Title: Chronic Low Back Pain and Meditation
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Sample Size Determination: Our targeted sample size is 60 cLBP patients (30/group). To conduct group comparisons among the two primary outcomes (naloxone + saline induced changes in pain ratings) and to ensure an overall type I error rate < 0.05, we used conservative Bonferroni corrections in all power calculations. Employing the pilot data corresponding to our previous work (Wells et al., 2020), we fit repeated measures ANOVA models that include indicator variables for group (mindfulness vs. non-mindfulness) and session (baseline vs. naloxone vs. saline). The estimated square root of mean square errors is 0.23 (23%) for pain ratings. Thirty subjects will provide 80% power to detect a pain rating difference of 22% between the naloxone and saline conditions in the non-mindfulness group with an estimated SD of 0.3 (30%). We expect no meaningful differences in pain reductions between naloxone and saline infusion during mindfulness meditation. Thus, we will have 80% power to detect a significant group X drug type interaction. Finally, 30 subjects/group will provide 80% power to detect a significant group difference of 19% for pain intensity. Such effect sizes parallel those observed in our pilot data (Wells et al., 2020).

Primary outcomes

- Numerical pain ratings while lying in the supine and in response to the straight leg raise test (SLR), respectively.

Secondary outcomes

- Brief Pain Inventory (BPI): interference and severity measures of chronic low back pain.

- Pain Catastrophizing Scale (PCS): This is a 13-item assessment derived from definitions of catastrophizing. The PCS yields a total score and three subscale scores assessing rumination, magnification, and helplessness in subjects.

- Roland-Morris Disability Questionnaire (RMDQ): This is a critical assessment for the chronic low back pain phenotype and was recommended for use by the NIH.

- PROMIS 29-Item Profile: This is a 29-item generic health-related survey that assesses the following 7 domains: depression, anxiety, physical function, pain interference, fatigue, sleep disturbance, and ability to participant in social roles/activities.

Exploratory outcome

- SF-12 Health Survey (SF-12): This is a 12-item version of the SF-36 item Health Survey designed to assess general mental and physical functioning, and overall health-related quality of life.

Statistical Analysis Plan: To test the primary hypotheses, a 2 (group) X 2 (rest vs. manipulation) X 3 (baseline vs. naloxone vs. saline) mixed model ANOVA will be employed to test differences in the change in pain from supine to straight leg raise test (SLR 1; SLR 2) within and across each testing session. Significant interactions will be explored using post-hoc paired simple effects tests to test the hypotheses that non-mindfulness meditation but not mindfulness induced analgesia will be reversed by administration of naloxone but not saline. Between group comparisons will also be explored with simple effects tests.

Secondary and exploratory outcomes will be assessed with a 2 (group) X 2 (baseline vs. post-intervention) by testing between and within group differences comparing baseline vs. post-study assessments. Simple effects tests will interpret significant main effects and interactions.

Wells RE, Collier J, Posey G, Morgan A, Auman T, Strittmatter B, Magalhaes R, Adler-Neal A, McHaffie JG, Zeidan F (2020) Attention to breath sensations does not engage endogenous opioids to reduce pain. Pain 161:1884-1893.