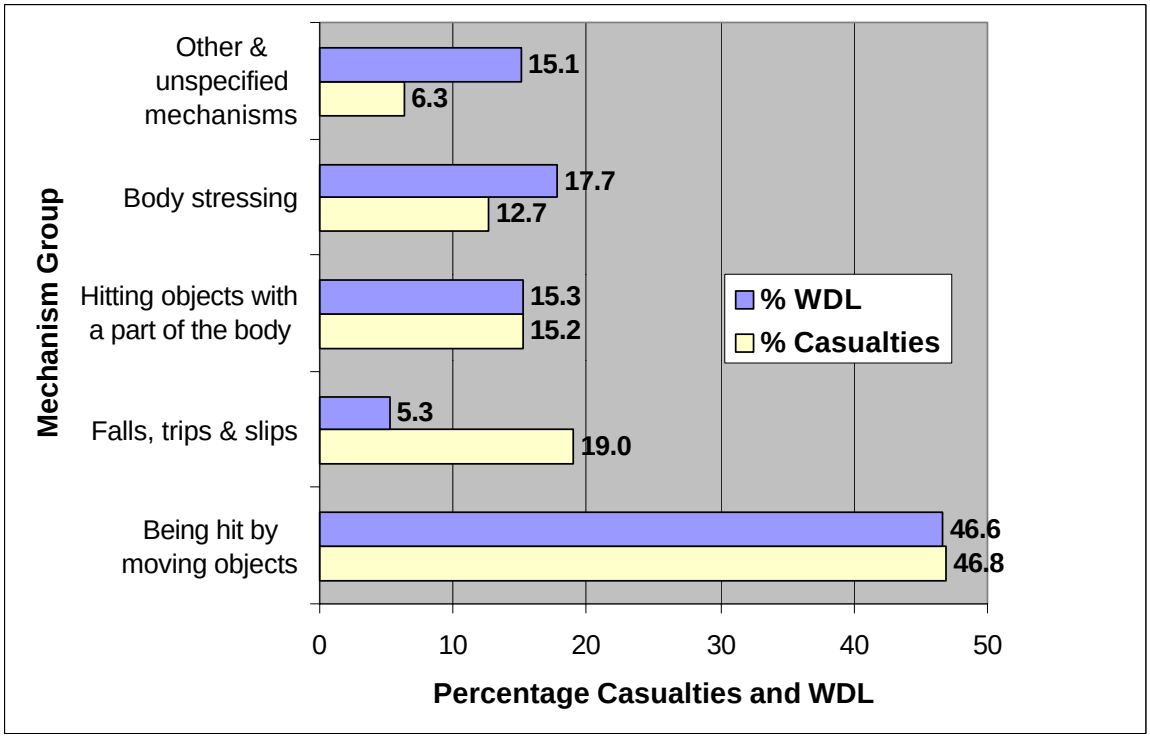

Figure 1–28: Mechanism group associated with soccer injuries

1.64 Agency. Approximately 60 per cent of soccer injuries were associated with animal, human and biological agencies. This is not surprising given that the mechanism of injury often involved physical contact with another person. Equipment and environmental agencies (eg playing surface) contributed to 15 per cent and 14 per cent of soccer casualties, but contributed much less proportionally to WDL (less than six per cent for equipment and environmental agencies).

1.65 Summary. The most likely injuries to occur during soccer are sprains and strains and fractures. Lower limbs, especially knees and ankles, are the portion of the body most likely to be affected. Being hit by moving objects (eg other players) is the most likely mechanism of injury; however, falls, trips and slips; hitting objects with a part of the body; and body stressing also play a significant role in injuries.

Rugby union/league

1.66 Injury nature—casualties. Rugby union/league was the activity associated with the fourth highest number of working days lost. As depicted in figure 1–29, sprains and strains of joints and adjacent muscles was the most common rugby union/league injury, accounting for 35 per cent of all casualties from this sport. Fractures and disorders of muscles, tendons and other soft tissues accounted for 16 per cent and 14 per cent more of all rugby injuries. No other single injury nature accounted for more than eight per cent of rugby injuries. Rugby union/league accounted for a total of 214 casualties reported to DEFCARE and 2100 WDL during FY 97/98.

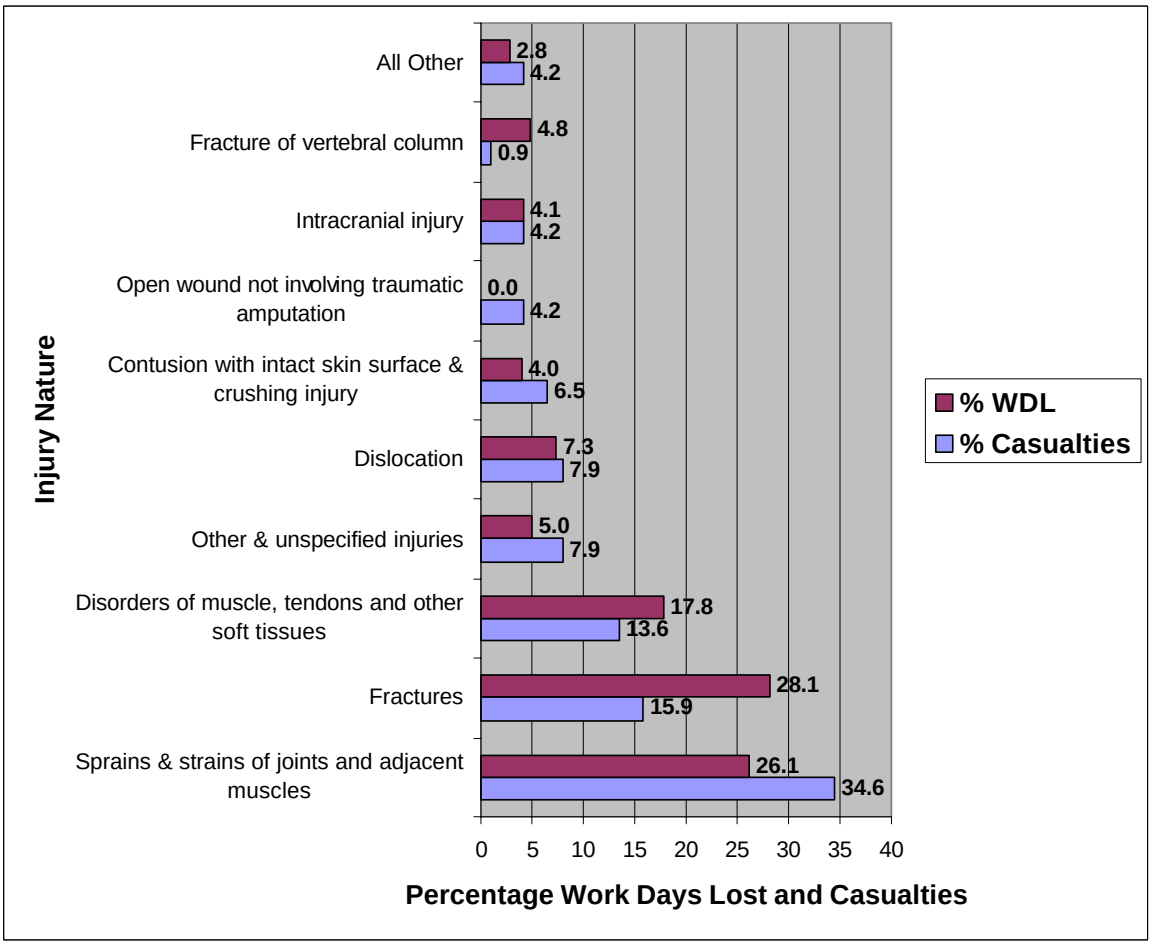

Figure 1–29: Proportion of casualties and working days lost by injury nature for rugby union/league injuries

1.67 Injury nature—WDL. The average WDL from all rugby injuries was over nine days, compared to the average for all reported injuries of 6.5. Fractures and sprains and strains accounted for 28 per cent and 26 per cent of all WDL due to rugby, respectively. Disorders of muscle, tendons and other soft tissues accounted for a further 18 per cent of WDL due to rugby. All other injury natures each accounted for less than eight per cent of WDL.

1.68 Injury location. As depicted in figure 1–30, upper limb and lower limb injuries each accounted for approximately 31 per cent of rugby injuries and over three-quarters of WDL due to rugby. Head and trunk injuries each occurred in approximately 14 per cent of reported rugby casualties. Neck injuries accounted for a further seven per cent of rugby casualties. Head, neck, and trunk injuries were each associated with approximately seven to eight per cent of WDL.

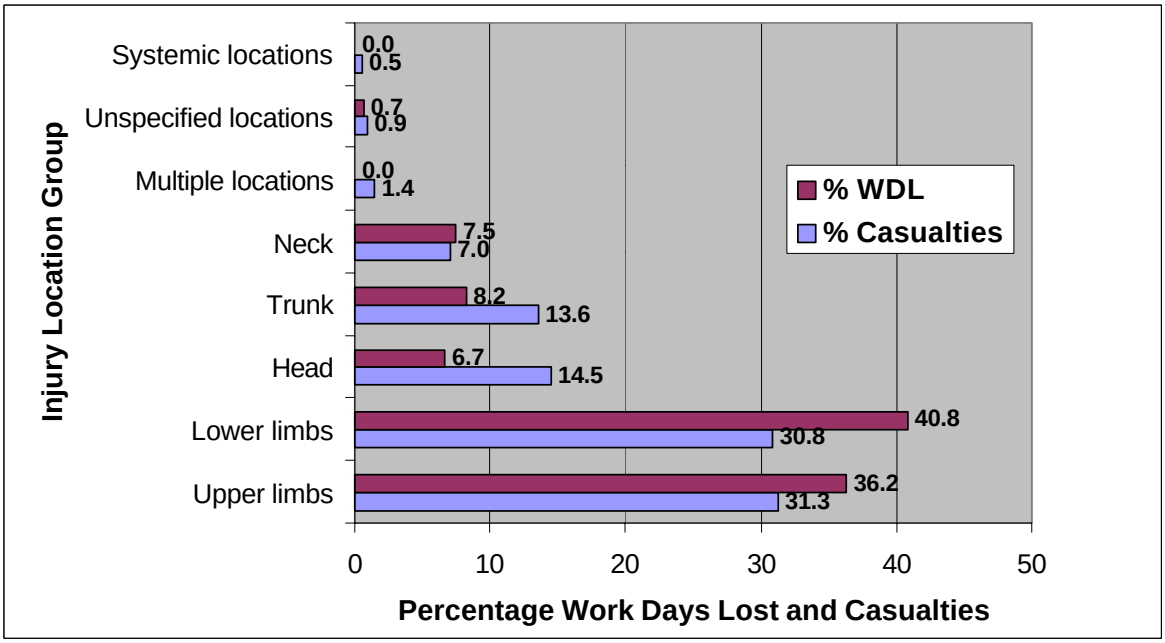

Figure 1–30: Proportion of casualties and working days lost by injury location group for rugby union/league

1.69 Lower limb injuries. A more detailed analysis total of lower limb injuries shows that half of all rugby lower limb injuries (representing over 15 per cent of all rugby injuries) involved the knees. Ankle injuries accounted for a further 21 per cent of lower limb injuries during rugby and approximately seven per cent of all rugby injuries. All other injury locations were each involved in less than 10 per cent of lower limb injuries during rugby and less than three per cent of all rugby injuries. Knee injuries also accounted for 20 per cent of WDL due to rugby. Lower leg, foot, and toe injuries each contributed to between four and six per cent of WDL resulting from rugby. Therefore, rugby injuries involving the lower limbs were overwhelmingly concentrated in the knees and ankles (71 per cent), which caused the majority of WDL—consistent with trends in both soccer and touch football.

1.70 Upper limb injuries. An analysis of upper limb injury location shows that shoulders were involved in 58 per cent of rugby injuries involving upper limbs and 18 per cent of all rugby casualties. Injuries to wrists and fingers were each involved in approximately 13–14 per cent of all upper limb injuries during rugby and four per cent of all rugby injuries.

1.71 Mechanism. Figure 1–31 summarises the mechanism group associated with rugby union/league injuries. As one would imagine, two-thirds of rugby injuries involved being hit by moving objects (eg another person). Falls, slips and trips and hitting objects with a part of the body led to 11 and 10 per cent, respectively, of all rugby injuries. Body stressing was a factor in approximately eight per cent of rugby injuries. There was a fairly close association between the percentage of casualties from each injury mechanism group and the resulting percentage of WDL. Being hit by moving objects accounted for 70 per cent of WDL due to rugby. Body stressing was the next highest mechanism group contributing to WDL and accounted for 10 per cent of lost time.

