THE SIGNIFICANCE OF PAIN IN SPORT

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Abstract:

Considering the contemporary significance of sport in the light of its particular purpose a reasonable classification of the term "pain" seems to be difficult for the time being.

Sport can have a positive as well as a negative influence on pain and vice versa. The fact that pain is a symptom which an individual cannot fail to notice and hardly ignore establishes its biological meaning as a serious warning symptom which, regarding muscles and motivation, puts a decisive limit on the capability to practising sport in general and on the high performance of the athlete in particular. Therefore the pain is not only a pathological symptom but a useful and therefore biologically necessary sensory instrument.

A very critical judgement by the doctor is required to establish the sense of the consequentially deducted claim for teaching the sportsman toughness, tolerance of pain and the conscious surmounting of the pain-threshold, as it is frequently demanded by the coaches.

The responsibility how to estimate pain and what conclusions for the sport activities of the athlete should be drawn rests on the doctor, the coach and also on the athlete himself. Anyhow, in the case of any doubt, sparing the athlete is always the better solution.

Key words: pain, warning symptom, sport performance, pain tolerance, ethical issues

DIE SINNHAFTIGKEIT DES SCHMERZES IM SPORT

Zusammenfassung:

Geht man von der Bedeutung des Sports im Lichte seiner besonderen Aufgaben, scheint es zur Zeit schwer, den Begriff Schmerz sinvoll einzuordnen.

Sport kann sich auf den Schmerz, aber auch Schmerz auf den Sport, sowohl positiv als auch negativ auswirken. Dass Schmerz ein subjektiv nicht übersehbares und, wenn überhaupt, nur sehr schwer übergehbares Symptom darstellt, gibt dem Schmerz sicher seinen biologischen Sinn als ernstzunehmendes Warnsymptom, durch das die Sportfähigkeit allgemein und besonders die sportliche Höchstleistung motorisch und motivativ entscheidend limitiert wird. Schmerz ist damit nicht nur ein pathologisches Symptom, sondern eine sinvolle und deswegen eine biologisch notwendige Sinneseinrichtung.

Es bedarf einer sehr kritischen Beurteilung durch den Arzt, um die Sinnvölligkeit der Forderung zur Erziehung des Sportlers zur Härte, Schmerztoleranz und willensmäßigen Überwindung der Schmerzbarriere, wie sie nicht selten von Trainern gefordert wird, zu bestimmen.

Die Verantwortung für die Bewertung des Schmerzes sowie für die Folgen für die Sporttätigkeit des Sportlers liegt bei dem Arzt, dem Trainer sowie bei dem Sportler selbst. Doch, wenn im Zweifel, ist die Schonung des Sportlers immer die bessere Lösung.

Schlüsselwörter: Schmerztoleranz, Sportübung, Ausdauer

Considering the contemporary significance of sport in the light of its particular purpose as an indispensable instrument of pedagogy, personality development, health, prophylaxis, therapy, recreational activities and even as a show-element, a reasonable classification of the term "pain" seems to be difficult for the time being.* In particular if starting from the ideal assumption that sport and health are inseparable. Only by taking a closer look, many connections, positive and negative, between sport and pain as well as various possibilities, which result from their mutual influence, are recognised.

That means that sport can have a positive as well as a negative influence on pain and vice versa. The fact that pain is a symptom which an individual cannot fail to notice and hardly ignore establishes its biological meaning as a serious warning symptom which, regarding muscles and motivation, puts a decisive limit on the capability of practising sport in general and on the high performance of the athlete in particular. Because of that pain is not only a pathological symptom but a useful and therefore biologically necessary sensory instrument.

As pain usually prevents the athlete imperatively from serious load injuries, it has a definite prophylactic character. That simultaneously makes pain a "beneficent" biological warning signal, to which is great

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importance attributed in kinesiotherapy and physiotherapy, as my teacher Prof. Böhler has always pointed out. "Exercise must not cause pain", could be read on a big poster in the consulting rooms of the Vienna Hospital for Accidents and was meant as a warning not only for the patients but also for the therapists.

Pain is a very complex biological phenomenon which many people unjustly consider only in a negative sense and therefore equate with illness and damage. With regard to the competitive athlete, who wants to feel healthy, pain has become a natural but disliked companion of his sport career, with which he has learned to, respectively even has to, live. That applies in particular to the professional athlete, who very often cannot afford to take a break for the necessary time of recuperation after an injury or an illness simply for financial reasons, like any other freelance.

