

健康の維持・増進を目指した 運動処方の人およびラットにおける再検討

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Reconsideration of Exercise Prescription for Maintenance and Improvement of Health in Human and Rats

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ABSTRACT

Effects of exercise on the utilization of soleus muscle as the countermeasures for prevention of atrophy caused by inhibition of antigravity activity were studied in 7 healthy male subjects. Electromyogram (EMG) activities in soleus were recorded during 1) treadmill walking at 4 and/or 6 km/hr, with 0, 6, 10, and/or 15% uphill inclination, 2) cycling at 70, 130, and/or 170W, by pedaling using arch or front sole, and 3) weight lifting (isometric and/or squat push up) by whole sole or front sole. The greater EMG levels were observed, when the load was increased and the

subjects pedalled by front sole. EMGs were also greater, when the weight lifting was performed by using front sole than whole sole. These results clearly suggested that plantarflexion of ankle joints are essential for stimulation of soleus. As for the walking, two different patterns were noted. EMGs in subjects, who step on the floor using heel, were increased when the inclination and speed were elevated. But those in other subjects, who step on the floor using whole sole, were decreased when the work intensities were increased. It is suggested that the individual differences in the walking patterns should be considered for the prescription of walking exercise. Roles of afferent input on the regulation of protein expression in brain were also investigated in adult rats. Deafferentation was performed bilaterally at L4-6 segmental level of spinal cord. Expression of proteins related to glycolytic enzymes and inhibition of cell death was lowered in hypothalamus and thalamus by deafferentation. But the responses in hippocampal proteins were minor. It is suggested that afferent input, which is influenced by activity of leg muscles, plays an important role in the regulation of brain function.

要 旨

トレッドミル歩行や自転車エルゴメータ運動、膝伸展運動が、ヒトにおけるヒラメ筋活動に及ぼす影響を追求した。その結果、膝伸展および自転車エルゴメータ運動では、足関節の底屈が必須であることが示唆された。かかとから着地するヒトでは、歩行速度や登り勾配が増すほどヒラメ筋活動は増大したが、足裏前部で着地するヒトでは逆に減少した。歩行運動処方には個人の歩行パターンを考慮する必要があることが明らかとなった。また、脊髄 L4-6 における後根神経の両側切除が、脳タンパク質発現に及ぼす影響をラットで追求した。その結果、感覚神経切除 2 週間後、視床および視床下部における解糖系酵素発現、細胞死抑制因子等に関与するタンパク質発現が減少した。しかし海馬には大きな変化はなかった。脚筋活動の影響を受ける感覚神経を介した情報が、脳機能に重要な影響を及ぼすことが示唆された。