T15

Exercise and conditioned pain modulation have different effects on cuff pressure pain tolerance in humans

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Background/aims: Exercise and experimental pain is known to cause an acute decrease of the pain sensitivity. Assessment of pain inhibitory mechanisms is often done by paradigms of exercise and experimental pain in both healthy subjects and pain patients. It is currently unknown whether pain and different types of exercise has similar effects on pain sensitivity. The aim of the present study was to investigate the effects of experimental pain and different types of exercise on deep tissue pain tolerance in healthy subjects.

Methods: On two separate days fifty-four healthy subjects (23 females, 33.8 ± 15.0 years) were assigned in random order to cold pressor tests (ice water at 1–2 °C; 120 s duration) for the dominant hand and foot, bicycling exercises (100 W and 200 W; 20 min duration), and isometric contraction exercises (30% and 60% of maximal voluntary contraction, MVC; 180 s duration) of the dominant quadriceps and biceps brachii muscles. Before, immediately after, and 10 min after cold pressor tests and exercises, pressure pain tolerance (PTT) were assessed with computerized cuff-algometry at the non-dominant lower-leg and upper arm. Subjects reaching maximum stimulation intensity at baseline were excluded from the analysis. PTTs were analysed with repeated measures ANOVA and multiple comparisons.

Results: Immediately and 10 min after the cold pressor test in the dominant hand and foot significantly increased PTTs were found at the non-dominant upper arm and lower leg ($P < 0.05$). Both intensities of dominant biceps brachii isometric contractions produced a significant increase in the PTT at the non-dominant lower leg immediately after and 10 min after contractions ($P < 0.05$). After the 30% dominant quadriceps isometric contraction the PTT at the non-dominant lower leg was significantly increased ($P < 0.05$).

Conclusion: Cold pressor pain produced a contralateral and extrasegmental increase in deep tissue pain tolerance. Isometric arm exercise produced an extrasegmental increase in pain tolerance, whereas isometric leg contractions produced a contralateral effect. Aerobic exercise had no effect on pain tolerance. Thus, exercise and pain related inhibitory effects were not comparable.

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T16

Hyperalgesia in human skin and deep-tissues inside and outside of a UVB irradiated area

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Background/aims: The ultraviolet B (UVB) inflammatory pain model is often used to induce a steady hyperalgesic area in human skin. UVB causes a well-described erythema, developing maximal response within about 24 h. The aim of the present study was to investigate if cutaneous UVB irradiation can influence both superficial and deep-tissue mechanical pain thresholds in the site of irradiation and in the surrounding area.

Methods: An area of 3 cm × 4 cm, located on the low back of 16 healthy volunteers, was irradiated by UVB (Medlight, Germany; 3xMED: Minimal Erythema Dose). The degree of inflammation was detected by measuring superficial blood flow before and after irradiation, inside and outside the stimulated area. Applying quantitative sensory assessments, mechanical pain threshold changes were detected one day after irradiation, within and outside of the irradiated area. Sensitivity to cutaneous mechanical stimuli was assessed using pin prick and deep-tissue pressure pain thresholds were evaluated on 12 spots (4 within and 8 outside, 1.5 cm distant from the irradiated area) by a computer-controlled pressure algometer (Aalborg University, Denmark; 1.0 cm^2 flat probe, 0.5 cm^2 flat probe and a V-shaped probe with a contact surface of 0.03 cm^2).

Results: 24 h after exposure, the irradiated skin showed clear erythema with a boundary matching the irradiated area and a statistically significant increase in cutaneous blood flow ($P < 0.001$) compared with baseline assessment. Cutaneous pin prick pain thresholds and deep-tissue pressure pain thresholds (all probes) were significantly decreased inside and outside the irradiated area ($P < 0.05$).

Conclusions: Cutaneous UVB irradiation reduces mechanical pain thresholds to pin-prick and pressure stimulation which may indicate allodynic responses in both the skin and in deep-tissues. Expansion of the responses to areas outside the irradiated zone confirmed the presence of secondary hyperalgesia to mechanical stimuli.

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T17

Effect of experimental jaw muscle pain on bite force during mastication

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Background/aims: Muscular pain often impairs masticatory function in Temporomandibular disorder patients. The specific aim of this study was to investigate how the bite force during mastication is influenced by experimental muscle pain caused by infusion of glutamate into the masseter muscle.

Methods: 12 healthy adults participated, after providing informed consent. Customized metal frames of the intraoral bite force sensor were manufactured for all subjects, and placed on their preferred chewing side. To induce experimental pain, a sterile solution of glutamate (0.5 M) was infused into the posterior part of the masseter muscle. Isotonic saline (0.9%) was infused as a control (randomized, cross-over design). During chewing three different kinds of test food (two different size carrots and gummy), bite force, electromyographic (EMG) activity of bilateral masseter muscle and anterior temporalis muscle were recorded. The first and last five masticatory cycles were used for analyses. The outcome parameters were as follows; Visual Analog Scale (VAS) for pain, impulse and duration from the bite force signal, duration and amplitude of EMG. Three-way ANOVAs with food (3 levels), sessions (5 levels: baseline, during glutamate, baseline 2, during isotonic saline, follow-up), cycles (2 × 5 levels) were carried out.

Results: Glutamate caused moderate levels of pain (mean VAS: 2.4 ± 0.9) whereas isotonic saline only caused low levels of pain