

Reduction of Bodily Pain in Response to an Online Positive Activities Intervention

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Abstract: Inducing temporary positive states reduces pain and increases pain tolerance in laboratory studies. We tested whether completing positive activities in one's daily life produces long-term reductions in self-reported bodily pain in a randomized controlled trial of an online positive activities intervention. Participants recruited via the Web were randomly assigned to complete 0, 2, 4, or 6 positive activities administered online over a 6-week period. Follow-up assessments were collected at the end of 6 weeks and at 1, 3, and 6 months postintervention. We used linear mixed effects models to examine whether the intervention reduced pain over time among those who had a score <67 on the bodily pain subscale of the Short Form-36 at baseline (N = 417; pain scores range from 0 to 100; higher scores indicate less pain). Mean pain scores improved from baseline to 6 months in the 2-activity (55.7 to 67.4), 4-activity (54.2 to 71.0), and 6-activity (50.9 to 67.9) groups. Improvements were significantly greater ($P < .05$) in the 4-activity and 6-activity groups than in the 0-activity control group (54.1 to 62.2) in unadjusted and adjusted models. This study suggests that positive activities administered online can reduce bodily pain in adults with at least mild to moderate baseline pain.

Perspective: This study demonstrates that teaching people simple positive activities can decrease reported levels of bodily pain; moreover, these activities can be administered over the internet, a potential avenue for broadly disseminating health interventions at relatively low costs and with high sustainability.

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Key words: Pain management, internet, intervention studies, mind-body therapies, happiness.

Improving pain management is a public health priority at the national level.^{18,21} Recommended strategies for transforming pain management include taking a more interdisciplinary approach to pain manage-

ment and exploring new pain therapies.^{18,21} New approaches to pain management should be informed by the biopsychosocial model of pain, which takes into account that pain is determined by the interaction of biological, psychological, and social factors.^{11,33} For example, negative emotional states, such as anxiety or depression, can predispose one to pain, intensify or prolong experiences of pain, and arise in response to pain.^{10,11} Research has also shown that people with chronic pain who have more social support, or are more satisfied with the social support available to them, develop less pain-related disability⁶ and exhibit fewer pain behaviors.¹² Given the demonstrated interplay between psychosocial factors and pain, it is important to explore whether pain can be reduced through novel interventions targeting psychosocial factors.

The current study explores whether pain is reduced following a psychosocial intervention from the field

Received September 20, 2013; Revised January 24, 2014; Accepted February 9, 2014.

This study used data collected by Acacia Parks, Martin Seligman, and Stephen Schueller with support from the Positive Psychology Center at the University of Pennsylvania.

L.R.M.H.'s effort on the project was supported by the Veterans Affairs Health Services Research and Development Career Development Program (RCD 06-287).

The authors have no conflicts of interest to report.

The views expressed here are those of the authors and do not represent those of the Department of Veterans Affairs or the United States Government.

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1526-5900/\$36.00

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<http://dx.doi.org/10.1016/j.jpain.2014.02.004>

of positive psychology. Positive psychology focuses on promoting health by increasing positive emotions and behaviors rather than treating negative symptoms.^{29,31} Numerous positive psychology studies have shown that well-being can be increased through a variety of simple, evidence-based positive activities.^{19,31,32} Examples of positive activities that improve well-being include exercises involving gratitude, kindness, optimism, mindfulness, identifying and using personal strengths, reflecting on good things, forgiveness, or some combination thereof.^{19,32} The commonality across effective positive activities is that they increase one or more core components of subjective well-being: feelings of pleasure, engagement with the surrounding environment, and/or meaning in one's life.³¹

Studies testing the health effects of positive activities have mostly examined outcomes such as well-being or depressive symptoms, and report improvements in these outcomes in both depressed and nondepressed populations.³² Observational and experimental evidence suggests that completing positive activities may also reduce pain, in that experiencing pleasurable engagement with the environment (eg, feeling joy, excitement, or contentment) is associated with numerous positive physical health outcomes, including reduced pain and greater pain tolerance.^{26,31} For example, in adults with chronic pain in a long-term facility, watching a funny movie was associated with decreased self-reported pain and decreased pain medication.¹ An observational study also found that patients with high self-reported levels of positivity had better functioning (eg, faster walking speed) 2 years following a hip fracture than those who reported less positivity when the fracture occurred.⁸ Previous studies examining the impact on pain of being positive have examined the short-term impact of completing a single positive activity in an experimental setting or relied on observational data to examine the association of naturally occurring positive states with outcomes. We are aware of no prior studies that test the long-term impact of completing multiple positive activities in individuals with at least mild to moderate pain.

The current study addresses this gap using data from a randomized controlled trial designed to test the effect of an online positive activities intervention on depressive symptoms in a convenience sample of internet users who visited a positive psychology Web site.²⁷ Volunteers, regardless of depressive state, were randomly assigned to complete 0, 2, 4, or 6 evidence-based positive activities over a 6-week period. In this secondary data analysis, we examine the effect of the online positive activities intervention on bodily pain in the subset of participants who reported at least mild to moderate pain at baseline. We hypothesize that participants randomly assigned to complete 2, 4, or 6 positive activities will show greater reductions in bodily pain after the intervention compared with those assigned to a 0-activity control group.

Methods

Study Design

We conducted secondary analyses of data from a randomized controlled trial of an online positive activities intervention to examine change in bodily pain among participants who reported bodily pain at baseline. The Institutional Review Board at the University of Pennsylvania approved the study protocol.

Parent Study

Data were drawn from a parent study designed to test the feasibility of disseminating a positive activities intervention online and to test whether the number of activities offered to participants (0, 2, 4, or 6) affected adherence and outcomes.²⁷ The online version of the intervention was adapted from an established Positive Psychotherapy (PPT) program that included multiple activities delivered by a trained clinician in group psychotherapy sessions over multiple weeks.^{27,30} The goal of the online parent study was to provide "proof of concept" that the activities in the PPT program could be delivered more simply, without a clinician or in-person interactions, and still be effective. To provide maximum comparability between the online study and the original PPT program, activity instructions were adapted so that they could be delivered online, but the overall content and order of activities from the original program were preserved. Full details of the parent study procedures and primary study findings are available elsewhere.²⁷ Further details pertinent to this secondary analysis are provided below.

Participants

Participants were recruited for the parent study via a Web-based research portal hosted by the University of Pennsylvania's Positive Psychology Center and advertised in the book *Authentic Happiness*.²⁸ The parent study was described as a research study on positive psychology exercises and was accessible through links placed on the websites www.authentichappiness.org and www.ppresearch.sas.upenn.edu. Participants included all internet users who voluntarily visited the research portal, reviewed a description of the parent study, and consented to participate by providing an electronic signature. No additional inclusion or exclusion criteria were required to enroll in the parent study.

The purpose of the current study was to examine the impact of the intervention on bodily pain, which was assessed as a secondary variable. Because the presence of pain was not an inclusion requirement for the parent study, it was necessary to restrict the analytic sample for the current study to those with at least mild to moderate pain at baseline to be able to examine change in pain over time (see Study Measures for details on how pain was measured).

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