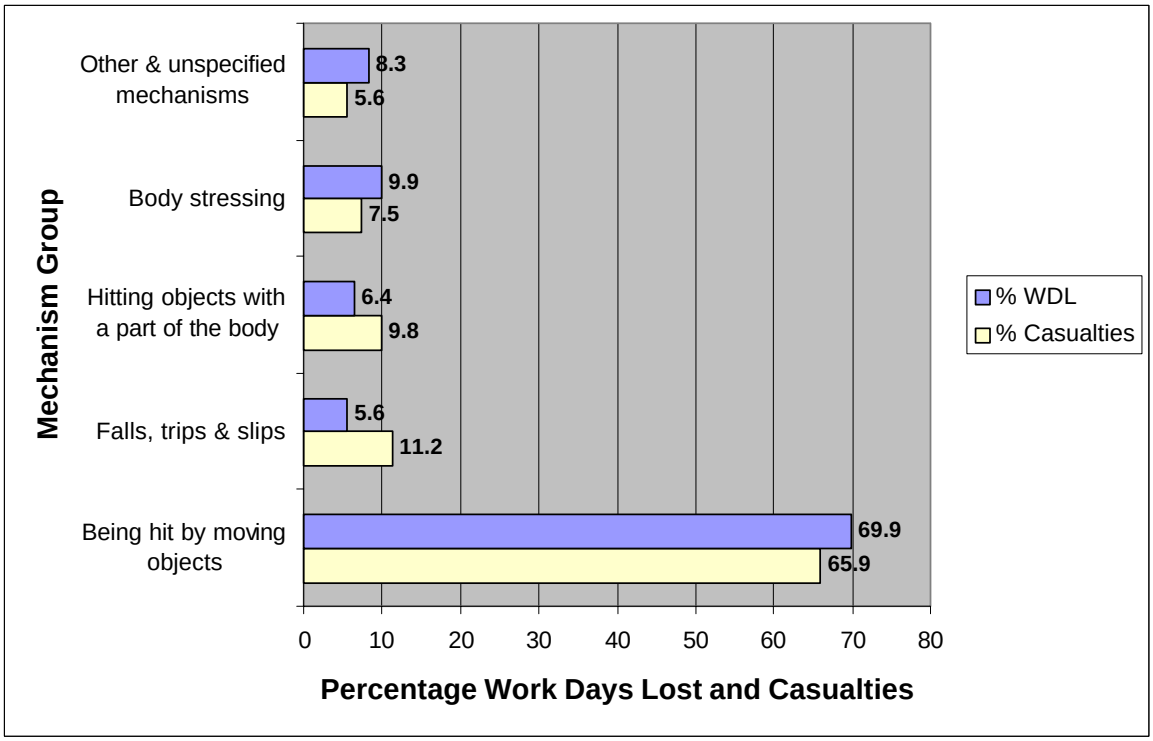

Figure 1–31: Mechanism group associated with rugby union/league injuries

1.72 Agency. The animal, human and biological agency group was by far the leading contributor to rugby casualties (86 per cent). This is not surprising given that the most common mechanism involved in rugby injuries was being hit by another person. Environmental agencies and equipment related issues played a much smaller role than soccer or touch football injuries. The percentage of WDL correlated closely with the percentage of casualties for each agency group.

1.73 Summary. Rugby union/league injuries are most likely to be associated with sprains and strains; fractures; and disorders of muscles, tendons and other soft tissues. Upper limbs and lower limbs are the most likely location of injury, but head and trunk injuries also occur fairly frequently. More specifically, knees, ankles, shoulders and wrists are the body parts most likely to be affected by rugby injuries. Being hit by other moving persons is by far the most frequent mechanism associated with injury.

Running/jogging

1.74 Injury nature—casualties. Running/jogging as a sport and fitness activity was the activity associated with the fifth highest number of working days lost. As depicted in figure 1–32, sprains and strains of joints and adjacent muscles accounted for over half of all running/jogging injuries. Disorders of muscles, tendons, and other soft tissues accounted for a further 17 per cent of casualties associated with running/jogging. In over 11 per cent of reports to DEFCARE, there was insufficient information to determine the specific nature of injury. Running injuries accounted for a total of 186 casualties and 2261 WDL reported to DEFCARE during FY 97/98. Approximately eight per cent of running casualties resulted in fractures. Van Mechelen[2] reported that most running injuries were associated with tendonitis in competitive runners and with strain and tendonitis in joggers.

2 Van Mechelen. Running injuries: A review of the epidemiological literature. Sports Medicine 14 (5): 320–335, 1992.

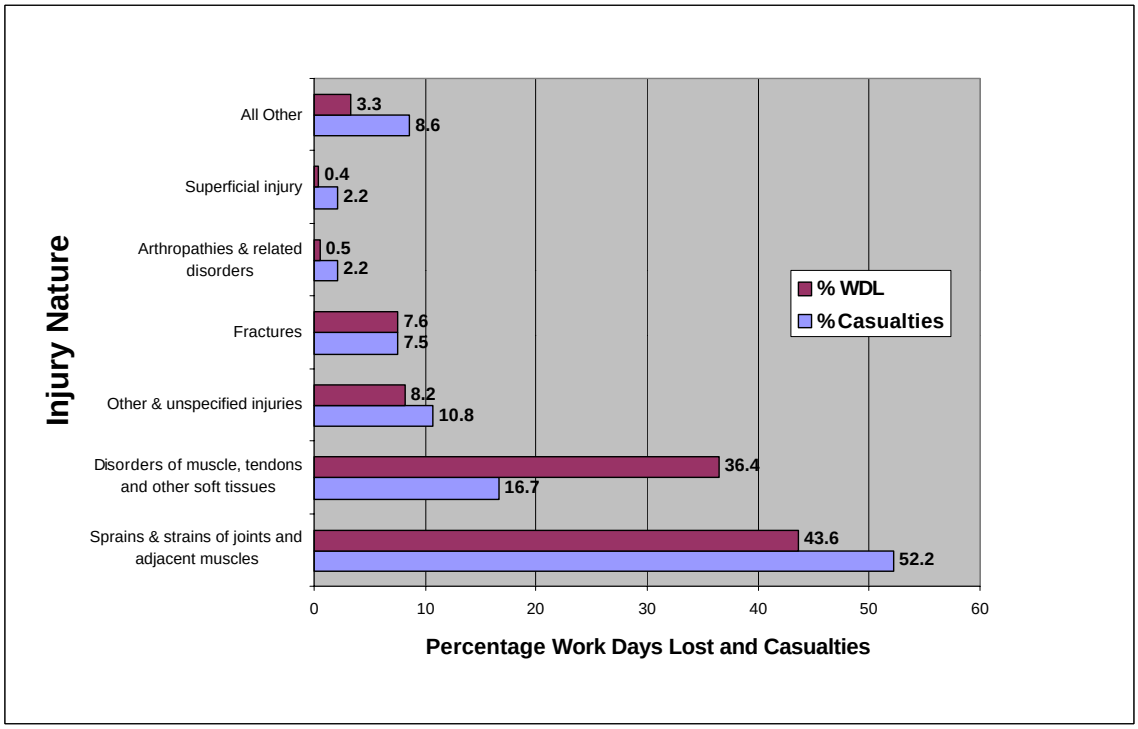

Figure 1–32: Proportion of casualties and working days lost by injury nature for running/jogging injuries

1.75 Injury nature—WDL. The average WDL from all running/jogging injuries was approximately 16 days, over twice the average for all reported injuries of 6.5. Sprains and strains were associated with 44 per cent of WDL. Disorders of muscle, tendons and other soft tissues accounted for 36 per cent of WDL and an average of 27 lost working days. Fractures accounted for approximately eight per cent of WDL.

1.76 Injury location—casualties. As one would imagine, the vast majority of injuries (nearly 80 per cent) from running/jogging occurred to lower limbs. This is not surprising given the nature of the activity. Upper limbs and the trunk were each associated with seven per cent of running/jogging casualties.

1.77 Injury location—WDL. Lower limb injuries accounted for an even higher proportion of WDL associated with running/jogging, constituting 88 per cent of all days lost. No other injury location group accounted for more than seven per cent of WDL.

1.78 Lower limb injuries. A more detailed analysis of lower limb injury location shows that ankle injuries comprised 27 per cent of all running/jogging injuries, as shown in figure 1–33. Injuries to the knee occurred in 19 per cent of all running/jogging casualties, while lower leg and injuries involving multiple lower limb locations each accounted for approximately 11 per cent of all running/jogging casualties. Lower limb injuries involving multiple locations resulted in 36 per cent of the WDL and an average of 41 WDL. Knee and lower leg injuries each accounted for 18 per cent of WDL from running/jogging injuries. While ankle injuries occurred most frequently, they were only associated with 12 per cent of WDL. A comparison to rates from various studies of running injuries reported by Rudzki is provided in table 1–8. ADF personnel during 1997–98 appear to experience a somewhat lower proportion of knee injuries and a higher proportion of ankle injuries compared with the Rudzki study.

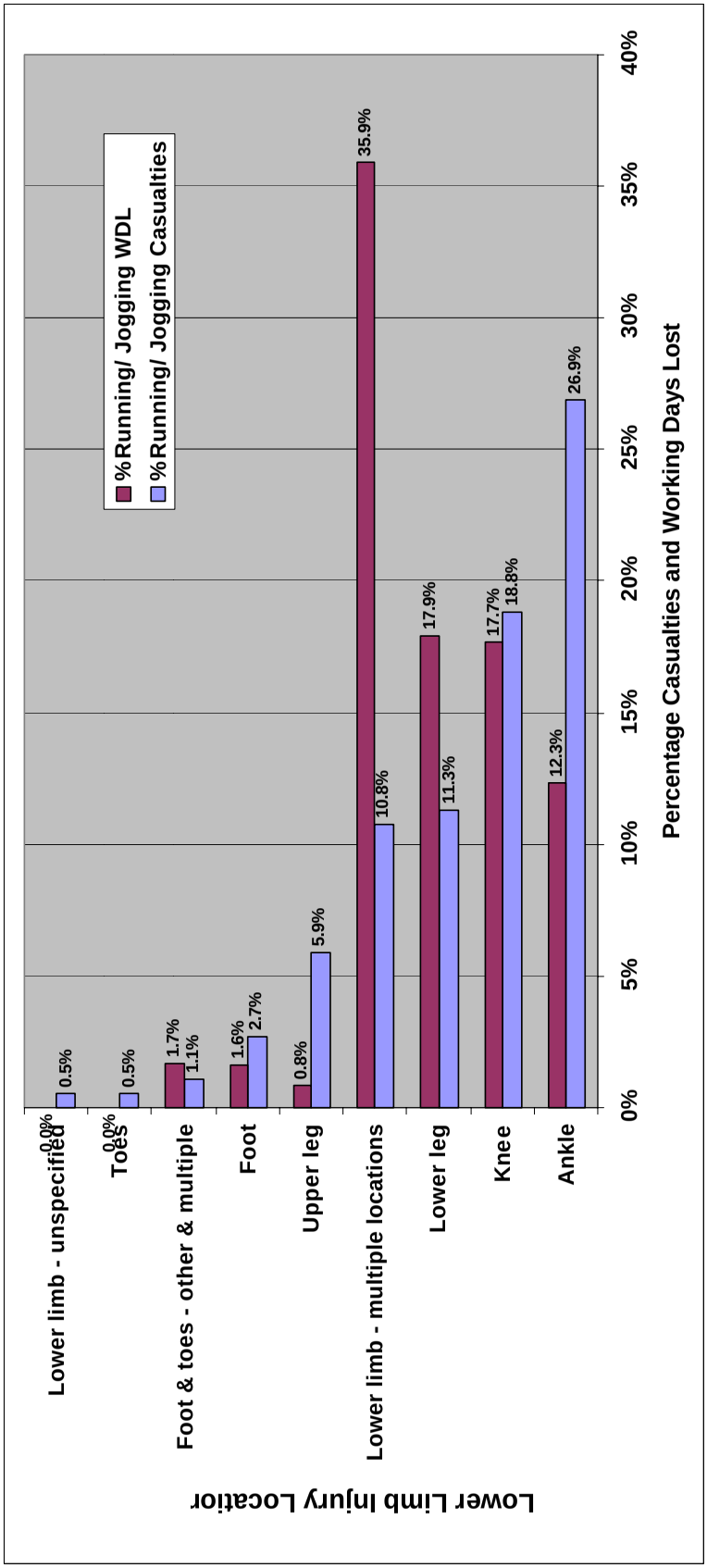

Figure 1–33: Proportion of casualties and working days lost associated with specific location of lower limb injuries for running/jogging

Location	ADF (%)	Rudzki[1] (%)
Knee	18.8	=25
Feet	4.3	2–22
Ankles	26.9	9–20
Lower leg	11.3	2–30
Shin	Included in lower leg	6–31
Upper leg	5.9	3–18
Back	4.3	3–18
Hip/pelvis/groin	0.5	2–11

Table 1–8: Comparison of Australian Defence Force lower limb injuries due to running with other studies

1.79 Mechanism. Figure 1–34 summarises the mechanism group associated with running/jogging injuries related to physical fitness and sport. Falls, trips and slips and body stressing were the most common mechanisms associated with running/jogging injuries, producing 40 per cent and 32 per cent, respectively, of the total casualties. In 20 per cent of the reports to DEFCARE, the mechanism could not be clearly determined. Body stressing accounted for the highest proportion of WDL associated with running/jogging (40 per cent). Falls, slips and trips, the predominant injury mechanism, was associated with 24 per cent of WDL.

