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Psychophysical Tests as Predictors of Back Pain Chronicity in Primary Care

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Abstract: **If persons at risk of developing chronic pain could be identified early in a pain episode, treatment could be tailored on the basis of risk. Responses to psychophysical tests differ in persons with chronic pain vs pain-free controls and thus appear promising as indicators of susceptibility to chronic pain. In a cohort of 157 patients making their first primary care visit during a back pain episode, we explored the relationships of psychophysical test responses (pressure pain thresholds at low back and thenar sites, cold pressor pain ratings, conditioned pain modulation, and mechanical temporal summation) to baseline measures of pain and psychological distress and assessed whether test responses predicted clinically significant back pain 4 months later. Examiner-standardized pressure pain thresholds were significantly ($P < .05$) correlated with baseline back pain severity and diffuseness of bodily pain (Pearson correlations = −.21 to −.35). Lower baseline pressure pain thresholds significantly predicted back pain at 4 months (odds ratio [95% confidence interval]: low back, .66 [.44, .96]; thenar, .62 [.40, .92]); however, after controlling for participant age and sex, these associations were no longer significant. Cold pressor pain, conditioned pain modulation, and mechanical temporal summation were not significant predictors of 4-month back pain in either model.**

Perspective: ***Some psychophysical test responses have been found to differ in persons with chronic pain vs pain-free controls. In this prospective study, psychophysical test responses had limited utility for predicting which primary care back pain patients would have clinically significant chronic pain 4 months later.***

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Key words: *Back pain, chronic pain, conditioned pain modulation, pressure pain thresholds, mechanical temporal summation.*

An estimated 30% of U.S. adults are currently experiencing a chronic pain problem that has lasted 6 months or more.[11] Back pain is the most prevalent chronic pain problem, affecting 8% of the population.[11] Initial treatment for back pain frequently occurs in primary care settings. Although most patients presenting with back pain in primary care improve significantly over the next few months, a substantial minority have persistent, high-intensity pain that can interfere with daily activities.[30] If persons at high risk for chronic back pain could be identified during their initial primary care visits, treatment could be tailored to the level of individual risk. For example, more intensive, multidisciplinary interventions might be offered to those at high risk of developing chronic pain, whereas short-term pain management and reassurance that back pain was likely to improve could be offered to patients at low risk. A risk-stratified approach has been shown to result in improved back pain outcomes and lower costs of care.[10]

Researchers have begun to investigate whether psychophysical tests, such as tests of conditioned pain modulation (CPM, sometimes called diffuse noxious inhibitory controls), can distinguish persons at high risk for chronic pain.[5] However, few prospective studies have examined the utility of these tests for predicting the course of clinical pain among patients presenting for care of common musculoskeletal pain conditions.

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Cross-sectional investigations indicate that patients with certain chronic pain conditions differ from pain-free controls in their responses to traditional psychophysical pain sensitivity tests (eg, pain threshold, pain tolerance), with chronic pain patients generally being more pain sensitive.[7,14] Studies using dynamic tests of pain modulation, assessing excitatory (temporal summation) and/or inhibitory (CPM) mechanisms, have found impaired pain modulation in persons with fibromyalgia,[18,23] irritable bowel syndrome,[9,14] temporomandibular disorders,[14] and chronic tension-type headache.[1,24] However, smaller studies of other chronic pain conditions (eg, trapezius myalgia,[19] rheumatoid arthritis,[20] and vestibulodynia[12]) found no significant differences in efficiency of CPM between chronic pain patients and controls.

Some prospective studies have found that individual differences in responses to psychophysical tests are predictive of subsequent clinical pain conditions. For example, preoperative pain sensitivity tests may predict levels of acute postoperative pain[8,22]; low cold pressor pain tolerance 1 week after whiplash injury was associated with failure to return to one's usual level of activity/work at 1 year[13]; and a summary score of pain sensitivity across several stimulus modalities predicted the onset of temporomandibular pain in young women who were pain-free at baseline.[3] CPM, assessed preoperatively in patients about to undergo thoracotomy, was found to be a strong predictor of chronic postoperative pain approximately 6 months later.[31] However, the literature on using psychophysical tests prospectively to predict clinical pain is limited.

The aims of the current study were to explore, in a cohort of patients making their first primary care visit during an episode of back pain, 1) the relationships of psychophysical test responses to self-report measures of pain and psychological distress at baseline; and 2) the degree to which these baseline psychophysical tests predicted the presence of clinically significant back pain at 4-month follow-up. If psychophysical test responses are predictive of significant pain at follow-up, care could be tailored (ie, risk stratified) such that resources could be directed toward those patients most likely to experience an unfavorable outcome, with those at low risk receiving less intensive interventions. As this was a hypothesis-generating pilot study, we examined a range of candidate psychophysical tests previously reported to be associated with chronic pain.

Methods

Study Sample

This study was conducted at Group Health, an integrated health plan in Washington State. All study procedures were approved by the Group Health Research Institute (GHRI) institutional review board. As part of a larger project assessing predictors of back pain chronicity,[26] daily searches of Group Health automated data files were conducted to identify patients who were potentially eligible for the study based on Group Health enrollment information, age, diagnoses, and back pain visit and surgery data. Participants were Group Health members in the greater Seattle area, age 18 to 64 years, who made a visit for back pain (index visit) to a Group Health primary care physician, physician assistant, or osteopath. We identified back pain visits using a previously developed[2] algorithm based on *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnostic codes. The algorithm identifies visits for "mechanical low back pain" (ie, pain not due to neoplastic, infectious, or inflammatory cause or associated with pregnancy or major trauma). Participants were required to have been enrolled in Group Health continuously for at least 2 years prior to the index visit, with no medical visit for back pain (as defined above) recorded in any Group Health automated data files in the year prior to the index visit. Exclusion criteria were as follows: 1) inability to participate in a telephone interview (eg, due to speech or hearing impairments or inability to speak English); 2) pregnancy; 3) treatment for cancer (other than nonmelanoma skin cancer) in past year; 4) prior back pain–related surgery; and 5) diagnosis of Parkinson's disease or multiple sclerosis. Additional exclusion criteria for participation in the psychophysical testing phase of the study were 1) sickle cell anemia, hemophilia, or any other blood disease; 2) history of lymph node removal; 3) lack of normal sensation in either hand or arm; and 4) having been instructed by a physician not to exercise or participate in strenuous activity. There were no specific inclusion or exclusion criteria based on whether the participant had experienced previous episodes of back pain.

Data Collection

Baseline Telephone Interview

After mailing a study introduction letter with a $2 preincentive payment, GHRI survey staff telephoned potential study participants. Attempts to contact participants began as soon as the letter was mailed and continued for up to 14 days following the index visit. (Because we wanted to collect the baseline data close to the index visit, patients who could not be reached within 14 days after the index visit were considered ineligible.) Upon reaching potential participants within the 14-day window, the interviewers explained the study, verified study eligibility, and obtained and documented oral consent from patients who agreed to enroll in the study. Study participants then completed the baseline telephone interview, for which they were compensated $10.

In-Person Psychophysical Assessment

At the end of the baseline interview, participants were invited to complete psychophysical tests at an in-person visit at the University of Washington. At certain times during the study, more participants were completing baseline interviews than could be seen at the research clinic in a timely manner. During these periods, participants to be invited for the psychophysical testing session were sampled at random. Individuals who were invited

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