However, a very critical judgement by the doctor is required to establish the sense of the consequentially deducted claim for teaching the sport person toughness, tolerance of pain and the conscious surmounting of the pain-threshold, as it is frequently demanded by the coaches. The competitive athlete cannot, of course, avoid a certain tolerance of pain, in particular as far as extreme weight loads in body-building are concerned and also with regard to continuous performance, which, by the way, the trained person copes with better than the untrained.

The possibilities of the athlete to encounter his/her personal conflict finally determine his/her success in sport. In war soldiers tend to be persuaded that pain tolerance is of course a soldier's duty and, as a special kind of personal heroism, absolutely necessary for his self-confidence. This argument has only theoretical character in connection with sport and is further not supported by the opinion expressed especially in Eastern European Countries, for instance in the former German Democratic Republic, that sport is war on another level with all its possible consequences for the athlete.

Understandably enough pain is experienced by the athlete as an inappropriate and negative sensation which has a strong emotional component depending on its quality and localisation. That quite often leads to a psychosomatic conflict situation which produces vegetatively disturbing symptoms according to the organ concerned (Weintraub, 1975) including paleness, transpiration, corediastasis, cramps of the muscles, oscillation of the blood pressure and even collapses.

Secondarily these symptoms exert a distinctive influence on the performance of the athlete and over a longer span of time also on his/her overall development in sport. That applies especially to the numerous and etiologically very different syndromes of pain which are relevant for the movement system primarily used in sport (Weintraub et al., 1975). In this connection pain and the consequences caused by an injury as opposed to simple situations of stimuli, like articulation of periost, are experienced very differently.

Here the experience of the athlete with regard to his/her own body and his/her knowledge of his/her specific physical problems plays a distinctive role, provided there is a minimum of intelligence and autoresponsibility. Therefore a physically handicapped athlete who have had a leg amputated, and thus suffers from phantom-limb pain, will think about it less during his/her sport activities than a non-amputee sufferers from similar pain from an *ischialgy* caused by a *discopathie*. Especially with physically handicapped athletes some particularities are found concerning the appearance, the perception, the absence, the importance, the evaluation and the consequences of pain as well as the possibilities on influencing it (Prokop, 1998). That applies especially to paraplegics and mentally handicapped athletes provided they can even feel the pain.

According to its primary biological function pain is, with little exception, an inborn and most alarming inhibition signal which has various effects on different athletes. Because pain as a symptom can indicate a pathological situation and as a consequence enables the doctor to make a more precise diagnosis, it is a pre-condition for efficient medical measures which, strictly speaking, need not necessarily be a therapy. Furthermore, pain has numerous other meanings, especially in connection with exceptional performances in sport, attributing to it even positive aspects beyond its

functional preserving purpose. Thus pain can even stimulate the athlete to give a better performance and therefore cause rather atypical emotions which enable the athlete to meet special athletic requirements. The latter mainly depends on the personality structure of the athlete and on the specific situation.

People suffering from psychosomatic pain are attributed certain personality features (Beck, 1975), which, depending on acute or chronic pain, show a more or less neurotic character. In this connection pain can give either a positive or a negative emotional impetus. While a very painful blow on an evidently exhausted boxer's nose can motivate him by causing a spontaneous reaction of anger to such a degree that he wins, the same emotion can reduce the power or resistance of another person so far that he/she gives up. If an athlete's performance in a competition is not satisfactory, he/she often gives up on the pretext of suffering from pain.

For a doctor pain is a major and indispensable key-symptom for his/her diagnosis, in which the location of the pain need not necessarily correspond to its place of origin. This discrepancy can lead to diagnostic errors as experience has shown. Transmitted pain which projects irritations of the organs on certain zones of the skin ("Zones of Head") is a typical example for this phenomenon. For different reasons pain is unfortunately very often triggered either not at all, not strong enough, with delay or too late. Pain loses just as well its biological point when the athlete represses it unintentionally or on purpose. The latter indicates however, and there are very impressive examples especially in sport, that the lack of a subjective feeling of pain constitutes neither a reliable indicator nor suitable proof for the wholeness, the function and the loading capacity of an organ.

Especially with regard to the cardio-pulmonary system this may have lethal consequences. Therefore the injection given nearly automatically to any athlete in competitive sport in order to eliminate his/her pain, to make him/her fit and to enable him/her achieve a performance which would otherwise not be possible, is of an often underestimated, even pathological nature and consequently irresponsible from a medical point of view.

This does not necessarily exclude the justification of a procaine infiltration before or during a competition as an exception to the rule in special cases, provided that the athlete's health is most likely not jeopardised. The responsibility for this measure lies always with the doctor even if the injection must be, or has been given at the special request of the athlete or an official.

