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Highly reduced activity for 3 weeks impairs mood profile without affecting kynurenine pathway metabolites in the blood of healthy young individuals

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INTRODUCTION:

Low physical activity is one of the major health risk factors and it may also induce acute and long standing mood disturbances. Kynurenine pathway metabolites have been shown to associate with mood state and also respond to physical exercise. The aim of the present study was to reveal how plasma markers of kynurenine metabolism change in response to two 3-week phases of the intervention – severely limited activity followed by resumed activity plus additional physical exercise – in young healthy individuals.

METHODS:

Twenty-four healthy individuals (7 females) aged 25.6 ± 5.6 years volunteered to 6 weeks of intervention. During the first 3 weeks, activity was highly reduced using only forearm crutches for ambulation with one leg suspended (INACT). The following 3 weeks consisted of resumed activity plus additional supervised training sessions (mix of resistance and high intensity interval training, 3 to 6 sessions per week; ACT). At baseline and after both INACT and ACT, blood was collected for subsequent UPLC-MS/MS analysis of eight kynurenine pathway metabolites (Tryptophan, L-kynurenine, KYNA, QUIN, 3HK, Picolinic acid, Niacin, 3-Hydroxy anthranilic acid). Questionnaires for activity (IPAQ), anxiety/depression (HADS) and profile of mood states (POMS, 65 items) were assessed at the same occasions. Activity was monitored with activity bracelets.

RESULTS:

During INACT, activity was reduced ~7-fold on average (IPAQ score from 2200 to 300 MET min/week), and increased to ~4000 during ACT; average daily step count was ~1200 during INACT and ~7400 during ACT. During INACT, depression score on HADS scale tended to increase (3.3 to 5.5; $p=0.067$), while anxiety score did not change; however, HADS anxiety score was reduced with ACT compared to after INACT ($p=0.01$).

On POMS scale, depression (5.7 to 11.7; $p=0.025$), fatigue (4.8 to 9.5; $p=0.001$), confusion (4.8 to 7.0; $p=0.029$) increased, vigor decreased (18.7 to 15.9; $p=0.045$) and total mood disturbance (14.0 to 33.4; $p=0.020$) increased with INACT. Intriguingly, those subjects who developed mood disturbance with inactivity, were more active before the intervention according to their IPAQ report ($p<0.05$). All POMS scale scores fully restored to baseline with ACT.

None of the eight kynurenine pathway metabolites in the plasma changed significantly with either INACT or ACT. Some subjects developed depression according to HADS scale (mild – 1 case, moderate – 1 case, severe – 2 cases), by the end of INACT, but such developments were not reflected in the concentration of any of the kynurenine pathway metabolites.

CONCLUSION:

Severe voluntary restriction of activity for 3 weeks had substantial negative, but transient, impact on mood state in young healthy individuals. These changes were not accompanied by alterations in blood concentrations of kynurenine pathway metabolites.

Topic: Health and Fitness

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