Heat Illness in Cyprus

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SUMMARY: Heat illness in the Armed Forces is an emotive issue. No specific service-wide system currently exists to monitor the incidence of heat illness. Within British Forces Cyprus medical policy guidelines for physical activity at various Wet Bulb Globe Temperature (WBGT) readings were issued in 1988. A local system for reporting heat casualties was introduced in August 1989. This paper examined retrospectively the reports of heat illness casualties from August 1988 to December 1992 in Cyprus. There was a reduction in reported incidents causing heat casualties over the period studied from 18 incidents in 1990 to 8 in 1992. There was also a reduction in the maximum recorded WBGT reading for each incident. From these results it would seem that there may have been a reduction in preventable heat casualties attributable to commanders following the WBGT guidelines.

Introduction:

Heat illness in the Armed Forces is an emotive issue. There have been several unfortunate episodes that have resulted in death. These have been well publicised by the media (1,2). However military forces have to be capable of fighting in all environments. This necessitates some training in hot climates. Therefore a balance has to be struck between the benefits of training and the risk of casualties as a result of heat. The physiological consequences of exercising in heat have been investigated in great detail by military research institutes. During World War 2 nearly two hundred recruits died from heat stroke in the United States (3). Since then much research effort has been directed to devising a useable measure of the physiological load imposed by a hot environment. This measure could then be used as a guide to reduce heat casualties. Research conducted at the United States Marine Corps Depot, Parris Island in the 1950s using the Wet Bulb-Globe Temperature (WBGT) Index as a measure of heat stress forms the basis for many guidelines in use today (3,4,5).

Within the British Army efforts have been made to raise the level of awareness of the prevention and treatment of heat illness. All newly graduated military medical officers receive specific instruction on the medical problems associated with military operations in hot environments (6). A recent Defence Council Instruction gives detailed guidance to commanders about heat injury (5). All personnel deploying on operations or exercises will receive training to raise their awareness of heat illness (7).

In order to monitor the effectiveness of these preventive measures a system for reporting heat casualties is required. No specific service-wide system currently exists. The only sources of this information are hospital admission or MOD 298 records (Report on Injuries or Immediate Death Resulting from other than natural causes - Service Personnel). Hospital based records have been analyzed to give a crude 'all services' heat illness rate of 0.41 per thousand per year (8). Such analysis will only detect the more severely affected casualties who required admission to hospital. There is no available analysis of

heat illness figures based on MOD 298 records. The most recent reported clinicopathological research within the British Army was undertaken in Hong Kong (9). This paper studied all heat casualties (total 45) admitted to hospital during 1985. The results are skewed as a result of two mass casualty incidents (causing 22 and 18 casualties respectively). In view of this its difficult to extrapolate the effectiveness of local preventive policies.

Within British Forces Cyprus medical policy guidelines for physical activity at various WBGT readings were issued in 1988. A local system for reporting heat casualties was introduced in August 1989. This required completion of a proforma by medical centres for each heat casualty treated which was submitted to the Joint Services Health Unit (JSHU) at RAF Akrotiri and a copy to the Medical Branch Headquarters British Forces Cyprus (HQBFC). This system allows for all heat casualties treated by the medical services in Cyprus to be reported.

This paper aims to examine retrospectively the reports of heat illness casualties from August 1988 to December 1992 in Cyprus in order to assess the effectiveness of current policies for the prevention of heat casualties.

Table 1
Summary of Distribution Of Heat Illness Incidents

N=38				Year											
Year				1989			1990			1991			1992		
Number				2			18			10			8		
N=36				Month											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Number	1	0	2	1	7	4	10	4	3	2	2	0			
(less 2 from 1989)															
N=55				Activity Of Affected Individuals											
Activity	CFT			EX			Mil Run			Org Run			Other		
Number	14			18			10			6			7		

CFT= Army Combat Fitness Test
Ex = Military Training Exercise
Mil Run= unit physical training
Org Run= club organised run
Other= other activity

Method And Results

All records of heat casualties held at JSHU and Medical Branch HQ BFC were examined. Missing meteorological data were sought from JSHU and the meteorological office at RAF Akrotiri.

There were 55 notifications of heat casualties in Cyprus for the period 2 August 1988 - 31 Dec 1992 involving 38 separate incidents. Table 1 summarises the time distribution and the activities for each separate incident involving heat casualties. Because the notification system was started in August 1988 the two notifications for that year are excluded from the table of monthly distribution so as not to distort the relative proportions. There were multiple casualties on 8 occasions. Three of these were as a result of Combat Fitness Tests (CFT), 4 from exercises and 1 from a military 'march and shoot' competition. The severity of heat injuries is shown in Table 2. Predisposing factors were recorded for 10 casualties: previous heat illness 3, diarrhoea and vomiting 2, recent vaccination 2 and alcohol 1. The distribution of the WBGT reading for each incident is shown in Figure 1. The divisions correspond to the guidelines listed at Table 3. Two incidents which occurred in Egypt are not recorded as WBGT readings for these are not available.