In this connection beta-endorphins as corporal opiates are attributed a special importance. Functioning as a self-protection mechanism they are produced in the brain as a result of different stress-situations, as for instance exposure to the sun's rays (Greiter et al., 1983), and also physical strain, in particular long-distance running (Appenzeller et al., 1984; Farell 1985; Arentz et al., 1986). They influence pain-tolerance and the pain-threshold by reducing the perception of pain and render the athlete comparatively insensitive to pain in stress-situations. They even stimulate the athlete's motivation by a certain euphoria and make exceptional performances possible. Therefore they can decisively help to master critical situations as they are caused by pain in sport.

Beta-endorphins most likely play an important role in the surmounting of the so called "wall-phenomenon" occurring in marathons. After approximately 30 kms, about one quarter of all runners experience strong pain and weariness especially in the legs (Summers et al., 1983) which may call continuation into question. Regarded from a different point of view, the resulting "physiological" blockade switching off the warning-mechanism by a biological feedback.

The numerous algogenic reasons range from different metabolic disturbances which pass off and can hardly be proved, for instance caused by a little trouble of an organ's blood supply due to spasms, to large irreversible tissue alterations caused by some acute or chronic external violence. If these non-physiological alterations starting with a certain discomfort and just tolerable troubles slowly infiltrate the organism, they are often barely noticed or habitually accepted as fate and consequently not taken seriously, be as it may at once or after some time. Furthermore the intensity of the individual athlete's pain depends also decisively on his/her psychic

condition, his/her situation and his/her form on that day.

That means that the same cause of pain can be registered quite differently and because of that the intensity as well as the activity of the pain vary considerably. The pain-threshold, the minimum quantity of irritation necessary for the excitation of the various pain receptors, depends not only on the athlete but is also determined by the actual vegetative situation and the environmental stimuli specific for an organ. As experience has shown it is also influenced by the athlete's present form and is thus not always experienced identically. This holds also true for some strains in sport which are subject to certain fluctuations when sensitivity to pain can be changed by good coping-strategies.

This can be achieved for example through an altered attention by applying the technique of dissociation (Scott and Barber, 1977), i.e. the conscious separation of sensations of pain from impressions of attention.

By certain concentration tasks, which can be trained, the athlete can be successful at unconsciously repressing the distinct and reasonable physical signals as there is for instance pain. That, however, leads to the loss of some of their biological protecting functions because of the increase in pain tolerance (Pen and Fisher 1994). Increased pain tolerance achieved with the help of autosuggestive methods, for example the traditional autogenous training, is therefore not always recommendable nor sensible.

A thus achieved autogenous desensitisation deceives the athlete at the same time about the physically dangerous situations and tempts him/her perhaps to pathogenical and inappropriate body loads. On the other hand, the technique of dissociation can be used especially to eliminate negative sensations as for instance pain, exhaustion and fatigue, provided that makes any sense at all. As a mostly unconscious cognitive strategy (Morgan et al., 1987) in certain threatening situations this technique constitutes a decisive aid to overcoming them. Particularly in those moments of acute danger when efficient life-maintaining activities are required in spite of strong inhibitory pain.

Especially in these situations the basic human personality is finally a more decisive factor than the often recommended help of a learnable psychical training. Therefore it is not surprising that athletes of high performance often dispose of a higher pain tolerance (Connor, 1993) in connection with a certain, though sometimes a little one-sided, elitist personality. This simultaneously implies that specific genetic qualities are of great importance not only for the performance itself but also for the origin, the intensity of and the control over pain. This is made comprehensible by the considerable amount of genetic pain syndromes on all organs, which were listed in great detail by Witowski and Prokop O. (1983).

The gamut regarding the intensity of pain, as it can appear in sport, ranges from a decent, strictly limited indication of a small banal dysfunction to pain syndromes seizing large parts of the body also including colic leading to unconsciousness. Jung describes these troubles in great detail based on his investigations during a 100 km race (1981) and on his own experiences as a runner. The spectrum of painful troubles goes from massive pain in the articulations of the legs and back over disorders of the heart and respiration to life-endangering breakdowns caused by exhaustion.

These troubles put an end to any other deliberate exercise of the athlete, which is why only half of the participants of marathon competitions reach the finishing line. The same holds true for 21 hour races, endurance swimming competitions and similar extreme events in sport which only aim is an entry in the Guiness Book of Records regardless of all the damages. In all these cases the sense of pain lies in the enforcement of a cessation of the physical strain, which has become non-physical and eventually even life-endangering.

Pain tolerance in sport can be pushed deliberately too far leading to a masochistic, senseless and dangerous auto-destruction presuming a more or less evidently neurotic personality of the athlete. These borderline personalities are frequently found in high performance sport. On the other hand, the unconscious transgression of the physio-pathological limit in sport (Prokop, 1996) does not necessarily point at an abnormal personality structure of the athlete and often results from a specific situation in a competition only.

