The paper is based on interviews and questionnaires with 71 healthy, pain-free female athletes. Incidents of discomfort, fracture, concussion and even coma appear to be both expected and accepted.

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Sport as a health risk

Sport is promoted as a healthy pastime, but discomfort and trauma appeared to be both expected and accepted suggesting that pain is deemed to be normal for sport.

Certain sporting activities are seen to be dangerous by the medical profession but the sporting participants do not share the same views.

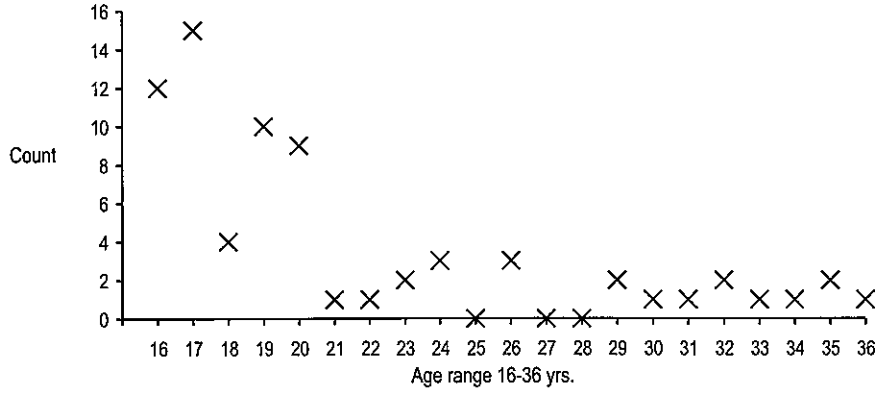
Casuality officers view certain sporting activities to be dangerous, (Schmidt & Howarth 1989, Juul 1989, Bixby-Hamilton et al., 1990 Christy et al. 1994). They report that a range of damage is seen from contusions, limb and spinal fractures and even coma. Male participants who practice collision sports (rugby, football) are seen to be equal to female horse riders and half a million visits to U.S. emergency rooms were from cycle injuries (Mellion 1991). The medically accepted view as to the consequence of these activities is apparently not shared by the sporting participants. A survey was undertaken to question athletes about their sporting history, attitudes and problems with their sport.

Method

As part of a larger ergonomic study, 71 fit, healthy, pain-free female athletes, (Table 1), completed a questionnaire on their sporting history. Coupled with unstructured interviews they were asked to describe problems encountered with sporting performance related to sporting comfort, health, injuries and areas of pain. Frequency and ages of participation in sport were questioned. Six sports were targeted that were judged to involve greatly the hip joints, [gymnastics, fencing, dancing, martial arts, exercise/pedal bike riding and horse riding].

As only two subjects had fenced, this sport was not included in the data. Of the group, 49 were horsewomen, 18 were athletes of varying disciplines and 4 sportswomen who were naïve to equestrian sports. Paralleling industrial injuries, caveats must be employed as numbers of those who have left the sport due to injury is not known and this may confound the study (Jahn 1982).

Table 1. Respondent's age (mean age 21, mode 16-17 years, range 16-36 years)



Results

The injuries sustained by the athletes who rode horses were reported as broken limbs and skull fractures. One subject did not think she had any lasting effect from her accident even though she had been in a coma for three days...*'I got over that a long time ago, OK'*. Caution must be applied as the volunteers' mean age was 21 years and conclusions for assessment of effect on long term health are necessarily speculative (see Table 2 & Figure 1).

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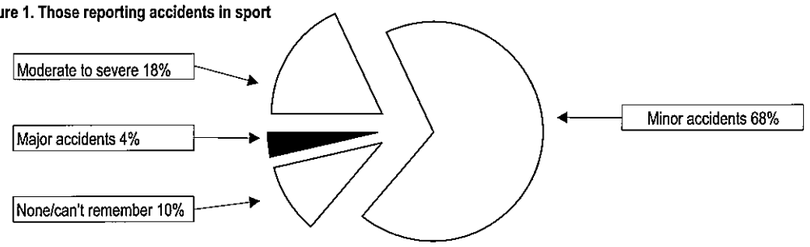
Table 2. Those reporting effects of accidents in sport

	no difficulties	slight problems	some problems	great problems
Performance in chosen sport	80%	20%	0%	0%
Performance in physical exercise	73%	25%	2%	0%

Figure 1. Those reporting accidents in sport



Comfort Rating and Discomfort Index

The data from Table 3 show numbers who performed in a particular sport and those who were pain free as well as the areas on the body that gave discomfort.

