Analysis of Y Listings and Medical Discharges of Officer Cadets at RMAS from January 1994 to May 1997, with Actions to Prevent Injuries

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SUMMARY: During 1995 the incidence of training related injuries to cadets at RMAS increased markedly. This paper quantifies the numbers placed on the Y List and removed from training, and those medically discharged. The main identified causes were drill, weight carriage, endurance training and lack of sleep. The training programme was modified including alterations in footwear, length and timing of physical periods and a reduction in weight carriage. Following these changes there was a highly significant fall in Y Listing from January 1996 and subsequent medical discharge.

Background

In early 1995 the incidence of attributable and non-attributable injuries and illness resulted in 9.58% of the Officer Cadet strength being placed on the Y List, and temporarily or permanently removed from training. The Academy Y List is the holding platoon for those cadets undergoing remedial training or awaiting medical discharge. Many officer cadets were subsequently medically discharged. Initiatives were made to elucidate the causes behind the increase in attributable injuries and make recommendations for changes in the training regime.

The main Commissioning Course (CC) consists of three 14 week terms beginning thrice yearly in January, May and September. During the intervening leave periods cadets are expected to complete an expedition and to gain adventurous training qualifications. The nomenclature for each intake is the last two figures of the year followed by a 1, 2 or 3; the intake beginning in May 1996 is thus 962. Males who are borderline at the Regular Commissions Board are required to attend an additional period of 10 weeks called Rowallan Company which runs prior to each CC. During the period of this report there was a single female platoon in one of the two or three companies. This platoon was separate for many of the physical activities but came together with its parent company for exercises and the larger drill sessions. The Academy maintains a gender fair policy with females partaking in all activities although weights and timings are varied.

Approximately 250 - 290 cadets enrol on the CC each term with an additional 40 - 50 on Rowallan. There is a continual throughput of overseas cadets; these are included in the Y List and discharge statistics although few were injured. Additionally RMAS runs short courses both regular and TA; these cadets and officers are not included in this report. Between 1994 and 1997 there has been a gradual increase in the number of cadets in training in line with the requirement to increase the output of trained young officers.

Any cadet who becomes unfit to continue training for whatever reason is liable to be placed on the Y List. A considerable degree of flexibility is used; an injury in the

third term or occurring before a leave period would not necessarily result in Y Listing, whereas an identical problem early in the first term would automatically preclude continuation.

The aim of this research was to determine if the changes made to the programme had an effect on the number placed on the Y List.

Methods

The following criteria were assessed:

- Percentage of cadets on the Y List
- Numbers of cadets placed on the Y List in each term with a breakdown into attributable and non-attributable injuries, and medical causes
- Analysis of medical boards with similar breakdown

It proved exceptionally difficult to determine whether an injury was attributable to service at the Academy or due to an injury prior to attestation. Some cases such as a civilian road accident were clear cut; more difficult cases include known earlier knee surgery when the cadet suffered further swelling following a run or assault course. These statistics for Y Listing and medical board procedures also exclude those who suffered repeated minor trauma or illness and then chose to leave voluntarily due to loss of confidence, or those who through minor injuries failed to perform adequately and were thus asked to leave. In 1995 the peak number of Y List cadets reached 78 with many serious injuries; this became known to the national press such as The Sunday Express (1) and a Working Group from the Academy was established to define the causes and make recommendations for change. Data collection on injuries and illness was limited and in March 1995 the MRS was equipped with the Medit System 5 to allow morbidity analysis using Read codes.

Formation of Working Group

The chairman of the Working Group was SO1 Training with the following represented: Commanders of Old and New Colleges, the Senior Medical Officer, Chief Instructor PT, Staff Quartermaster, Academy Adjutant and the Academy Sergeant Major. Discussions centered on

clinical trials possibly with the help of the Army Personnel Research Establishment (APRE) in particular in the fields of footwear and drill. Immediate problems were the relative paucity of cadets, large number of footwear options including different boots, brown shoes with and without extra soles plus use of training shoes, insoles and sock options. There were many confounding variables including the weather, previous physical exercise possibly with military service, nationality, Body Mass Index (BMI), sex and smoking (2,3,4,5). There were also problems with ongoing commitments for APRE, funding and the requirement to produce quick answers and solutions.

Causation of Injury and Illness

Even with the installation of medical computers it was difficult to ascertain the precise underlying cause of injury. The Y Listing event may have been a fall from the assault course or an ankle inversion on exercise, but frequently cadets had pre-existing blisters, ankle, foot or knee pains causing an abnormal gait. Much information was gained from directly questioning the cadets on their perceptions of the underlying cause. The following main areas were examined by the Working Group:

1. Drill
2. Weight Carriage
3. Heat Illness
4. Physical Training Sessions
5. Control of Additional Endurance Training
6. Presence and Training of Directing Staff
7. Lack of Sleep
8. Food and Time Allowed for Eating
9. Sport
10. Stigma of the "Sick Chit"
11. Blisters and their Prevention
12. "The First Five Weeks"

In October 1995 the Working Group hosted a conference to broaden the knowledge base, inviting those involved in similar work at Britannia Royal Naval College, Commando Training Centre Lympstone, RAF Cranwell, Headley Court and the various Army Training Regiments. Amongst topics discussed were: lower limb injuries at Lympstone, new developments in footwear, course modifications at RAF Cranwell, incidence of stress fractures in Army recruits and gait analysis. The SMO at Sandhurst gave a presentation on his understanding of the situation at the Academy at that time, and his thoughts for the way ahead.