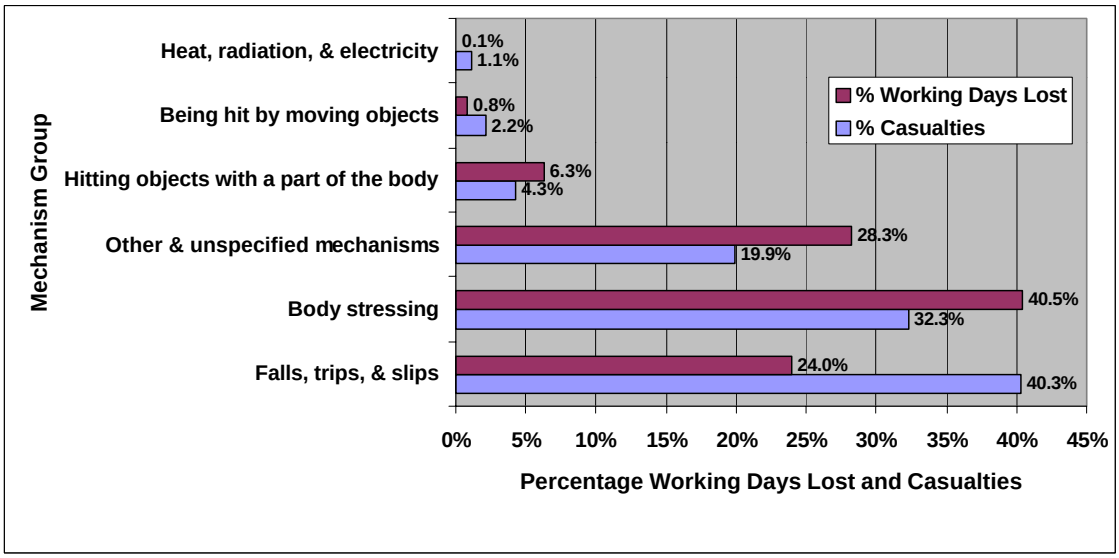

Figure 1–34: Mechanism group associated with running/jogging injuries

1.80 Agency. Figure 1–35 provides a detailed analysis of environmental agencies associated with running/jogging injuries, as environmental agencies contributed to nearly half of all reported casualties. Various conditions related to ground surfaces were most often reported as environmental agencies involved in running/jogging casualties. However, without looking at individual injury reports, it is difficult to determine what role the surfaces played in the injuries. For example, the surface could have been the agency of injury by causing a slip or trip or it could have been the agency in that striking the ground produced the injury. In reviewing the literature, Rudzki concluded that running surface is probably not a risk factor for injury.

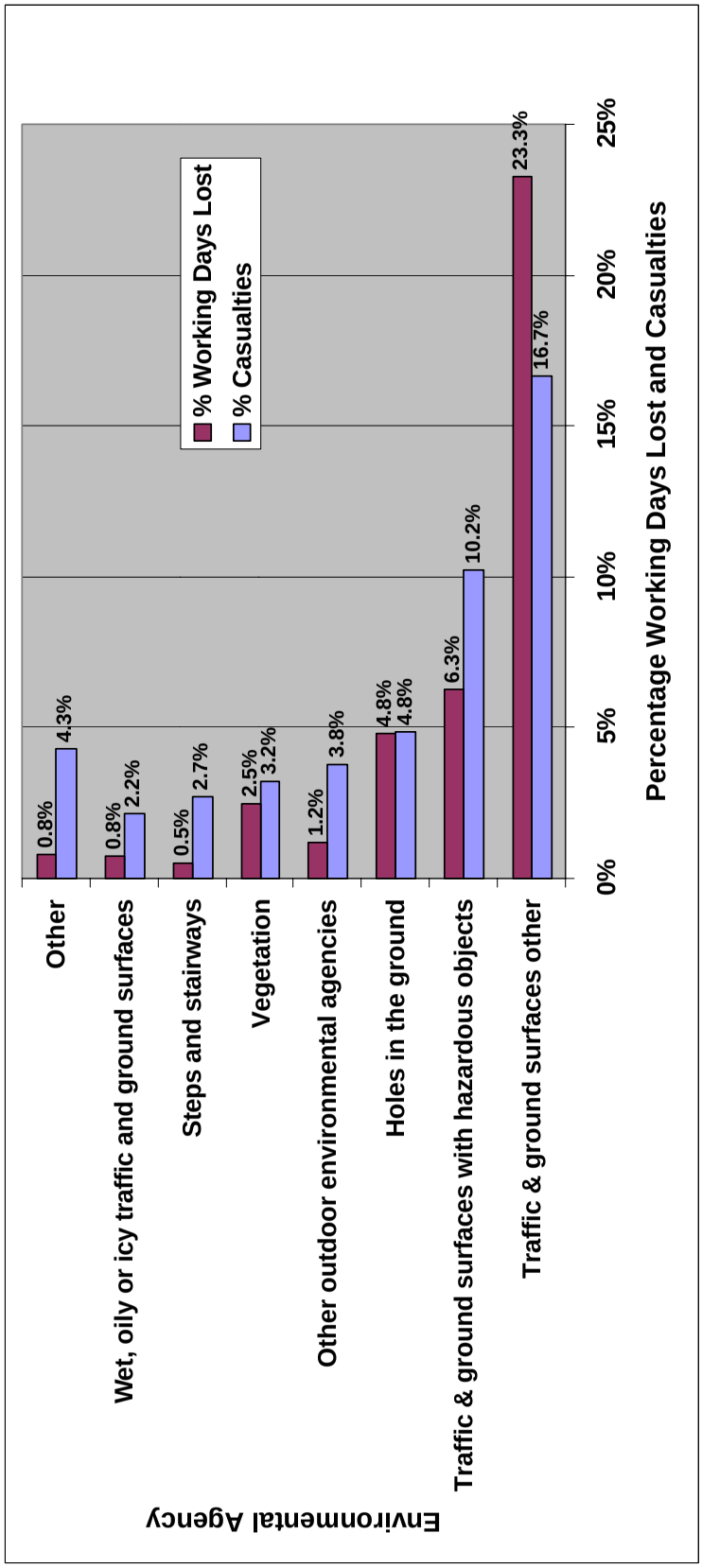

Figure 1–35: Environmental agencies associated with running injuries

1.81 Other factors. Rudzki discussed a number of factors associated with running injuries. In reviewing a number of studies, it was noted that most running injuries were associated with overuse. One study attributed over 75 per cent of injuries to overuse. The following factors were significantly associated with running injuries: previous injury, lack of running experience, running to compete and excessive weekly running distance. All studies found that running distance was the most important factor for injury with increases in running frequency and duration related to increased incidence of injury. A study of United States (US) Army personnel indicated that a substantial amount of additional running gained no significant improvement in two-mile run performance, but resulted in a significantly higher number of injuries[3]. Training errors such as running too often, too fast or too long are major causes of injury, and one study associated training errors with 60 per cent of running injuries.

1.82 Summary. Injuries during running/jogging (physical fitness/sport) are most likely to involve sprains and strains and disorders of muscles, tendons and other soft tissues. Most of these injuries will occur in the lower limbs, particularly in ankles and knees. However, lower leg and multiple location injuries also account for a significant portion of WDL. The mechanism associated with these injuries is most likely to be falls, trips and slips and body stressing. The surface used for running is frequently the agency involved in injuries.

1.83 Conclusions—activities with highest WDL. Injuries occurring during PT or sport most frequently involve lower limbs, particularly ankles and knees. Types of injuries most commonly involve: sprains and strains, disorders of muscles, tendons, and other soft tissues, and fractures. These injuries account for both the highest percentage of casualties and WDL. Touch football, rugby union/league, and physical training also have a large percentage of injuries and WDL due to upper limb injuries—particularly shoulders, fingers, and hands. Common injury mechanisms for all activities were falls, trips, and slips and body stressing, while rugby, touch football, and soccer added the mechanism of being hit by moving objects. The predominant environmental agency affecting casualties and WDL involved poor or inadequate ground surfaces. Injuries incurred during PT, touch football, rugby, soccer, and running accounted for a reported 1330 casualties and 14 600 WDL during FY 97/98 alone. Significantly, over 1000 casualties accounting for an additional 5000 WDL were recorded in an 'Unknown' activity by DEFCARE.

1.84 Recommendations—activities with highest WDL. In order to minimise sport and PT injuries the ADF must address the following issues: adopting world class techniques for physical training and sports training; providing qualified personnel to supervise conditioning and training activities; educating commanders and ADF personnel at all levels on the benefits, risks and risk minimisation strategies associated with sport and PT; and aggressively managing injuries when they occur. Implementation of currently available prevention strategies targeting the factors listed above and further study concerning the causes of PT injuries above should be pursued to improve health, and increase readiness and productivity. In order to carry out best practice training and conditioning programs, qualified supervision must be provided in the form of coaches, trainers, and referees who are properly qualified for their tasks. These resources must be pushed to the lowest unit levels and be readily available in order to develop a prevention, versus a reaction or treatment, culture. Commanders and the soldiers, sailors and airmen in their units must understand the benefits and risks associated with participation in sport and PT, so that they can take every precaution to minimise unnecessary risk. Prevention of injuries and illnesses is not a medical function—it is a command function for which leaders must be held responsible, as it has direct bearing on unit and personnel readiness. Finally, more resources are needed to develop an accurate reporting system that captures injury and illness data across the ADF, is user friendly, and is readily available to commanders at all levels. A section entitled 'Prevention of physical training and sports injuries' is provided at the end of this chapter which provides much more exhaustive recommendations on this subject.

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3 Jones B. et al. Epidemiology of injuries associated with physical training among young men in the Army. Med Sc Sport Ex. Vol 25, No 1, February 1993. Pp 197–203.

PART-TIME PERSONNEL

Individual activities

1.85 Table 1–9 and figure 1–36 depict the activities associated with the greatest number of casualties among part-time ADF personnel whilst on ADF duty. The activity associated with approximately 23 per cent of the casualties was unknown, which is similar to the proportion of unknown activities for full-time forces.

1.86 **Casualties.** Of the known activities, physical training was by far the leading casualty producing activity, similar to full-time forces. PT accounted for approximately one-third of all injuries associated with known activities. Although four sport-related activities (running/jogging, walking, touch football and volleyball) were among the top 15 activities associated with injury, sports injuries were less prominent than among full-time personnel. Three of the top seven activities associated with the most casualties were military training activities (marching, shooting, and weapons familiarisation). Several work-related activities, such as walking, running/jogging, stores handling, equipment maintenance, and vehicle maintenance, were among the fifteen leading casualty producing activities. Driving was also among the leading causes of workplace related injury and illness reported to the DEFCARE system. It is interesting to note that several activities associated in some way with running or walking are among the leading casualty producing activities.

