Insights in Blood Pressure

Extended Abstract
Vol. 4, Iss.1
2018

Fitness, COVID-19 and future pandemics: The sports medical mission of physical education.

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Abstract

COVID-19 has afresh called the eminent importance of the immune system to mind, as well as cardiorespiratory fitness and health-promoting life-styles. Within the broad spectrum of interventions physical exercise captivates by self-reliance, empowerment, sustainability and multifarious physiological 'co-benefits' – in a nutshell: a most human and efficient means to encounter pandemic threats. History of medicine demonstrates that pandemics are common, but differ in pathogenic conditions, distributions and severity, hence the necessity to take eventual pandemics into account: Fitness gains momentum and we have to re-think the term 'recreational sports'.

Control of pandemics requires efficient acute and preventative treatment, identification and support of risk groups – and strong immune defence in the entire population, which is of outstanding importance and greatly involves general fitness and health-oriented sports. In many countries schools are a viable (and the only) means to reach the whole (younger) population and to support personal growth. Taking immunological and epidemiological tasks into account, close collaboration between sports medicine and physical education is needed. Accordingly, the present research intends to encourage specific links between medicine and education and suggests a framework that is tailored to this complex challenge.

Systemic meta-synthesis is an enhanced model of meta-synthesis, which is usually considered a qualitative technique to generate hypotheses. By contrast, a systemic meta-synthesis is epistemologically controlled and creates so called 'powered hypotheses', which are more robust. The empirical strength of the components of this study made a systemic meta-synthesis possible, hence the pragmatic weight of the related theoretical framework. In general, systemic meta-synthesis is an appropriate means to hypothesise underlying mechanisms, suggest translational values and create multi-dimensional medical systems which greatly differ from the features of RCTs and meta-analyses and their rather narrow, though concentrated, focus.

Results. The wealth of scientific results in sports medicine and the technique of systemic meta-synthesis allow the construction of a theoretical framework and guidelines for physical education and mass sports to enhance the immune system, and thus to reduce the potential harm of future pandemics. Nonetheless, the huge impact of sports on the immune-system is not based on a singe direct function, and complex interrelationships involve the following perspectives:

Cardiorespiratory fitness. New data are emerging that exercise may reduce the risk of acute respiratory distress syndrome, a major cause of death in patients with COVID-19, and cardiorespiratory fitness as a protective factor against pro-inflammatory responses after infection by SARS-CoV-2 is discussed. A wealth of studies substantiates the relationship between endurance training, cardiorespiratory fitness, immune responses and health-related quality of life in both the healthy population and a broad spectrum of patients. Nonetheless, the role of the immune system in exercise is complex and challenging, and studies make clear that too little exercise can depress the immune system, while

This work is partly presented at 15th World Hematology & Immunology Congress, December 05-06, Lisbon, Portugal

excessive exercise can (also) lead to compromised immune system.

Metabolism. Overweight and high BMI have become a serious burden in the West and societies akin to Western life styles, and immunological research on obesity and the metabolic syndrome sheds light on their adverse impact on chronic disease progression, immune regulation and vaccine efficacy. Moreover, studies suggest that adipose expansion and chronic obesity trigger inflammatory programs and switch the immune system to proinflammatory state. Such findings call for physical exercise, as well as interdisciplinary collaboration between sports medicine, internal medicine, nutrition, educational systems and public health.

Mental health and stress management. Since the Hungarian-Canadian endocrinologist Hans Selye founded stress theory, clinical experiences have given rise to the hypothesis that there is a connection between stress and immune reaction, and psychoneuroimmunology (PNI) has been exploring key mechanisms how mental and psychosomatic stress cause immunological changes. Relationships and interdependencies are complex and involve dissimilar areas such as synaptic plasticity, epigenetics and the immune system, which are not disconnected, though. A wealth of data – also from narrative medicine – substantiate the positive effect of physical activities on mental health and sports are considered a viable means to regulate stress-levels, hence their immunological relevance.

Sports-identity and body-self. In spite of all these positive effects of sports and physical exercise, sustainable motivation for adherence is a frequent problem – both in preventive and in rehabilitative medicine. Interdisciplinary research focuses on individual preferences and specific health benefits of the various sports disciplines, and body-awareness, body-self and sports-identity come into play.

Sports as life-style. Longitudinal studies showed that regular physical exercise extends longevity and reduces the risk of physical disability and frailty. In the same breath, sports medicine points out that training intensity must be tailored to the athlete's physical conditions and training frequency matters. High risks and negative impacts of momentary physical exertion in individuals with low fitness levels and deficient strength are well known and relevant institutions recommend regular exercises and sports-oriented lifestyles. This translational challenge calls for intensified collaboration between research and practice.

Competence of self-adjustment. From the perspective of sports medicine there are ideal, insufficient and dangerous zones of training intensity. Beneath ideal zones activities are lacking in physiological training effects, above them they cause health risks. In school and mass sports respecting heart rates, e.g. according to the Karvonen formula, has become popular, although often interdependencies between training zones and individual conditions are ignored. Relationships between training intensities/frequencies and the immune system are less popular. Reasons seem self-evident: there are no such easily and clearly measurable parameters and immunity is less appealing than visible strength and fitness. Awareness of the interplay between sports and immune system is an educational challenge and appropriate self-adjustment competence is targeted.

The COVID-19 pandemic found global fame, while other epidemics and pandemics are commonly ignored or regarded as commonplace flu waves. COVID-19 has sharpened the general awareness of the immune system's importance and the time is ripe to go in for broad and sustainable sports activities and physical education to strengthen our immune systems.

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