Drill

It was the drill that cadets particularly mentioned to the SMO as the underlying cause of their lower limb injuries. This was associated with the issue and immediate use of the officers' brown shoe with steel heels, use of George Boots, "cob webbing" (a drill movement at fast rate with short stride) and generally moving rapidly around the Academy between departments in the first few weeks after arrival. It was felt, although not actually proven at the time, that these activities contributed to the stress fractures

in calcaneum, metatarsals, tibia and pelvis; injuries which only resulted in Y Listing after the major exercise phase later in the term. There were particular problems with the females and their current issue shoe with its lack of support and minimal shock absorbency.

Changes introduced included the use of training shoes in the first week, banning of "cob webbing", use of issue boots for some drill periods, the early issue of the Combat Assault Boot in lieu of the Combat High Boot, issue of Sorbothane heels to all and the availability of other insoles if required, and the removal of additional drill and endurance periods during "Platoon Commander's Disposal". Liaison was also established with the Defence Research and Textiles Agency on the design and implementation of the new drill boot.

Weight Carriage

On interviewing the cadets it became apparent that the weight they were required to carry at a very early phase of their training was excessive. As well as contributing to the lower limb injuries many of the neurological and cervical injuries were believed to be weight related. On analysis the cadets were carrying bergans of 22 Kg plus helmet and webbing on the major exercise at the sixth week, and at the end of the second term were loaded with over 39 Kg.

After reviewing the requirements, the sixth week exercise was reduced to webbing and day sacks to a total of 8 Kg, with two safety bergans each of 11 Kg being shared between the groups of six cadets. There is no progression throughout the course so the major second term exercise has a maximum combined weight of webbing and bergan of 30 Kg for males and 20 Kg for females. In addition a weapon and helmet is carried.

Heat Illness

In 1994, 1995 and early 1996 heat illness was a major cause for concern at the Academy, both at Sandhurst and out on exercise. Although only three were Y Listed and one medically discharged it caused considerable morbidity and time off training. Several cadets were seriously ill with core temperatures exceeding 41°C.

The following aspects were examined in detail:

Timing of events

Collection of wet bulb globe temperature (WBGT) data at the appropriate time in relation to activity and in appropriate location

Clothing

Weight carriage

Use of helmets

Fluid before, during and after activity

Use of stops

These areas were firmly addressed by SO1 Training and the Chief PT Instructor.

More difficult issues related to the removal from the event of those with pre-existing medical problems, and the inherent desire for those undergoing officer training to succeed rather than withdraw from any physical activity. Officer cadets are motivated to give their best and are

loathe to stop voluntarily and let down their peers. The Academy purchased a heat stress monitor (HS 3700 Data Logging) and trialled a personal heat stress monitoring device. With the arrival of further issue WBGT instruments the Academy was able to provide a comprehensive and recordable analysis of the conditions over the training area.

After successfully resolving the heat illness at RMAS, a problem remained on exercises. Of concern was the cycling through of exercises on a termly basis with "The Pink" (Exercise Instructions for Directing Staff) being similar whether the exercise was conducted in March, July or November. Flexibility in the dress, weight carriage, provision of water and orders to directing staff has now been introduced. There has been no repeat of the episodes in Brecon and Germany in the summer of 1995 when many cadets succumbed to heat illness on exercise and no cadets were admitted to hospital solely for heat illness during 1996 or early 1997. The changes made by Academy staff are in line with the recommendations of Bricknell (6).

Parallel Changes

Concurrently changes were made to the timetable removing the numerous occasions when major exercises, endurance competitions and drill periods were running consecutively. All periods were colour coded with red the most severe and time was allowed for recovery between red graded sessions. At the same time the use of "Platoon Commander's Disposal" periods for extra physical training was stopped and all PT periods were run by appropriately qualified staff with warm up and cool down sessions. Foot care was enhanced by early lectures from medical staff, the bringing forward of the issue of the combat assault boot and heel insoles, and ongoing discussions on the optimal sock combinations. New directing staff, both officers and SNCOs, were briefed on health issues and possible legal ramifications. The directing staff were forbidden to be in the cadets' accommodation after 2300, and a policy of lights out from 2400 to 0600 was instituted to allow increased rest. Attempts were made to remove the stigma of being on a "sick chit" with injured or sick cadets receiving appropriate help in the remedial suite or physiotherapy department rather than standing on the edge of a drill square. Officer cadets were to be encouraged to seek medical attention early; this allowed referral to the physiotherapists and a more rapid return to full fitness.