Table 3. Number of athletes, number of pain-free individuals, areas and totals of pain in the five sports

No. = participants in this sport
Total = cumulative number of painful areas
Proportion = proportion of pain area to the number of participants.

Sport	No.	no pain	feet	knees	ankles	legs	seat	hips	back	other pain	Total
Gymnastics	**34**	25	1	1	1	0	0	0	1	4	**8**
proportion		*0.73*	*0.03*	*0.03*	*0.03*	*0.0*	*0.0*	*0.0*	*0.03*	*0.12*	
Martial Arts	**13**	9	1	1	1	1	0	1	2	3	**10**
proportion		*0.69*	*0.07*	*0.07*	*0.07*	*0.07*	*0.0*	*0.07*	*0.15*	*0.23*	
Dance	**52**	40	2	4	1	3	3	1	5	0	**19**
proportion		*0.77*	*0.04*	*0.08*	*0.02*	*0.06*	*0.06*	*0.02*	*0.09*	*0.0*	
Bike riding	**69**	37	2	8	1	6	13	2	9	5	**46**
proportion		*0.54*	*0.03*	*0.12*	*0.01*	*0.09*	*0.19*	*0.03*	*0.13*	*0.07*	
Horse riding	**67**	13	1	8	14	10	27	15	27	11	**113**
proportion		*0.19*	*0.02*	*0.12*	*0.21*	*0.15*	*0.4*	*0.2*	*0.4*	*0.16*	

Expressing the numbers who were free of pain against the total number gave the sport *Comfort Rating* (see Table 4). For example, out of 69 subjects, 37 said they were pain-free when bike riding, resulting in a comfort rating of 0.5 (see Table 4).

Table 4. Comfort rating: Those without pain/total number of volunteers

	Total number of volunteers	Numbers without pain	Rating
Dance	52	40	0.8
Gymnastics	34	25	0.7
Martial Arts	13	9	0.7
Bike riding	69	37	0.5
Horse riding	67	13	0.2

The *Discomfort Index* compares the number of painful areas against the number of athletes who participated in that sport, (see Table 5).

Table 5. Discomfort Index: Number of pain area / number of athletes

	Total number of volunteers	Number of painful areas	Index
Gymnastics	34	8	0.24
Dance	52	19	0.37
Bike riding	69	45	0.66
Martial Arts	13	10	0.77
Horse riding	67	113	1.72

The *Discomfort Index* does not include the degree of discomfort but focuses on the areas reported when performing each sport. Surprisingly, horse-riding (Index = 1.72) scored more than twice that of bike riding (Index = 0.66). Perhaps participants in equestrian sports do not expect to be pain free (desensitization to the saddle and getting good balance is known as 'acquiring a seat'), many of the riders admitted that skin on their seat bones bled from friction caused by the equestrian saddle.

Discussion

Athletes' attitudes may parallel workers' health views related to industrial tasks. In order to arrest, treat and prevent damage to the athlete, the sports physician/coach/educator (Moore & Cupit 2001) should have an understanding of the individual's health concepts. Responses suggested that the athletes believed physical damage to their bodies had no lasting effects. They appeared to hold a view that there were no consequences once they had recovered from their accidents - limb fracture, concussion and various states of coma (see Table 2 & figure 1).

...the athletes appeared to hold dichotomous health models - The horsewomen practiced 'conditioning monitoring' for their horses, but adopted a 'crisis management' approach for their own health.