Rank	Activity	No of Casualties	% of Total
1	Physical Training	270	25.3
2	Unknown	244	22.9
3	Walking (non-sport and fitness)	86	8.1
4	Marching	62	5.8
5	Running/jogging (work related)	47	4.4
6	Stores handling	47	4.4
7	Shooting	30	2.8
8	Running/jogging (sport/fitness)	26	2.4
9	Driving	23	2.2
10	Equipment maintenance	21	2.0
11	Vehicle maintenance	19	1.8
12	Walking (sport and fitness)	15	1.4
13	Football, touch	14	1.3
14	Volleyball	12	1.1
15	Weapons Familiarisation	11	1.0

Table 1–9: Activities associated with the highest proportion of injury and illness part-time personnel

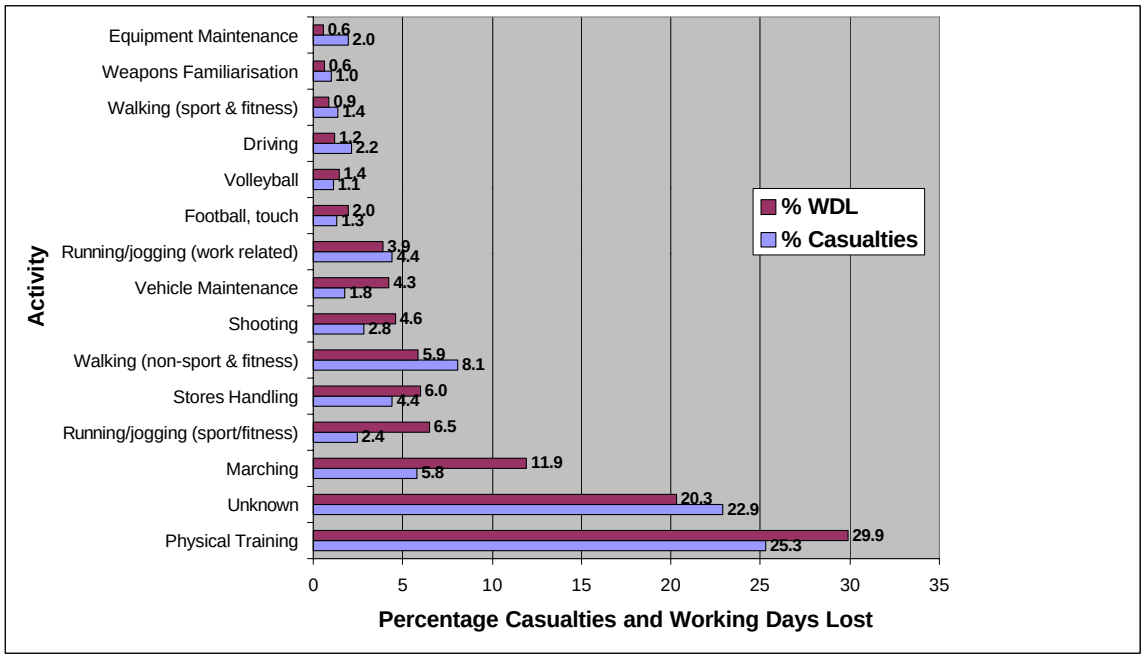

Figure 1–36: Reported activities associated with highest percentage of casualties and working days lost for part-time personnel

1.87 WDL. A total of 2279 working days were reported to DEFCARE in FY 97/98 due to injuries and illness to part-time personnel. Table 1–10 and figure 1–36 depict the activities resulting in the most working days lost (WDL). In terms of overall WDL, physical training is by far the activity of greatest concern and was associated with 30 per cent of WDL for known activities. Marching was the second highest known activity in terms of contribution to WDL and accounted for over 12 per cent of WDL for known activities. Running/jogging (sport/fitness), stores handling and walking (non-sport and fitness), each contributed to 6–7 per cent of WDL. Shooting, vehicle maintenance and running/jogging (work related) each contributed to between 4–5 per cent of WDL. No other activity contributed more than 1.5 per cent to WDL.

Rank	Activity	Hospital (days)	Sick (days)	Light Duty (days)	Total
1	Physical Training	65	111	505	681
2	Unknown	18	213	232	463
3	Marching	2	15	255	272
4	Running/jogging (sport/fitness)	21	43	84	148
5	Stores handling	3	85	49	137
6	Walking (non-sport and fitness)	12	23	99	134
7	Shooting	4	18	83	105
8	Vehicle maintenance	0	2	95	97
9	Running/jogging (work related)	0	34	55	89
10	Football, touch	0	9	36	45

Rank	Activity	Hospital (days)	Sick (days)	Light Duty (days)	Total
11	Volleyball	4	27	2	33
12	Driving	0	12	16	28
13	Walking (sport and fitness)	0	3	17	20
14	Weapons familiarisation	1	3	10	14
15	Equipment maintenance	1	11	1	13

Table 1–10: Activities associated with highest numbers of total working days lost

Activity groupings

1.88 Casualties. When the above activities are grouped into more broadly defined groupings of PT, work related, sports, military training, and motor vehicle, one-third of all casualties from known activities among part-time personnel was related to physical training. Activities related to work and military training accounted for 29 per cent and 21 per cent of casualties, respectively. Sport injuries made up 14 per cent of casualties reported to DEFCARE for part-time personnel. Injuries related to motor vehicles comprised the remaining four per cent of casualties to part-time personnel.

1.89 Part-time versus full-time casualty percentage. A comparison of casualties among part-time personnel to casualties among full-time ADF personnel is provided in figure 1–37. The percentage of physical training injuries and military training injuries was significantly higher for part-time forces. The proportion of sport injuries was much lower for part-time forces as compared to permanent forces. The proportion of injuries where the activity was unknown or related to motor vehicles was approximately the same for part-time and permanent forces.

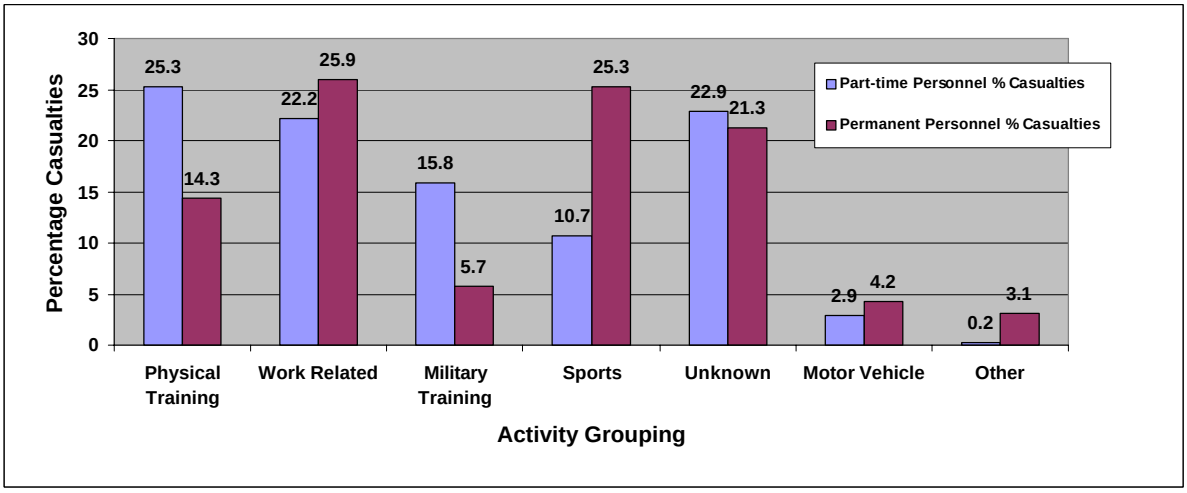

Figure 1–37: Comparison of proportion of casualties by activity group for full-time and part-time personnel

1.90 Part-time versus full-time casualty rate. The overall rate of injuries for part-time forces is approximately three times higher for part-time personnel as compared with full-time personnel when the part-time rate is calculated in terms of full-time equivalents (285/1000/yr versus 91/1000/yr). Table 1–11 below provides a comparison of injury rates for part-time and full-time personnel by activity group. Except for the 'Other' category, the injury rates were higher for part-time personnel for all activity groups. The rates of PT and military training injuries were substantially higher for part-time personnel. It is possible that, as a group, part-time personnel are less involved in physical conditioning when they are not participating in military work and therefore that they are more prone to PT injuries. This could also have an affect on military training injuries given that marching and running/jogging were the military training injuries contributing to the greatest number of injuries among part-time personnel. Injuries related to shooting and weapons familiarisation were more prevalent among part-time personnel, which may be

indicative of training differences. The very nature of working part-time in any workplace, but particularly in the physically challenging environment typical of many military activities, would logically tend to lead to higher injury rates.

Activity Group	Full-time Rate	Part-time Rate[(a)]	Ratio Part-time/Full-time
Physical Training	13	72	5.5
Work Related	24	63	2.6
Military Training	5	45	9.0
Sports	23	30	1.3
Unknown	19	65	3.4
Motor Vehicle	4	8	2.0
Other	3	0.5	0.2
Overall	91	285	3.1

Note

(a) Rates calculated based on full-time equivalents.

Table 1–11: Comparison of injury rates by activity group for full-time and part-time forces

1.91 **Summary.** Even the relatively cursory analysis provided indicates that injuries to part-time personnel are significant. While there are similarities with injury patterns observed in full-time personnel, there are distinct differences as well. Therefore, while some injury prevention initiatives and recommendations applied to full-time personnel will likely also benefit part-time personnel, there appear to be differences which warrant particular focus on the unique nature of risks faced by part-time forces. Because of the heavy reliance on part-time forces by the ADF, further study should be undertaken immediately to gather additional information concerning injury and illness affecting part-time forces and tailor specific prevention measures to meet their unique needs.

WORKERS COMPENSATION CLAIMS

Overview

1.92 The Military Compensation and Rehabilitation Service (MCRS) provides worker's compensation and rehabilitation services, in accordance with Commonwealth legislation, to members and ex-members of the ADF. In addition, MCRS works with the ADF to minimise the human and financial cost of work-related injuries, and supports members to obtain their full and just entitlements. Workers' compensation has been available in the ADF since 1949. Up to 1994, MCRS only covered peacetime service and did not cover operational service. A change in the legislation occurred on 07 April 1994 and operational service is now also covered by MCRS.

1.93 Compensation claims provide an indication of workplace injuries and illnesses, which are more severe.

Total claims received and accepted

1.94 Figure 1–38 depicts the total number of new workers' compensation claims accepted over the past six years. In FY 97/98, 4980 claims (79 per cent of claims submitted) were accepted. Over the eight year period from FY 90/91 to FY 97/98 the number of new claims received almost doubled. The percentage growth in claims was particularly large from FY 92/93 to FY 93/94 when a 28 per cent increase occurred. One possible explanation for this is anticipation of new legislation, which led to more people filing before the new legislation was passed. The increase from FY 93/94 to FY 94/95 was also quite large, 17 per cent. This can possibly be attributed to the 'Just in Case' advertising and awareness campaign lifting the awareness of the availability of benefits from MCRS. Since FY 94/95, the number of new claims submitted has remained relatively constant. These two examples point out the importance of looking at underlying causes when assessing changes in reporting of various statistics.

1.95 Influencing factors. Greater than half of claims are received from members who are about to be or are already discharged. Furthermore the average time lag from when a compensable injury occurs to when a claim is submitted averages ten years in the ADF (also about the average time personnel stay in the military) compared to one month on average in the civilian sector. Potential cultural reasons for this discrepancy include impact on careers, promotion, and possible discharge. These factors make it inherently difficult to use compensation statistics as a tool to measure success in implementation of preventive interventions and policies for the ADF.