Many cadets were unhappy with the feeding arrangements, not merely the usual complaints about quality and quantity but the time allowed to eat. Frequently cadets at the back of the meal queue had to leave for the next event before receiving or having time to eat their meal. Changes centred on timetabling, the addition of milk supplements and a possible fourth meal.

As the size of the Y List increased a requirement for a second Remedial Instructor was identified to allow the platoon to split into "Earlies" - those recently injured, and

"Lates" - those expected to return to training within one term. With the purchase of additional sophisticated equipment an excellent remedial suite was established under the direction of the Chief Instructor in Physical Training. Sport was examined and although it was found that cadets were injured, no sport stood out as a major contributor to Y Listing or medical discharge.

Analysis from the Meditel computer system indicated that the majority of morbidity commenced in the first five week period. Although the pass-off from the square at that point is retained, the concept of there being a "make-or-break" at the five week point was deemed dated in the current legal climate.

Results

Table 1 is an analysis of the numbers and rates per 100 cadets of those on the Y List. The peak of Y listed cadets was 78 and the total cadet population at the Academy has shown a progressive increase. Statistical analysis for P value of 0.001 is arrived by comparing the rates of 1994-5

Table 1
Analysis of those on the Y List with Numbers and Rates per Hundred Cadets.

Date	Y	Not Y	Total	Rates	P
5 Dec 94	47	603	650	7.23	
3 Apr 95	64	604	668	9.58	
31 Jul 95	65	650	715	9.90	
4 Dec 95	73	673	746	9.79	
1994-5	261	4312	4573	5.71	***
10 Jan 96	53	681	734	7.22	
13 May 96	52	669	721	7.21	
9 Dec 96	44	687	731	6.02	
1996	129	2037	2166	6.82	0.005
17 Feb 97	37	714	751	4.93	
12 May 97	39	770	809	4.82	
9 Jun 97	36	791	827	4.35	
1997	112	2275	2387	4.69	0.0000

with 1996 and 1997. The general chi square comparing rates for 1994 with 1997 is 6.64, 1995 vs. 1997 40.01, and 1996 vs. 1997 9.57.

The numbers and rates of cadets newly placed on the Y List with musculoskeletal injuries for each term from January 1994 to the end of April 1997 is at Table 2.

Table 3 highlights those who unfortunately had to proceed to medical discharge for attributable injuries; of these 75% were related to the lower limbs. Following any injury, attempts are made to allow recovery into training; on occasions medical discharge is delayed for up to two years from the original injury if there is a prospect of recovery sufficient to allow a return to training.

Table 2
Analysis of Cadets Placed on the Y List for
Attributable Injuries
Rate per 100 Cadets, per Term

Period	All Attributable musculo-skeletal injuries placed on Y List	Rate per 100 Cadets per Term
Jan - Apr 94	14	2.2
May - Aug 94	22	3.4
Sep - Dec 94	22	3.4
Jan - Apr 95	24	3.6
May - Aug 95	27	3.8
Sep - Dec 95	26	3.5
Jan - Apr 96	13	1.8
May - Aug 96	12	1.7
Sep - Dec 96	10	1.4
Jan - Apr 97	8	1.1

Table 3
Medical Discharge for Attributable Injuries
Rate per 100 Officer Cadets

	1994	1995	1996	1997 (4 months)
All Attributable Injuries	2.9	3.8	2.9	1.1
Lower Limb Injuries	2.6	2.8	1.8	1.1

Discussion

This paper describes the work that was undertaken to reduce the injury and medical discharge rate at the Royal Military Academy Sandhurst that was particularly high in 1995. Although the MRS was computerised it was difficult to ascertain precisely the direct cause of the injuries that were occurring. The proposals for multiple trials discussed at the Working Group would have taken considerable time to complete and would have proved difficult with the comparatively small numbers of cadets and the multiplicity of confounding variables. The time scale required for change also precluded lengthy trials; solutions were needed rapidly. The changes proposed were based on the recommendations of the SMO, the chief PT instructor, the SO1 Training and the Commander Old College responsible for the first term and Rowallan cadets.

From the figures of Y Listing and medical discharges

either the changes have been successful or the standard of cadets selected has increased remarkably. The latter was thought unlikely by analysis of the initial physical assessments on arrival at the Academy. On average 25% of each intake fail the initial Induction Term Fitness Assessment held in week 1; this figure has barely changed.

The standard of medical performed at the Permanent Standing Medical Boards has in general been excellent; problems have arisen in cadets who have never been appropriately boarded, and those who have been allowed through on appeal following initial rejection by PSMB.

Although much has been achieved, and considerable savings made in training and legal costs, further progress is needed. However with the reduction in numbers on the Y List one of the remedial instructors has been deployed elsewhere, and the remaining staff are taking on additional roles. As there is no current equivalent of Rowallan Company, females who fail to perform adequately are now placed on the Y List for supervision of training courses or detachments. At present a team of physiologists from Optimal Performance Ltd, paid by the Army Individual Training Organisation, is working at the Academy to make further recommendations.

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