From the unstructured interviews, the athletes appeared to hold dichotomous health models. The horsewomen practiced 'conditioning monitoring' for their horses, but adopted a 'crisis management' approach for their own health. The riders were assiduous in ensuring that their horses were worked on both sides, but they neglected themselves by not changing arms when they mucked out stables or swept the yard. Over development on one side of the body may contribute to muscles imbalance and increased risk of sporting accidents (Masters 1999).

The belief model held by these athletes appeared to be based on 'body performance' - being pain-free was synonymous with perfect health. The impression these young women gave was that they saw themselves to be 'perfect' and any injuries were discrete incidents holding no long-term repercussions. This is in contrast with the view held by ergonomists that cumulative trauma produces a physical breakdown (cumulative trauma disorder, CTD, Kroemer 1989).

The sports physician/coach/educator should be aware of the athletes' attitudes to self-health and to the consequential problems of compliance with instruction. It would appear that the belief was held that when the symptoms were gone, the problem must have gone, therefore there is no need to continue preventative measures. Further research is needed to explore this duality of approach to health by athletes.

Sporting history

The athletes' sporting history suggests that they tried out various sports, presumably to challenge themselves, and to assess their own abilities. The volunteers' attempted and rejected different sports. Certain sports activities may have a 'carry-over', enhancing or reducing performance. Ballet dancing requires hip turn-out, but correct horse riding requires the feet to turn inwards. Some volunteers left horse-riding to concentrate on dance for this very reason. Conversely, turning the feet in brings the pelvis deeper into the saddle. Whereas, turning out the feet uses external rotators of the hip and so lifts the pelvis out of the saddle – a common riding fault in novice riders. By so doing, the subjects may be been unconsciously protecting the pelvic floor (Bolourchi & Hull 1985). This action penalises the rider in dressage competition. By lifting the pelvis off the saddle causes rider instability, and this may contribute to riding and cycling accidents, (Mellion 1991, Bovim & Andersen 1992) as well as producing subtle overuse injuries.

Body position

Body position may also affect performance (Kyle & Caiozzo 1986, Too 1990). This raises a general ergonomic problem where continuous

The list is long for areas of pain experienced when bike riding.

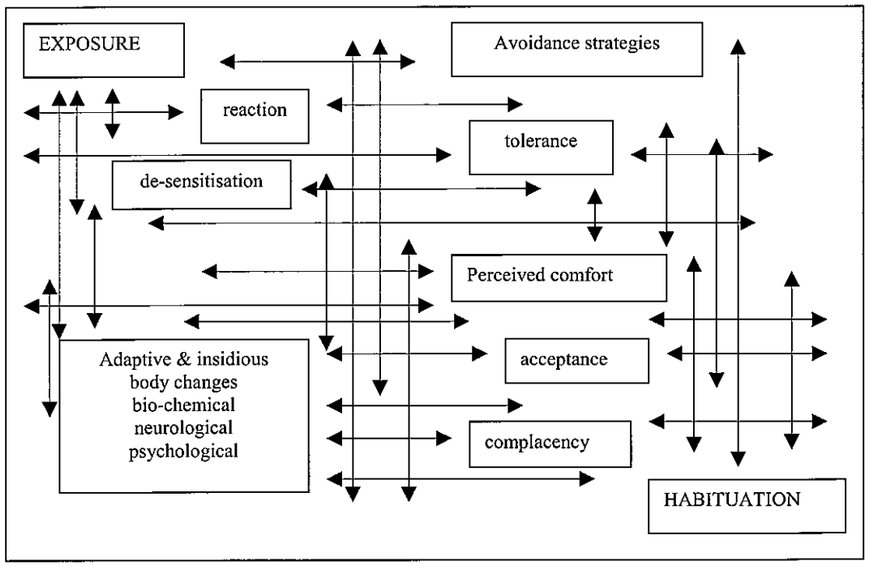
body action may affect the athletes' or animals' body shape and consequently their health (Waterer 1981, Schmidt & Howard 1989).