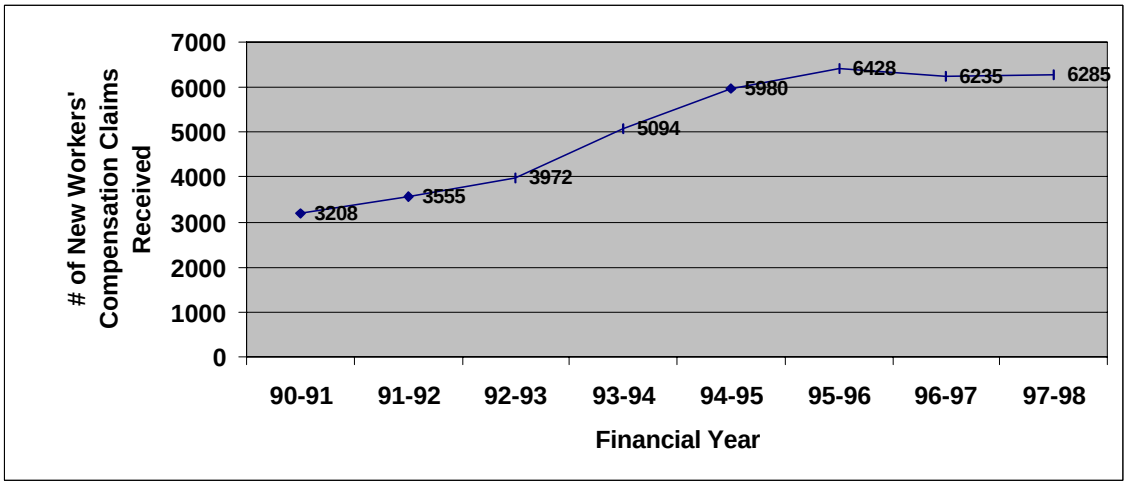

Figure 1–38: Workers' compensation claims received by the Australian Defence Force from 1990–91 to 1997–98

Claims by injury location

1.96 Tables 1–12 and 1–13 provide a summary of claims submitted to MCRS by location of injury over the past several years. Knee injuries and leg (other than knee) injuries were the leading causes of compensation claims, each accounting for 19 per cent of compensation claims. Back injuries and arm injuries accounted for 15 per cent and 13 per cent, respectively, of compensation claims. Ears/hearing accounted for seven per cent of compensation claims.

Condition Claimed	92–93	93–94	94–95	95–96	96–97	Avg.
Knee	648	909	1121	1303	1218	1040
Leg (not knee)	498	830	1098	1299	1279	1001
Back (not neck)	554	754	826	980	889	801
Arm	437	602	738	808	891	695
Other (specified)	433	578	640	726	945	664
Ears/Hearing	316	338	420	387	413	375
Head	122	157	173	200	170	164
Neck	91	126	150	210	154	146
Multiple Injuries	136	128	133	139	183	144
Stress	66	92	136	179	136	122
Respiratory	111	111	118	81	88	102
Eyes/Sight	85	93	106	112	88	97

Table 1–12: Claims for compensation by injury location

1.97 Injury location and compensation claims. Table 1–13 also provides a comparison of the injury location associated with compensation claims from 1992–97 to the injury location for casualties reported to the DEFCARE system in FY 97/98. Given that the most recent data for compensation claims (1997–98) does not vary significantly from the overall average for percentage of compensation claims from 1992–97, it may be reasonable and instructive to compare the numbers to see if there is any correlation.

Injury Location	% of Compensation Claims (92–97)	% of Casualties (97–98)[(a)]	% of WDL (97–98)[(a)]
Knee	19.4	10.0	21.9
Leg (not knee)	18.7	21.5	28.2
Back (not neck)	15.0	9.5	12.1
Arm	13.0	21.7	20.1
Other (specified)	12.4	15.6	8.3
Ears/hearing	7.0	0.9	0.2
Head	3.1	6.8	2.1
Neck	2.7	2.3	2.3
Multiple Injuries	2.7	4.7	3.4
Stress	2.3	0.5	0.5
Respiratory	1.9	2.8	0.3
Eyes/sight	1.8	3.7	0.6

Note

(a) Numbers are for permanent forces only.

Table 1–13: Comparison of location of injuries reported to DEFCARE and workers' compensation claims

1.98 Compensation claims and WDL. The proportion of compensation claims and WDL is quite similar for knee injuries and almost twice the proportion of casualties. The proportion of compensation claims seems to correspond fairly closely with either the percentage of casualties or the percentage of WDL for most injury locations. Back injuries make up a higher proportion of compensation claims than of casualties or WDL, which is not surprising given that back injuries can be particularly debilitating. Conversely, arm injuries make up a lower proportion of compensation claims than of casualties and WDL. Again, this is not surprising since recovery from arm injuries is more likely to be complete and faster than back injuries. It is also not surprising that ear injuries/hearing loss make up a higher percentage of compensation claims, since much hearing loss is probably due to repetitive exposure over time rather than specific incidents that are likely to be reported to DEFCARE. However, in most cases the condition associated with compensation claims is similar to that associated with casualties and WDL reported to DEFCARE. Thus, injury prevention strategies that focus on the leading causes of casualties and injury locations will also likely decrease the number of compensable injuries.

Rates of compensation claims

1.99 Figures 1–39, 1–40 and 1–41 depict compensation claims in terms of the rate of claims per 1000 full-time equivalent personnel per year. The rates in figure 1–39 were calculated using claims information provided in the *COMCARE Annual Report 1997–98*. The total claims numbers reported in the Annual Report differ somewhat from the sum of numbers provided by MCRS by bodily location; however, the difference is not large and the trends are essentially the same. Figure 1–39 indicates that the overall rate of compensation claims has increased by 78 per cent over the past six years. However, the steep and almost linear increase in claims from FY 92/93 to FY 95/96 levelled off considerably the following year and the rate has been relatively constant for the past three years. The average rate over the five-year period was 92 claims per thousand personnel per year. The rate for FY 97/98 corresponds to over 10 per cent of the full-time equivalent personnel submitting a compensation claim during the year;

however, as was noted earlier, there is often a substantial time lag between when an injury occurs and when a claim is submitted. In addition, when annual cost data are compared to the claims rates on the same scale, the increase in the annual cost due to compensation claims appears to be increasing at a much more rapid rate than the increase in the rate claims are filed. Rates are shown for injury locations in figures 1–40 and 1–41 to provide a baseline, which can be more accurately compared from year to year than in comparing the absolute number of claims received. Figure 1–40 shows dramatic increases (greater than 100 per cent) in compensation claim rates for knees, leg, back, and arm injury locations over the last five years, whereas figure 1–41 shows that claim rates for other bodily locations are much lower and have increased more modestly over the last five years.

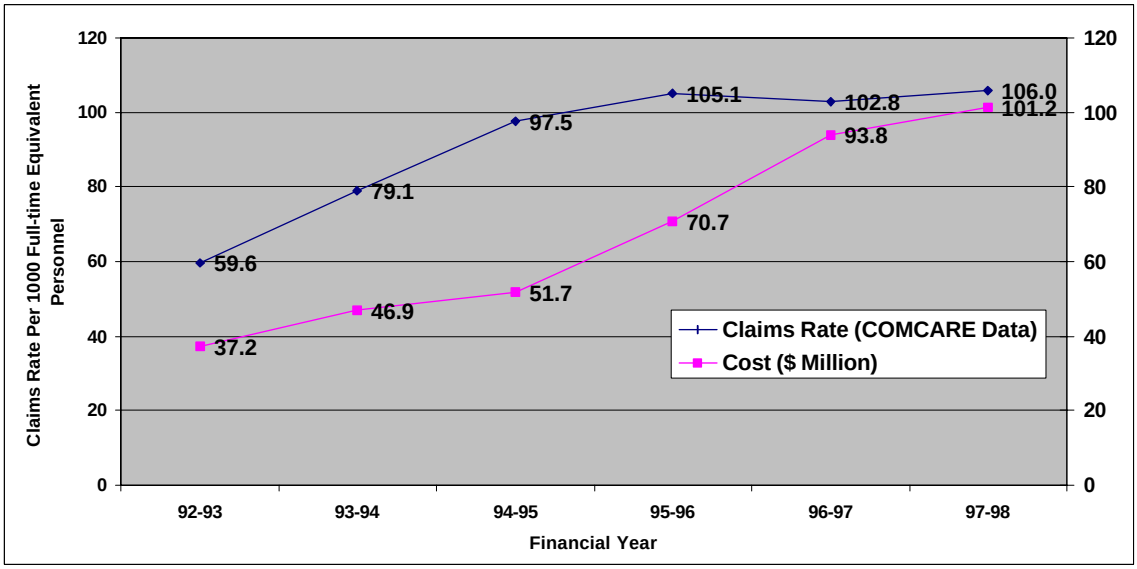

Figure 1–39: Trends in overall compensation claim rates

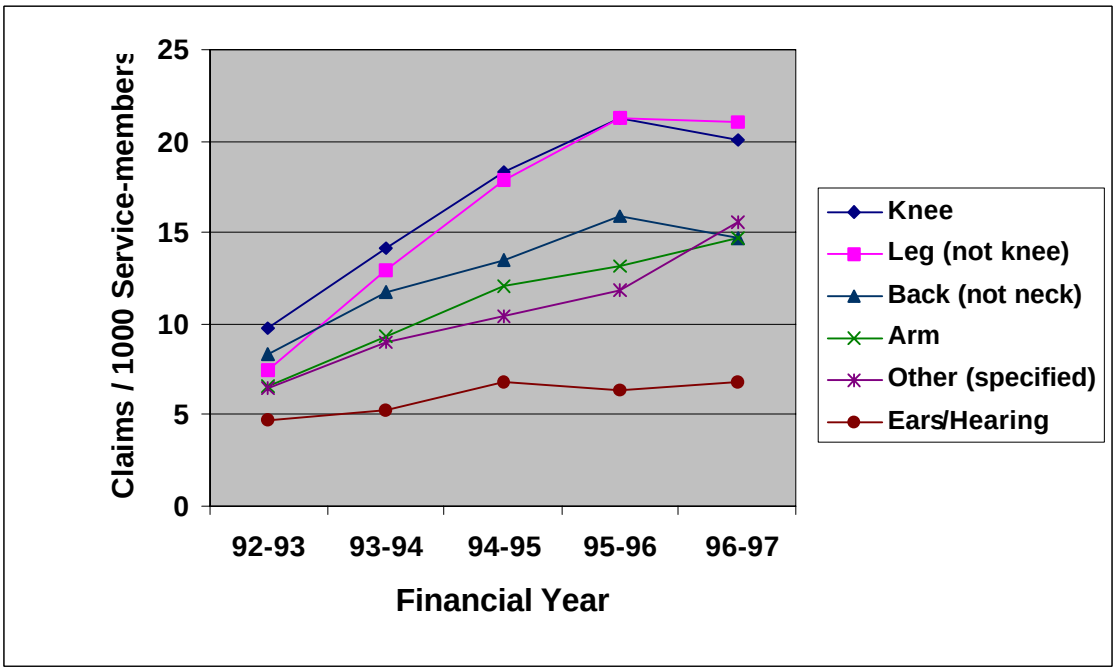

Figure 1–40: Trends in compensation claim rates for bodily locations with highest number of claims

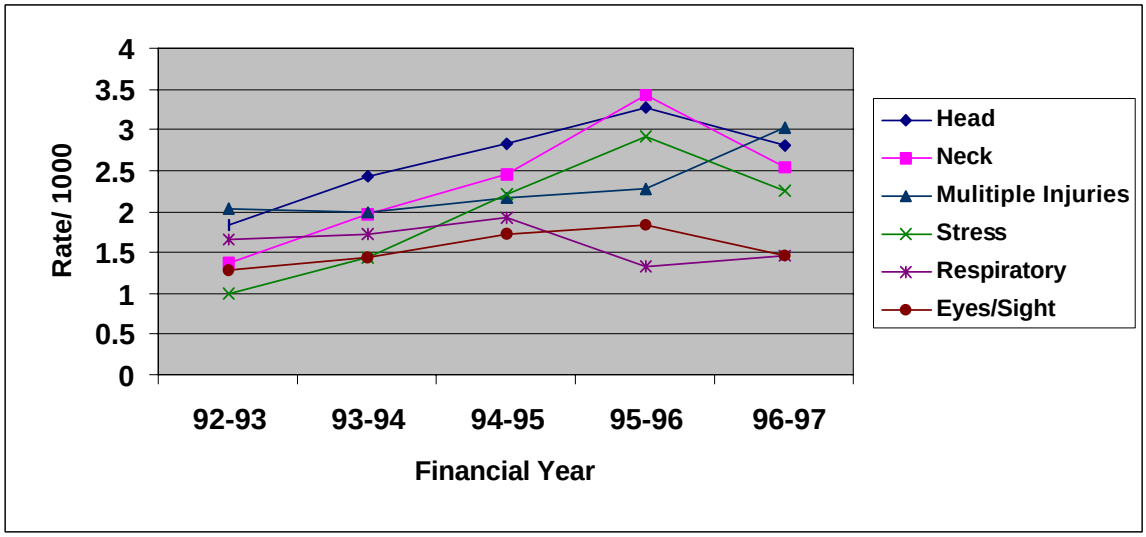

Figure 1–41: Trends in compensation claims for other bodily locations

Cost of workers' compensation and rehabilitation

1.100 Overall costs. The cost of military workers' compensation benefits was $101.23 million in FY 97/98. An additional estimated $9.97 million was spent on administrative costs. Figure 1–39 depicts the change in workers' compensation benefit expenditures over time based on data from the *COMCARE Annual Report 1997–98*. Over the seven year period from FY 91/92 to FY 97/98, workers' compensation benefits expenditures nearly tripled. The percentage annual increase was over 30 per cent from FY 94/95 to FY 95/96 and from FY 95/96 to FY 96/97. However, the percentage increase was eight per cent from FY 96/97 to FY 97/98, the lowest annual increase since FY 92/93. Figure 1–42 provides a breakdown of the proportion of cost attributable to various benefits. Incapacity payments made up over one-third of the workers' compensation costs in FY 97/98. Permanent impairment and non-economic loss payments each accounted for over 20 per cent of benefits costs. Medical payments and other payments each accounted for approximately nine per cent of total benefits costs.