Table 2
Distribution of Severity of Heat Illness

N=55	Definition	Number
Mild	First Aid treatment only	27
Moderate	Any hospital admission, IV infusion	18
Severe	Admission longer than 24 hours	10

N = 36 Average 27.45 SD 41.59

Fig 1. WBGT Distribution

Discussion

These figures show a reduction in reported heat casualties over the years 1990, 1991 and 1992. The majority of incidents happened in the summer months which was predictable. Most heat casualties occurred as a result of military organised activities. There are no records of heat casualties prior to the introduction of

WBGT based guidelines for exercise so the effect of these on the numbers of heat casualties cannot be directly measured. The current service WBGT guidelines for exercise in the heat are reproduced at Table 3. From Figure 1, 21 incidents occurred when the WBGT index was greater than 29°C. The guidelines require discretion in the planning of heavy exercise for acclimatised personnel when WBGT readings are at this level or above (Table 3). In 1992 the highest WBGT readings for a heat casualty on a military activity was 28.9°C. On the two occasions when heat casualties occurred at WBGT reading greater than 29°C in 1992 the individuals were running voluntarily. On this basis it would seem that there might have been a reduction in preventable heat casualties attributable to commanders following the WBGT guidelines.

Table 3
The Wet Bulb Globe Temperature (WBGT) Index (5)

The following guidelines are intended to provide for safe exercising. They may not completely eliminate the risk of heat casualties as they relate to healthy service personnel only. It must be accepted however, that to move outside these guidelines with risk incurring heat casualties and such action would normally require justification on operational grounds.

When the WBGT Index reaches	Restriction
a. 26°C	Intense physical exertion may precipitate heat illness. Be prepared. Exercise discretion in planning heavy exercise for unacclimatised personnel.
b. 29°C	No strenuous physical activity for unacclimatised personnel. Discretion in planning heavy exercise for acclimatised personnel. Avoid standard Combat Fitness Tests (Army) or other strenuous sustained physical exercise of this level. Periods of strenuous exercise should not exceed 30 minutes with a rest period of rehydration and cooling lasting at least one hour.
c. 31°C	Strenuous exercise should be halted for recruits and other trainees with less than 10 weeks training in hot weather. Stop Basic Fitness Tests and Combat Fitness Tests (Army). Hardened acclimatised personnel can carry on limited activity at WBGT Index of 31°C to 32°C for periods not exceeding 6 hours a day.
d. Exceeds 32°C	All outdoor training, strenuous activity and non-essential duty should be halted for ALL personnel.

The reliability of reporting cannot be accurately assessed. There are two major Army garrisons in Cyprus, Episkopi and Dhekelia. In each there is a resident infantry battalion, though the battalion at Dhekelia was only established in 1990. Episkopi reported a total of 16 incidents and Dhekelia 8. This variation could reflect the difference in total population between the two garrisons over the whole period of study. Twelve reports originated from the local military hospital and were not duplicated.

by medical centre notifications. Therefore it is possible that there has been under-reporting by all medical centres. Furthermore the reporting system notifies the chain of command of these casualties so there might have been pressure by local commanders to avoid notification. The effects of these factors cannot be fully assessed but it has to be assumed that the relative numbers reported each year are a true reflection of the incidence of heat casualties in Cyprus.

It is not possible to make an accurate estimate of the true incidence because of the difficulty defining the 'at risk' population. A raw figure based on total military personnel would be meaningless because of the variations in employment and activity and thus exposure to risk. The best population would be the numbers participating in physical activity at the time of a particular heat casualty incident. This figure is impossible to determine retrospectively.

There were 10 incidents (13 casualties) which occurred when the WBGT was within 'safe' limits. All but two of these occasions involved CFTs or speed marches. Clearly there are other factors additional to the heat stress which determine whether an individual suffers with heat illness. Factors such as load carrying, clothing and duration of activity are constant for a whole group. There must be other factors which cause an individual from a group to become a heat casualty. In this study such factors were identified in only 10 cases. It is recognised that there is a subgroup of individuals who are vulnerable to heat illness (8). Perhaps this is an area for further research. The true incidence of this vulnerability would be useful. Subsequently a simple screening test could be developed to identify these people so that their PULHHEEMS employment grading could reflect this susceptibility.

This study demonstrates the value of a specific reporting system for environmental injury to determine the effectiveness of current policies and to identify areas for possible future investigation. Perhaps consideration should be given to the introduction of such a scheme service-wide.

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