The list is long for areas of pain experienced when bike riding (see table 3). This echoes the Bovim and Andersen (1992) report of problems during the 300 mile cycle race – from simple chafing, skin eruptions, pudendal neuropathy, impotence, traumatic urethritis and vulva traumas. Improper fit of the saddle can also induce trochanteric bursitis, iliopsoas tendonitis, patello-fermoral pain syndrome. Foot paraesthesia, metatarsalgia, Achilles' tendonitis and plantar fasciitis, have been reported by Mellion (1991). In spite of these problems, horse riders' responses suggested that there were levels of pain and these were seen to be normal and acceptable. Comfort rating and pain index scales were constructed, (see Tables 3, 4 & 5). Surprisingly, horse-riding had the lowest comfort rating score and the highest discomfort index over martial arts and gymnastics. Some riders reported during the unstructured interviews that they bled from chaffing due to friction and pressure sores, while others appeared to be inured to the shape of the saddle.

The mechanics of tissue compression explored by Minns & Sutton (1982) and by Nelham (1984) suggest that release of pressure causes further chemico-neuro-mechanical events, where maximal damage occurs days later with the cessation of the activity.

Further investigation into the neuro-physiology of cyclic tissue compression and release is needed. With the responses from the athletes and using considerations based on Hussain (1953), Kosiak (1959) and Brand's (1975) experiments, the response to exposure to tissue compression and discomfort in sport is suggested below in a network of responses (see Figure 2). There is a complicated picture of habituation, avoidance, de-sensitization, and perceived comfort. It is postulated that a cycle of events may occur where the body learns both psychologically and neuro-physiologically to adapt to sporting equipment in spite of discomfort. This may have wider applications such as acquiring a new motor skill, performing repetitive actions.

Figure 2. Network diagram. A suggested complex relationship - exposure to haituation.



Selection for a particular sport does not always examine the athlete's shape as an entry requirement..

Conclusions

It is generally accepted that sport is a healthy pastime, but the results question this concept. The old hunting adage that riding to hounds is 'like warfare with 90% of the excitement but only 10% of the danger', could aptly summarise the risks in many sports. The dangers are several in bike riding and horse-riding as these can be seen as being potentially contact/collision sports.

Selection for a particular sport does not always examine the athlete's shape as an entry requirement but concentrates on the novice's aptitude. This is in contrast to ballet and equine selection, where the dancer's or horse's conformation is deliberately assessed with asymmetry being sufficient for rejection regardless of potential ability. This criterion may seem harsh but it is well known that asymmetrically shaped animals do not perform well, and later succumb to physical breakdown. Likewise, ballet schools do not want to invest in years of gruelling work that can be destroyed by the athlete's potential prevalence to injury before the performer reaches their professional peak.

In conclusion:-

- Many factors influence the choice of and the continuation in a particular sport
- Injuries reported ranged from minor bruising to limb fracture and periods of coma
- Micro-trauma over a period of time was not perceived to have the same potential as major traumatic events
- The equestrian athletes appeared to hold dichotomous health concepts, one for their own body (crisis management) and one for the horse (condition monitoring)
- Discomfort and trauma in sport appeared to be both expected and accepted. This suggests that pain is deemed to be normal for sport (no pain – no gain)
- The implication was that the athletes believed that 'when pain had gone, the problem must have gone - therefore there are no lasting consequences'. If these attitudes are universally held, this could explain reduced compliance with preventative measures suggested by the sports physician/coach/educator
- Participants may judge their health only by their immediate performance and may not consider the long term effects of repeated minor damage
- Actions in one sport may enhance or detract performance in other activities
- Sport should be viewed as an industrial occupation in terms of the potential damage
- The numbers and the damage to athletes who have left the sport are not known - a confounding factor when examining injury from sporting activities

Discomfort and trauma in sport appeared to be both expected and accepted - This suggests that pain is deemed to be normal for sport (no pain – no gain).

The study offers an insight into the assumptions that athletes have about their own health. Further investigation should be undertaken into the health perceptions of the general public and in the ways for the physician/coach/educator could empower the individual in order to prevent present and future physical problems.

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