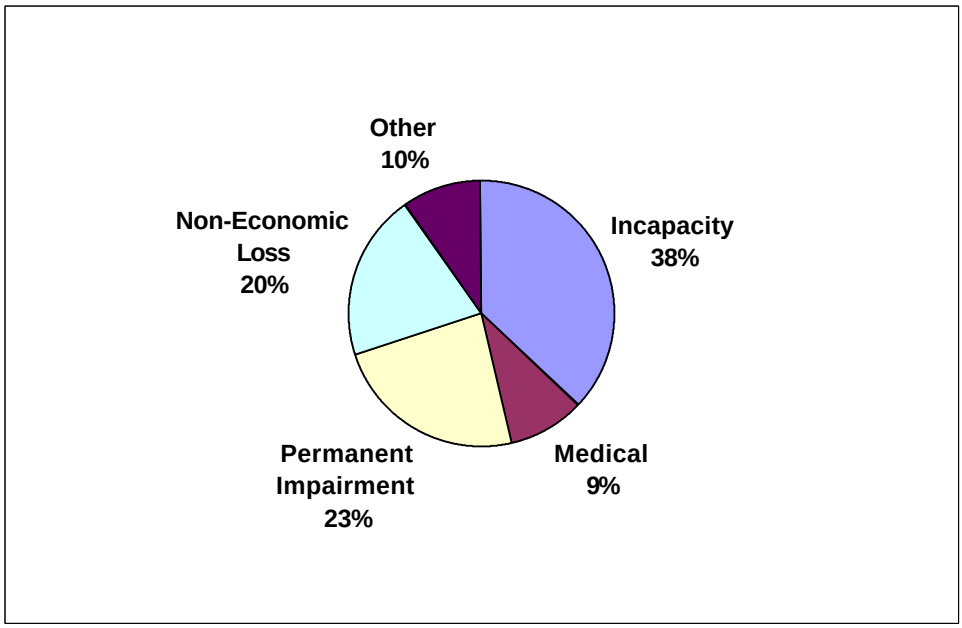

Figure 1–42: Major areas of Australian Defence Force workers' compensation expenditure

1.101 Outstanding liability. As noted in the *COMCARE Annual Report 1997–98*, there is usually a lag between acceptance of initial liability and the lodging of claims for supplementary benefits, such as permanent impairment. The Australian Government Actuary Investigation into the Military Compensation Scheme[4] determined the value of outstanding claims liability. Outstanding claims liability represents the estimated present value, as at 30 June 1997, of future claim payments to be made in respect of injuries sustained prior to 30 June 1997. The overall outstanding liability estimate for non-incapacity payments is $328.2 million. A analysis of outstanding liability percentage by injury nature group is presented in Figure 1–43. Back injuries make up the largest proportion of outstanding liability (30 per cent) followed by knee injuries (19 per cent) and other lower limb injuries (12 per cent).

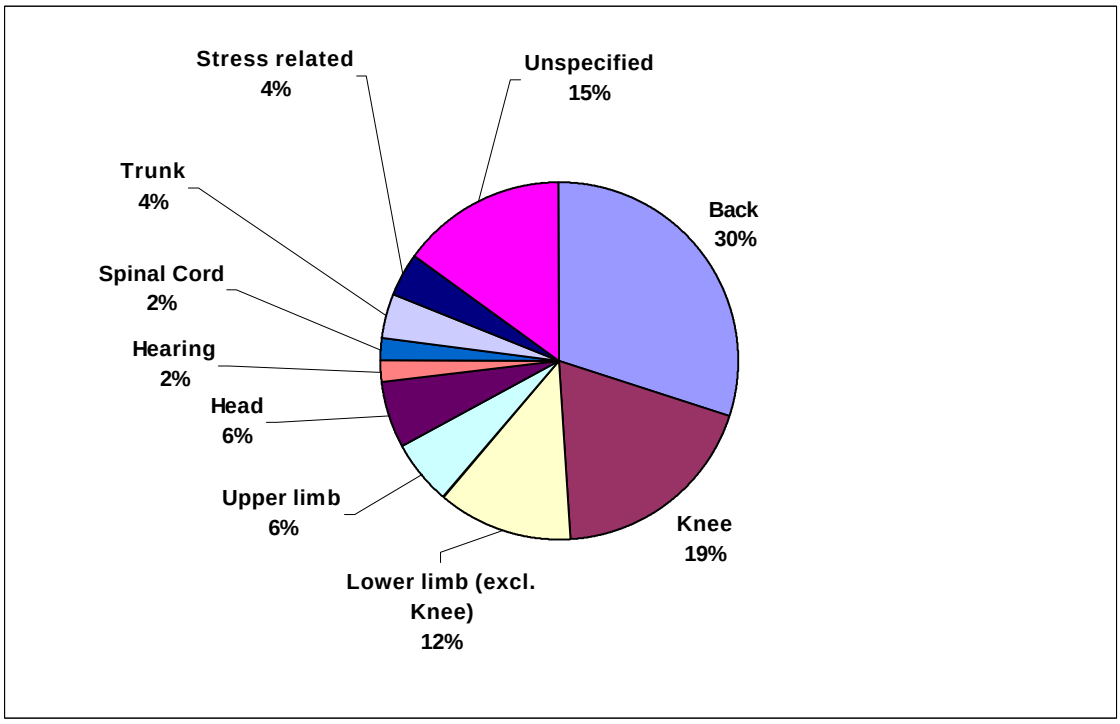

Figure 1–43: Outstanding workers' compensation liability by injury nature group

1.102 Costs by Service. Table 1–14 provides a breakdown of compensation and rehabilitation costs for each of the Services and figure 1–44 depicts the average percentage of cost over the period FY 91/92 to FY 97/98 attributable to each Service. The Army accounts for 71 per cent of the costs associated with workers' compensation benefits. Although the Army is the largest Service, this figure is well above the percentage of the current full-time force made up of Army personnel (45 per cent). Conversely, the Air Force and Navy, which comprise 29 per cent and 26 per cent, respectively, of the current full-time force, contributed to only 14 per cent and 15 per cent of benefit costs. Although the Army makes up 60 per cent of the total force (full-time and part-time), the relative contribution of the Army still appears to be quite high. As discussed earlier, the DEFCARE data also indicated that Army Program experienced proportionately higher number of reported injuries and illnesses. It could be that the nature of work activities conducted by Army personnel are inherently more likely to produce injuries. However, it does indicate that preventive interventions that focus on the Army are likely to have the biggest payback in terms of reduced compensation costs.

4 Australian Government Actuary Investigation, September 1997.

FY	Navy	Army	Air Force	Total
91–92	4.917	22.911	6.639	34.467
92–93	7.186	24.242	5.748	37.176
93–94	7.903	32.555	6.424	46.882
94–95	7.647	37.119	6.927	51.693
95–96	9.949	51.946	8.819	70.715
96–97	13.571	66.816	11.921	92.309
97–98	15.469	71.728	14.033	101.230

Table 1–14: Military compensation and rehabilitation costs ($m) by Service

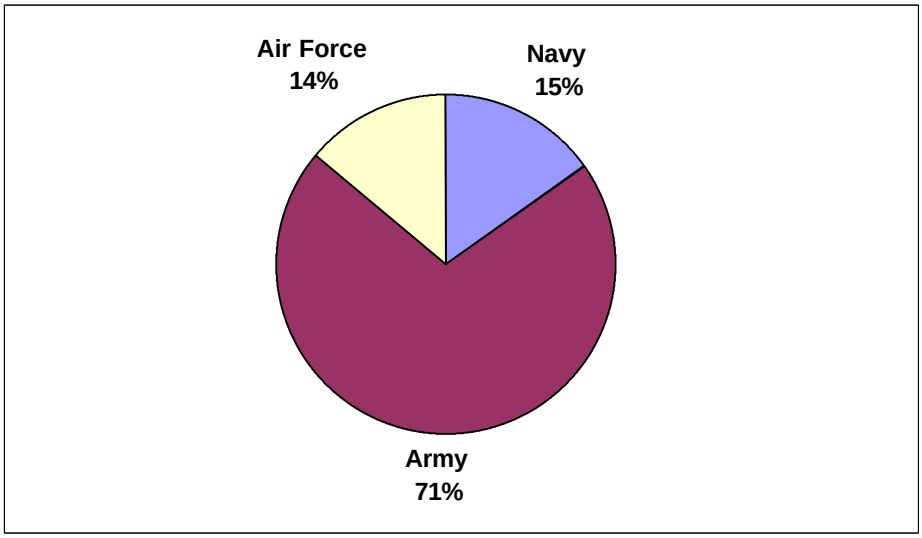

Figure 1–44: Average proportion of compensation and rehabilitation costs by Service for FY 92/93 to FY 97/98

COMPARISON TO RELEVANT BENCHMARKS

Australia's health

1.103 Injury is a significant cause of mortality and morbidity in Australia. According to the Australian Institute of Health and Welfare (AIHW)[5] there were over half a million hospital admissions in 1995–96 due to injury and poisoning. The hospital separation rate for injury and poisoning in the total population was 2078 separations per 100 000 population in 1995–96, which was an increase of over 21 per cent over the rate from 1991–92. In 1995–96 over 11 per cent of those admitted aged between one and 44 years had a primary diagnosis of injury or poisoning. Injury prevention and control is one of Australia's five national health priority areas. Australia's Health focuses on major causes of mortality due to injuries and hospitalisation due to specific types of injuries (eg those related to firearms, child injury, etc); therefore, it provides data with limited usefulness for comparison to data presented in this section of the report. Comparisons to injury mortality data will be covered in the portion of this report focusing specifically on mortality.

5 *Australia's Health 1998*, AIHW.

Other occupations in Australia

1.104 Figure 1–45 depicts incidence rates for worker's compensation claims for selected industries obtained from Compendium of Workers' Compensation Statistics 1995–1996. Incidence rates are calculated by dividing the number of occupational injuries and diseases reported in a year by the number of thousands of wage and salary earners (full-time and part-time). Using the total number of personnel covered by MCRS as the denominator, the incidence rate for the ADF in FY 97/98 was 44.2. This is over 70 per cent higher than the all industries average rate and the rate for Government Administration and Defence (excluding the military). Only two industries had a higher incidence rate of compensation, mining (54 per cent) and manufacturing (46.8 per cent). Royal Military College/Australian Defence Force Academy cadets average only about 50 claims per year total. When they are excluded from the calculation, the incidence rate for the ADF would be approximately 59.8, which is higher than any industry group. Even this figure may be somewhat deceptively low given that 34 per cent of the workforce in the ADF is part-time and it is doubtful whether other industries would have such a high rate of part-time personnel. On the other hand, only claims resulting in a fatality, permanent disability, or temporary disability resulting in an absence from work of five working days or more are reported as part of the National Data Set for Workers' Compensation Statistics in Australia. The ADF uses no such limitation in reporting. Foley mentioned that analysis of data available from a number of compensation jurisdictions indicated that occurrences of less than five days duration, on average, represent 46 per cent of all new claims lodged annually[6]. Thus, it is difficult to make a direct comparison between workers' compensation rates in the ADF and in other industries/businesses in Australia because of the differences in reporting and criteria.

