Endogene Schmerzhemmung durch körperliche Aktivität

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Mechanisms of Exercise-induced Hypoalgesia

Opioid mechanisms

Peripheral mechanisms: enhanced levels of β-endorphin in the plasma; β-endorphin is released by the pituitary

Central mechanisms: Release of β-endorphin via the hypothalamus which has projections to the periaqueductal grey and activates descending inhibitory pathways

Non-opioid mechanisms

- Exercise may decrease disease activity
- Exercise may improve body mechanics
- Exercise may improve the affective-motivational component of pain (runner’s high)
- Exercise may improve social components
- Gate-control theory: myelinated afferents may inhibit nociceptive processing
- Activation of the corticospinal tract which may induce presynaptic inhibition
- Exercise may induce stress and evoke stress-induced analgesia
- Enhancement of blood pressure may reduce pain (baroreceptor activity inhibits pain)

Muscle pain was induced by two injections of acidic saline solution, pH 4.0, into the left gastrocnemius muscle; exercise: walking on a treadmill (15 or 30 min)

Reversal of mechanical hyperalgesia by exercise

Daily naloxone before exercise attenuated the antihyperalgesic effect of exercise

Healthy subjects:
Estimation of pain intensity (electrical stimulation of tooth and finger) at rest, 5-10 min after exercise, and 60 min after exercise

Exercise: cycle ergometer, stepwise increase by 50 Watt every 3 min, starting at 100 W
Time course of blood endocrine levels in the plasma following naloxone or placebo injections

Changes in pain threshold and changes in beta-endorphin levels were not significantly correlated with each other!!

Maximal possible effect of morphine, heat tail-flick test; Activity rats ran in activity wheels for 20 days prior to nociceptive testing

1: rats ran in activity wheels for 17 days prior to testing
2: Reversal of activity conditions
Pressure pain threshold at three assessment sites before, during cold pressure test, immediately after cold pressure test and 15 min after cold pressure test.

Pressure pain threshold at three assessment sites before, after 10 min bicycling, after 2 x 10 min bicycling, and 15 min after bicycling.

Pressure pain threshold at three assessment sites before, after first biceps contraction, after second biceps contraction, and 15 min after biceps contraction.

Pressure pain threshold at three assessment sites before, after first quadriceps contraction, after second quadriceps contraction, and 15 min after quadriceps contraction.
Conclusions:

Acute exercise evokes **multisegmental decrease** in pain sensitivity during and following exercise in healthy subjects. EIH larger in exercising body part.

Aerobic exercise produces hypoalgesic effect at moderate to high intensity for longer periods.

Isometric exercise produces EIH at low and high intensity, duration less important.

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