Such extreme loads reduce the numerous positive aspects of endurance training to absurdity, making this kind of sport a psychosomatic nonsense. In view of the absolutely binding principle "Primum nil nocere", we find it hard to understand that so called sport physicians in various functions, often omitting an exact and adequate evaluation of the athlete's capacity, additionally even help to put them in acute danger. In this connection the delayed injuries of the movement system have not yet been taken into account.

A certain difficulty in the evaluation of the significance of pain lies in the exact differentiation between disturbing troubles and real pain. This applies especially to some temporary organ sensations of the heart circulation system, the viscus and the movement system, which can be interpreted as specific troubles as well as pain and have to be coped with according to the situation during a competition and the daily form of the athlete affected.

Which means that this ambivalence makes an exact diagnosis very difficult for the responsible coach and sport physician. If they cannot even exclude simulation and dissimulation, the decision whether the athlete is fit for competition or not can pose a serious problem. Notwithstanding that fact research on pain in sport has got a big backlog of demand. Therefore reducing everything to black-and-white terms - pain tolerance as a risk and pain as an absolute contra-indication in sport - is hardly ever justified.

Consequently the responsibility of how to estimate pain and what conclusions for the sport activities of the athlete should be drawn rests on the doctor, the coach and also on the athlete himself. Anyhow, in the case of doubt sparing the athlete is always the better solution.

References

1. Appenzeller, O., Appenzeller, J., Standefer, J., Skiper, B., Atkinson, R. (1984). Opioida and endurance training. *Annuals Sports Med.*, 2,22.
2. Arentz, T., de Meirleir, J., Hollmann, W. (1986). Die Rolle der endogenen opioiden Peptide während Fahrradergometriearbeit. *Dtsch. Zschr. Sportmedizin*, 7.210.
3. Beck, D. (1975). Die Persönlichkeitsstruktur bei psychosomatischen Schmerzzustände am Bewegungsapparat. In: . A. Weintraub, R. Battegay, D. Beck, G. Kaganas, F. Labhordt, W. Müller (Eds.) *Psychosomatische Schmerzzustände des Bewegungsapparates.* Schwabe & Co Verlag Basel.
4. Connor, Patrick J.O. (1993). Psychologische Faktoren der Ausdauerleistungsfähigkeit. In R.J. Shepard and P.O. Åstrand (Eds.). *Ausdauer im Sport*, Köln: Dtsch.Ärzt-Verlag.
5. Farell, P.A. (1985). Exercise and Endorphins, male responses. *Med. Sci. Sports Exerc.*, 17, 89.
6. Greiter, F., Bachl, N., Prokop, L. (1976). Die Wirkung künstlichen Sonnenlichtsauf die Leistungsfähigkeit des menschlichen Organismus. *Österr. Journal F. Sportmedizin*, 6/4,3.
7. Jung, K. (1981). *Phänomen 100-km-Lauf.* München: Schwarzeck-Verlag.
8. Morgan, W.P., O'Connor, P.J., Sparling Pate R.R. (1987). Psychological Characterization of elite female distance funners. *Int. J. Sports Med.*, 8 (Suppl. 2), 124.
9. Pen, LJ and Fisher CA (1994). Athletes and pain tolerance. *Sports Med.,* 18, 5, 319.
10. Prokop, L. (1966). *Zur physiopathologischen Grenze im Sport.* Wien: WUV-Universitätsverlag.
11. Prokop, L. (1998). *Aufgabe Behindertensport.* Purkersdorf: Verlag Brüder Hollinek.
12. Schultz, J.H. (1932). *Das autogene Training.* Leipzig: G. Thieme Verlag.
13. Scott, D.S. and Barber, T.X. (1977). Cognitive controll of pain: Effects of multiple cognitive strategies. *Psychological Record*, 27, 373.
14. Summers, J.J., Machin, V.J., Sargent, G.I. (1983). *Psychological factors related to marathon running. Journal of Sport Psychology,* 5, 314.

15. Weintraub, A. (1975). Psychosomatische Schmerzsyndrome des Bewegungsapparates und ihre Konfliktspezifizät. In Weintraub, A., D. Beck, G. Kaganas, F. Labhardt, W. Müller (Eds.) *Schmerzsyndrome des Bewegungsapparates.* Basel, Stuttgart: Schwabe & Co Verlag.
16. Witkowski, R. and Prokop,O. (1983). *Genetik erblicher Syndrome und Miâbildungen.* Berlin: Academie-Verlag.

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