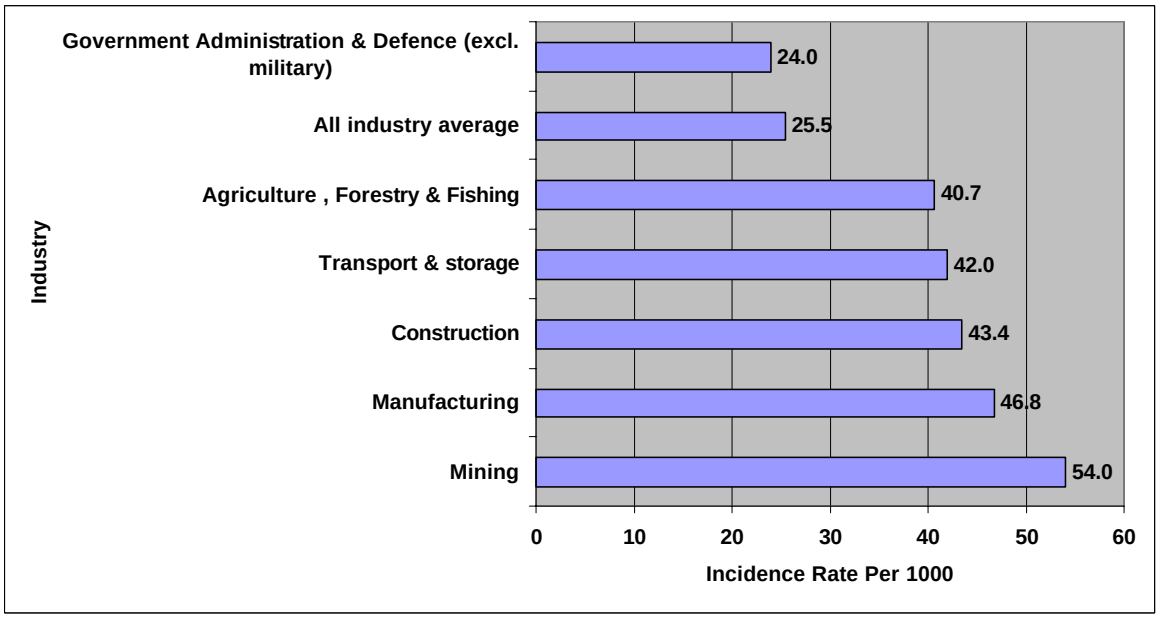

Figure 1–45: Incidence rates for workers' compensation claims for selected industries

1.105 The average rate of claims received in the ADF for the six year period from FY 92/93 to FY 97/98 was 91.7 claims received per 1000 full-time equivalent personnel per year. The rate of claims accepted for the ADF in FY 97/98 was 83.6 per 1000 full-time equivalent personnel per year. However, the Compendium of Worker's Compensation Statistics only includes claims which resulted in a fatality, permanent disability or temporary disability resulting in an absence from work of five working days or more. It is conceivable that some claims submitted to MCRS resulted in less than five working days lost, which would make the MCRS rate proportionately lower. It would seem useful for the COMCARE Annual Reports to also report data in a way that would allow more direct comparison and benchmarking against civilian industry groups. However, the long lag time between military injuries and claims will make this more difficult.

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6 G. Foley, The Role of Workers' Compensation-Based Data in the Development of Effective Occupational Health and Safety Interventions, Commonwealth of Australia, 1996.

1.106 It would be most beneficial for the COMCARE report to indicate rates for each of the sub-populations mentioned above. However, in the absence of figures for each sub-population, it would seem that also reporting rates in terms of full-time equivalent personnel would perhaps give a more realistic figure for comparison purposes. According to the *COMCARE Annual Report*, the average COMCARE rate was 45.6 claims per 1000 employees per year. Other comparison rates provided in the COMCARE report are shown in table 1–15.

Entity	Number of Employees Covered	Number of Claims Received per 1000 employees	Number of Claims Accepted per 1000 employees
Australia Post	33 761	137.3	115.8
ADI Limited	3500	78.6	68.9
ADF[(a)]	112 184	56.0	44.2
COMCARE[(b)]	173 977	51.9	45.6
Reserve Bank of Australia	1232	27.0	24.0
Telstra	59 201	72.2	73.6

Notes

(a) Rate calculated by dividing by total population covered by MCRS.

(b) Includes ACT Public Service and Commonwealth employees.

Table 1–15: Jurisdictional compensation claim statistics

Frequency of compensation claims

1.107 The frequency rate of occupational injuries and diseases is calculated by dividing the number of compensation claims for injuries and diseases by the number of millions of hours worked. No data on frequency was provided in the *COMCARE Annual Report*. The frequency rate for ADF personnel was estimated as 47.7 assuming each full-time equivalent worked eight hours per day. The frequency rates for various industries from the Compendium of Workers' Compensation Statistics 1995–1996 are depicted in figure 1–46. The estimated frequency rate for the ADF was almost twice the rate for mining, the industry with the highest reported frequency. Even if the estimated numbers of hours exposed was determined by assuming an average 10 hour day, the frequency rate is still extremely high (38.2).

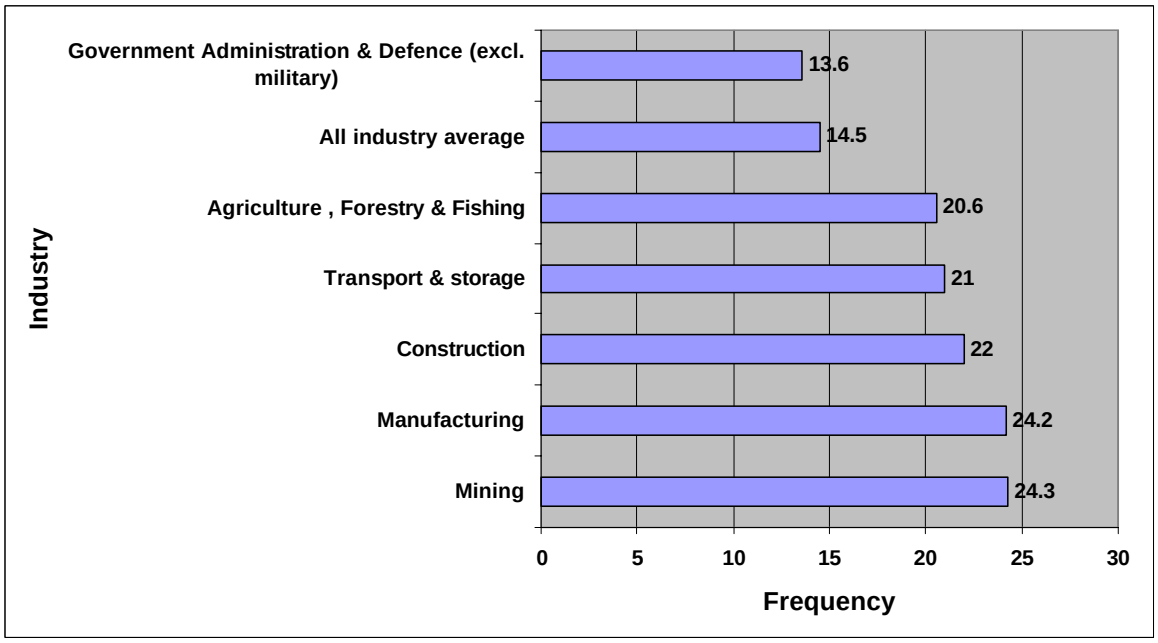

Figure 1–46: Frequency rates for workers' compensation claims for selected industries

DEVELOPING A SAFETY CULTURE IN THE AUSTRALIAN DEFENCE FORCE

Introduction

1.108 In his inaugural speech as Chief of the Defence Force, Admiral Barrie said, 'I want our safety record in peacetime to reflect the awesome responsibilities we exercise in wartime and stand second to none in our community.' The Australian National Audit Office (ANAO) Performance Audit of the ADF Health Services released in May 1997 made the following recommendations regarding Occupational Health and Safety (OHS):

a. 15.a. Give greater attention to epidemiological research into injuries and illnesses;

b. 15.b. Develop both short and long term strategies aimed at reducing the level of injuries and illnesses; and

c. 15.c. Identify all costs associated with compensable injuries and illness in the ADF, and put in place arrangements for these to be the budget responsibility of the relevant sub program managers

Progress made

1.109 With regard to the first recommendation, progress has been made in developing and fielding the DEFCARE database, which is certainly a tool that has some utility for epidemiological research as demonstrated to some extent in this report. However, a framework for epidemiological research into injuries and illnesses has not been adequately developed. Indeed the ADF does not currently have an epidemiological research capability at the present time. Data must not only be collected, but analysed to determine what aspects of injury prevention and control require attention.

1.110 The second recommendation obviously relates to the first. The purpose of epidemiological research into injuries and illnesses is to prevent them or minimise their impact. For the most part it does not appear that the ADF is using data on injuries and illness to develop short and long-term strategies for injury prevention.

1.111 While some progress has been made in developing a compensation module for DEFCARE, other costs associated with injuries and illnesses, such as disability pensions and Department of Veterans' Affairs compensation claims, are not routinely captured in a way that allows a full and detailed analysis of all costs. Furthermore, these costs are not born by the program and sub-program which gives less incentive for management to be truly interested in the tangible importance of reducing injuries and illness because the costs associated with treatment, rehabilitation, and compensation are truly transparent.

STRATEGIES FOR MINIMISING PREVENTABLE INJURIES AND ILLNESSES

Introduction

1.112 Based on the information presented above, there is every reason to believe that most of the workplace injuries experienced by ADF personnel are preventable. In addition, the foregoing discussion and other data presented in this report make it clear that the ADF does not currently have effective strategies for minimising preventable injuries in place. Physical training and sports injuries result in the greatest cost in terms of readiness, personnel unavailable for duty, and monetary expenditure for treatment, rehabilitation and compensation. Therefore, these types of injuries should receive primary attention for prevention policies and programs. Military training and work-related injuries also play a significant role and the data presented in this report provides indications as to what types of activities should be targeted for prevention efforts.

Prevention of physical training and sports injuries

1.113 Physical training and sport activities are important contributors to providing a fit and healthy Force. Benefits which may be derived from physical training and participation in sport include: increased endurance, strength, and agility; increased resistance to disease; teamwork; espirit de corps; stress reduction and mental health; and weight loss or maintenance. Based on these benefits, PT and sport participation should be highly encouraged for all ADF personnel. However, as demonstrated in this report, these same activities can result in injuries, which can substantially degrade the personnel component of ADF capability as well as the expenditure of large amounts of money for treatment, rehabilitation and compensation. Thus, the key is to find ways to conduct physical training and sports activities in a way that maximises the gains and minimises the attendant risks. Table 1–16 provides a summary of common risk factors associated with sports and physical training injuries. Intrinsic risk factors are those associated with the individual, while extrinsic risk factors deal with factors outside the individual, but which are associated with the activity itself. Effective injury prevention strategies must begin with an understanding of these risk factors and ways to minimise risk associated with each.

Common Intrinsic Factors	Common Extrinsic Factors
Overuse	Training errors
Alignment abnormalities	Environmental malconditions
Muscle weakness and imbalance	Poor equipment
Increased flexibility/joint laxity	Fouls and illegal play
Body composition	
Predisposing diseases	

Table 1–16: Risk factors associated with sports and physical training injuries

1.114 Based on questionnaires filled out by coaches, administrators and medical staff, the mean estimate is that 30–50 per cent of sports injuries were regarded as realistically preventable. This estimate differs across sports and levels of competition. For example, it was thought that only 5–10 per cent of injuries in professional rugby or Australian rules football may be preventable, while in lower grades this could be as high as 60–70 per cent[1]. A 1988 Australian Sports Medicine Federation (ASMF) study estimated the cause of sport injuries could be attributed to: human error (54 per cent), terrain (31 per cent), and equipment (15 per cent). Rudzki concluded that the two main areas of manipulation in injury prevention are education and environment. It was estimated that 20 per cent of total sport injuries could be prevented by education and 17 per cent by modifying the environment. Given the importance of education, the people considered most important to preventing injuries were coaches

and trainers. Coaches and fitness trainers are generally expected to have obtained some form of sports related qualification or accreditation. The overwhelming majority of experts interviewed by Egger rated education, particularly of coaches and trainers, as having a major role in contributing to injury prevention. Egger also estimated that $100 million could be saved over three years, for an investment of $300 000 towards educating coaches and trainers.[7]

1.115 The ASMF study authors included several recommendations cited by Rudzki including improved surveillance (national baseline sports injury survey and development of a blueprint for data collection), education (subsidised coach and trainer education and qualification courses stressing injury prevention), and structural/environmental change (changing rules where potentially viewed as beneficial). In terms of injury surveillance, the data currently captured in the DEFCARE database does not appear to be adequate to determine the true cause of injuries, which would then assist in developing interventions. Given the prominence of sports injuries in the ADF in terms of casualties and working days lost, it seems appropriate for detailed studies to be undertaken in the area of sports injury prevention by relevant professionals in the field. Contacts should be made with relevant public and private agencies who have a mutual interest in sports injury prevention to determine what cooperative efforts could be initiated.

