

# 児童期の習慣的な運動が 思春期後の力調節安定性に及ぼす影響

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## The Effect of Habitual Physical Activity on the Force Control in Children and Postpubertal Persons

by

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### ABSTRACT

The purpose of this study is to examine the effect of habitual physical activity on the force control (steadiness) in children and postpubertal persons. Nine children (9-11 yr) were assigned to the group who had habitual physical activity over 12-h per week (C-ACTIVE), and nine subjects (9-11 yr) were assigned to the group who did not have habitual physical activity (C-CONT). Eight postpubertal persons (18-22 yr) were also assigned to the group who had habitual physical activity over 12-h per week (Y-ACTIVE) from children, and seven subjects (9-11 yr) were assigned to the group who did not have

habitual physical activity (Y-CONT) from children. Subjects performed unilateral isometric contractions with the plantarflexor muscles to exert a steady force to match the target force at 2.5-20 % maximal voluntary contraction. Surface electromyogram (EMG) was recorded from the right gastrocnemius medialis (MG) and soleus muscles (SOL). The standard deviation (SD) of force and averaged EMG (aEMG) were calculated by the standard methods. The slope and y-intercept for the linear relation between the SD of force and mean force were compared between ACTIVE and CONT with an ANCOVA with mean force as a covariate using the individual data. The smaller SD of force in C-ACTIVE compared with C-CONT was confirmed by the smaller y-intercept in C-ACTIVE compared with C-CONT ( $p < 0.05$ , ANCOVA) and no differences in slope ( $P > 0.05$ , ANCOVA) in the linear relation between the SD and mean force. aEMG of MG in ACTIVE was significantly greater ( $p < 0.05$ ) than CONT at 5-10% MVC. There was no significant difference in EMG amplitude of SOL between groups except for 10% MVC. In contrast, there were no differences in SD of force and aEMG between Y-ACTIVE and Y-CONT. These data suggest that habitual physical activity reduces the fluctuations in plantar flexion force during steady contractions with respect to children. In addition, force fluctuations during plantar flexion are attenuated with greater activation level of the medial gastrocnemius muscle as suggested by our prior study (Shinohara et al. 2005).

## 要 旨

本研究は、児童期の運動習慣の有無が、児童自身および思春期後の力を精確に発揮する能力（力調節安定性）に及ぼす影響を明らかにすることを目的とした。対象は定期的な運動習慣がある児童（運動児童群：9名）と運動習慣がない児童（非運動児童群：9名）、および児童期より運動習慣が持続している18歳以上の若齢者（運動若齢群：8名）と児童期より運動習慣がない若齢者（非運動若齢群：7名）とした。課題動作は等尺性の足関節底屈動作とし、各被験者の最大筋力の2.5-20%を目標値とし、各目標値に対して力を精確に合わせる力調節試行を行った。その際、力、筋電図（腓腹筋内側頭およびヒラメ筋）を導出した。力調節安定性は、力の標準偏差から力変動として評価した。力調節試行時の力の標準偏差は運

動児童群の方が非運動児童群よりも有意に小さかった ( $p < 0.05$ , ANCOVA)。また、運動群の方が腓腹筋の筋活動量が高く、腓腹筋/ヒラメ筋活動比が有意に高かった ( $p < 0.05$ )。一方、18歳以上の若齢者においては運動習慣の有無による差はなかった ( $p > 0.05$ )。以上の結果から、18歳以後については本実験条件では運動習慣による差が認められなかったが、児童においては運動習慣は力調節安定性をより向上させており、児童期に定期的な運動を行うことは、神経・筋機能の発育・発達促進に有効であると考えられる。