1.116 Rudzki provides a detailed discussion of measures to prevent running injuries. Van Mechelen argues that health education is likely to be the most effective means of preventing injury. However, to be effective, it must be put forward as a planned strategy, aimed at a favourable modification of behaviour. Rudzki argues that efforts should be directed to educating runners about the clearly identified risk factors. Good rehabilitation programs have the ability to significantly reduce injury recurrence. There are several training guidelines that can help reduce injuries including: building up gradually, using a running speed that allows the runner to speak without shortness of breath, and having an individual training program while doing group training or being streamed into a group with similar ability. Excessive distance should be avoided. In principle, training that consists of running shorter distances with higher intensity has an equal or better effect on aerobic capacity.

1.117 There is little doubt that a major contributor to injuries is inappropriately designed training programs that lead to training errors (Best and Garrett)[8]. Training errors include a range of factors such as persistent high intensity training without sufficient recovery, sudden increases in training volume and/or intensity, a single severe training or competitive session, and inadequate warm-up. A participant in sport and physical activity needs to meet minimum physical, physiological and psychological requirements to cope with the demands of training and competition as well as reduce their risk of injury. Thus an effective training and conditioning program is essential to maintain fitness. Training should prepare the participant for sporting events and should not in itself constitute a high risk of injury.[9] Fitness maintenance during off-season with a gradual increase during preseason and competition needs appropriate planning. The fitness training programs for combat related tasks and sport are different. Mission specific programs that prepare ADF members for operational tasks need specialist physical training programs that minimise the risk of injury. Qualified physical training staff should prepare mission specific programs and conduct the training. Coaches, instructors and fitness trainers are responsible for ensuring that training programs are appropriately designed and do not negatively affect the members physical health.[9]

1.118 Primary prevention. Primary prevention refers to preventing injuries from occurring in the first place. Appropriate training and conditioning programs are key to primary prevention. Much knowledge has been gained in this area by professional sports teams and by programs associated with the training of top amateur and professional athletes. While competitors in the ADF are amateurs, the ADF cannot afford to be amateurish in its approach to training and conditioning. Although ADF personnel are not selected for service based on their athletic ability, the rigours of military service and the need for optimally fit and healthy personnel means that the ADF should take a professional approach to the physical training of its personnel. Proper conditioning is essential to injury minimisation. This implies the presence of knowledgeable personnel who can oversee sports and PT activities and provide advice and guidance. Proper conditioning increases strength and flexibility and decreases the risk of injury. Conditioning programs should emphasise aerobic conditioning, general strengthening, and sports specific strength development. Smarter training can often achieve the intended results with less injuries.

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7 Egger, G. 1990. Sports injury in Australia, Causes, Costs, and Prevention—A Report to the National Better Health Program.

8 Best, T. and Garret, W. 1993. Warming up and cooling down. Renstrom PAFH, ed. Sports Injuries: Basic Principles of Prevention and Care. Oxford: Blackwell Scientific Publications.

9 Vicenzino B. and Vicenzino D. 1995. Considerations in injury prevention. In Zubiaga, N. Briggs, C. and Carlisle, J. eds. Sports Physiotherapy. Melbourne: Churchill Livingstone.

For example, studies have shown that running injuries increase with excessive running distance. By reducing running distances, US military units experienced substantially decreased injury rates while still achieving the desired level of aerobic fitness[3].

1.119 Secondary prevention. Once individuals are injured it is very important that their injury be completely healed as soon as possible. If injuries are not completely healed and sports or PT activities resume, the injury may become worse, resulting in increased lost time from work and increased costs for treatment, rehabilitation and compensation. If not dealt with properly relatively minor acute injuries can progress to chronic and severe injuries, which may ultimately lead to permanent disability and invalidity. This again represents increased human and financial costs. The primary means of secondary prevention include early and aggressive physiotherapy for acute injuries and aggressive and structured rehabilitation for chronic injuries.

1.120 Injury prevention case study. In a paper accepted for publication in the Journal of Military Medicine[10], Rudzki and Cunningham noted the positive effects of a modified training program in reducing injury and medical discharge rates in Australian Army recruits. Changes in the PT program at 1 Recruit Training Battalion, included cessation of road runs, introduction of 400–800 m interval training, reduction in test run distance from 5 km to 2.4 km, standardisation of route marches and the introduction of deep water training. There was a 46.8 per cent reduction in the rate of total injury presentation between the pre and post change groups. In addition, the annual rate of male medical discharges fell by 40.8 per cent in 1995–96. The decrease in the male medical discharge rate resulted in an estimated savings of over $1.2 million. This case study is indicative of the significant benefits in injury and cost reduction that can be achieved through smarter physical training. There is clear evidence that professional sporting teams are training with greater specificity to avoid the accumulative affect of long distance running and protect their athletes from over use injuries. Cross training and activity specific resistance training provide alternative methods for training. To help minimise injuries for contact sports, strength training is generally accepted as essential in the training preparation phase. Greater emphasis on strength training as an injury management process is essential.

1.121 Revamping physical training and sports training in the ADF. In order to minimise sport and PT injuries the ADF must address the following issues: adopting world class techniques for physical training and sport training; providing qualified personnel to supervise conditioning and training activities; educating commanders and ADF personnel at all levels on the benefits, risks and risk minimisation strategies associated with sport and PT; and aggressively managing injuries when they occur. The ADF should train and play in a deliberate manner. The ADF should only sponsor or sanction activities where proper conditioning and training is required for all participants. In order to carry out best practice training and conditioning programs, qualified supervision must be provided in the form of physical training instructors, coaches, sport trainers, and referees who are properly trained for their tasks. PT programs should be tailored to address individual deficiencies and strengths. Finally, educating all members of the ADF is a key aspect of injury prevention. Commanders and the soldiers, sailors and airmen in their units must understand the benefits and risks associated with participation in sport and PT, so that they can take every precaution to minimise unnecessary risk. Finally, when injuries do occur, aggressive case management, including physiotherapy and rehabilitation, is required to insure that injuries are fully healed as soon as possible. There will likely be costs attendant with adopting this strategy. However, the cost reduction associated with decreasing injuries is sure to yield a net benefit. The final result will be increased readiness through a fitter and healthier force and increased resources available for other uses. The ADF should consider sponsoring a national or international symposium on sport and PT injury prevention, which would help to focus efforts and provide a forum for exchange of ideas on injury prevention strategies.

1.122 Minimising other injuries. While sport and PT injuries should be given the highest priority in terms of risk management based on the impact they have on the health of ADF personnel, other types of injuries also warrant targeted risk reduction efforts. A more detailed analysis of DEFCARE data related to the following work-related injuries should be undertaken: walking (non-sport and fitness), stores handling, equipment maintenance, ship maintenance and cleaning. Analysis of the DEFCARE data should provide clues as to where to focus efforts in terms of further investigations and studies. Similarly, a more detailed analysis of DEFCARE data related to marching and parachuting injuries should be conducted. A draft proposal for a Combat Load Handling Systems Study to be conducted by the Defence Science and Technology Organisation has been developed by the Director-General Defence Health Service. The draft proposal cites emerging evidence, which suggests that many physical activities carried out by Army personnel may exceed Occupational Health and Safety limits and standards. The

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10 S. J. Rudzki and M. J. Cunningham, The effect of a modified physical training programme in reducing injury and medical discharge rates in Australian Army Recruits, to be published in Military Medicine.

objective of such a study would be to optimise human performance in combat load handling systems. A more detailed analysis of the DEFCARE data for individual Services may also provide an indication of priorities for injury and illness prevention efforts on a Service specific basis.

CONCLUSIONS

1.123 Data gaps in reporting injuries. There are significant gaps in specifying important information through the current process of reporting injuries to DEFCARE. While a special working group has recently looked at improving the format of reports to make them more user friendly, it is important that a complete systems approach be used in seeking to gather all pertinent information in a way which encourages rather than discourages reporting of injuries.

1.124 Need for root cause approach. While much useful information is currently captured via DEFCARE, the classification system used has an outcome focus as opposed to a root cause focus. The Type of Occurrence Classification System used in DEFCARE is the Australian standard for OHS reporting. This type of system is useful for identifying problem areas within an industry and/or occupation. However, it is expected that more in-depth research to focus on identified problem areas and isolate important causal factors will be conducted. The data captured in DEFCARE focuses on consequences or outcomes (eg, what happened and what injury resulted) and not root cause (eg training deficiency, failure to follow standard safety procedures, equipment failure, inadequate supervision, etc); therefore, the available data has limited use in setting and prioritising prevention strategies. A system level approach that focuses on root cause is essential to establishing a system that is useful for prevention and control of injuries. The injury and illness reporting system should incorporate a prevention model (eg the Reason model). It is envisioned that OHS professionals who investigate incidents would use such a prevention model to determine the root cause of incidents and accidents. The root cause for incidents requiring investigations should be captured in DEFCARE. Additional data capture at some point in the process will likely be required in order to determine root causes. Appropriate ADF and external agencies with expertise in this area should be consulted in order to ensure that information vital to injury prevention is captured.

1.125 Need to focus on rates. The current standard reports available from DEFCARE do not include a determination of rates. The utility and importance of such rate calculations has been demonstrated in this report. Rates are key to comparing performance over time and in comparing to other relevant benchmarks. The DEFCARE system should include standard reports with rate calculations similar to those demonstrated in this report. In addition, reports which indicate the rolling five-year average for comparison purposes would also be quite useful for assessing what the data means.

1.126 Need to present data in user friendly form. Standard reports from DEFCARE should include graphical representation of data in a manner similar to that demonstrated in this report. To perform the analysis conducted in this report, data had to be manually re-entered into a spreadsheet and various charts and graphs constructed from scratch. This was a time consuming process, which could be automated to produce much more useful standard reports, which are readily available to those who have an interest at all levels of the Defence Organisation. This does not negate the need for useful tools for OHS managers and others to use to customise their own queries.

1.127 Need to focus on high risk areas. While it has long been realised that physical training and sport and fitness related injuries have a major impact on the ADF, it appears that relatively little focus has been given to reducing injuries from these activities. While there are a number of safety related committees within the ADF, there is not a committee which has as its charter the prevention and reduction of physical training and sport injuries. In the case of sport and PT injuries, much can be learned from following best practice established by professional sports team and top amateur athletic organisations. Implementation of established best practice techniques will minimise preventable injuries. A more detailed analysis of DEFCARE data should provide clues as to where to focus prevention efforts for other leading causes of injury. Special studies may also be warranted to determine the nature of the problem and the best methods of injury prevention and control. The expertise required for such studies may not reside solely within the ADF. Therefore, consultation with leading government and private sector individuals and organisations should be considered. Once the nature of the problems in the top risk areas are determined, specific programs for prevention need to be targeted and the results of these programs measured on an annual basis.

1.128 Need to hold leaders accountable for injury and illness prevention. The importance of injury and illness prevention in maximising ADF readiness requires much greater emphasis at all levels of the ADF. Current management practices in the ADF do not foster a proactive approach by commanders. As discussed in the ANAO Report on the ADF Health Services, 'It is likely that the issue of compensation would assume greater importance to program and sub program managers if these costs were part of their budget.' Costs of medical treatment, rehabilitation, compensation, and invalidity are all costs associated with injuries and illnesses, which should be attributed to the respective program and sub-program. Similarly, commanders and managers at all levels need to understand the human capability costs associated with injuries and illnesses in terms of working days lost and, in the case of invalidity retirements, loss of trained personnel from the ADF. Unit readiness reports include an assessment of equipment readiness. They should also include an assessment of personnel readiness, which includes personnel availability. Commanders and managers at all levels need good tools to be effective risk managers. First, they need to have an awareness of the significance of preventing injuries and illnesses in terms of ADF readiness. Secondly, they need reliable and accurate data presented in a readily understandable format on a regular basis that captures all the costs of injuries and illnesses for which they have oversight. The data must be tailored to the needs of commanders and managers at various levels. Thirdly, they need a framework of policy, programs and training that emphasises the minimisation of preventable injuries and illnesses as well as compliance with applicable legislation. Finally, they need competent, trained staff who can provide advice on injury and illness prevention strategies. History provides numerous examples of the difference that command emphasis can make in reducing preventable injuries and illnesses.