

Current Smoking as a Predictor of Chronic Musculoskeletal Pain in Young Adult Twins

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Abstract: Chronic pain is common during adolescence and young adulthood and is associated with poor quality of life, depression, and functional disability. Recognizing that chronic pain has significant consequences, it is important to identify modifiable health behaviors that may place young adults at risk for chronic pain. This study examines associations between chronic musculoskeletal pain and smoking in young adult twins (n = 1,588, ages 18–30) participating in a statewide twin registry. Twins completed questionnaires assessing smoking, mood (anxiety, depressive symptoms, and stress), and chronic musculoskeletal pain. Analyses examined associations between chronic pain and smoking, particularly the role of genetics/shared familial factors and psychological symptoms. As predicted, results revealed a near-2-fold increased risk for chronic musculoskeletal pain in twins who currently smoked compared to nonsmokers, even when accounting for psychological factors. Results of within-pair analyses were only minimally attenuated, suggesting that associations between smoking and chronic musculoskeletal pain are better accounted for by nonshared factors than by shared familial factors/genetic effects. Future twin research is needed to identify what nonshared factors (eg, attitudes, direct effects of smoking on pain) contribute to these associations to further understand comorbidity. Longitudinal studies and recruitment of participants prior to smoking initiation and chronic pain onset will better identify causal associations.

Perspective: This article describes associations between musculoskeletal pain and smoking in young adult twins, taking into account psychological symptoms. Findings highlight the importance of nonshared factors in associations between pain and smoking and the need to explore the roles of lifestyle, individual attitudes, and direct effects of smoking on pain.

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Key words: Chronic pain, smoking, twins, young adult.

Chronic pain is common during adolescence and young adulthood^{6,14} and is associated with poor quality of life, depression, and functional disability.^{26,27,54,60} Musculoskeletal pain is of particular concern and is the chief complaint at approximately 30% of primary care visits in individuals aged 20 to 39 years.³³ Recognizing that chronic pain has significant

socioeconomic consequences (eg, lost work productivity)⁵¹ and costs to the health care system,³⁴ it is important to identify modifiable health behaviors that may place young adults at risk for chronic pain.

Smoking prevalence and initiation is highest during young adulthood,^{4,19} making it a behavior of interest when examining risk for chronic pain. Research has shown that smoking is associated with concurrent pain intensity and pain-related disability across the life span, such that individuals with chronic pain who smoke have higher pain and greater pain-related functional impairment than nonsmokers.^{26,36,38,54,57,60} Associations among smoking and pain are particularly strong in younger populations, with the strongest associations between smoking and back pain occurring during adolescence.⁴⁹ Compared to nonsmokers, young adults who smoke are at increased

Received January 16, 2013; Revised April 8, 2013; Accepted April 18, 2013. This work was partially supported by grants from the National Institutes of Health to A.L.H. (NIH/NICHD K23HD071946) and to T.M.P. (NIH/NICHD K24HD060068).

The authors have no conflicts of interest to report.

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1526-5900/\$36.00

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<http://dx.doi.org/10.1016/j.jpain.2013.04.012>

odds for temporomandibular disorders⁴⁵ and recurrent headaches.⁵⁵ Moreover, smoking is associated with multiple pains³⁷ and is a risk factor for the development and persistence of pain over time.^{16,35}

Several explanations have been put forth concerning associations between smoking and chronic pain across the life span. Smoking can lead to physiological changes (eg, downregulation of the hypothalamic pituitary axis) that may increase pain sensitivity and pain perception, accelerate bone degeneration, and lengthen healing time (see review⁴⁸). Psychological factors have also been implicated, such that individuals with chronic pain may initiate or continue smoking to cope with pain and distress.^{11,12,39}

Research has examined psychological factors associated with both pain and smoking, particularly anxiety and depression. Individuals with comorbid chronic pain and depression have a higher incidence of smoking compared to those without comorbidity (see review⁴⁹), and adults with chronic pain who smoke have higher levels of depression²⁴ and greater suicidal ideation¹⁸ than nonsmokers. Moreover, in one study of young adults, adjusting for anxiety and depression attenuated associations between chronic pain and smoking,²³ suggesting that psychological factors contribute to this relationship.

The role of genetics in associations between smoking and pain has also been explored, with individual genes implicated in both smoking initiation^{32,46} and chronic pain development.^{7,13} Studies employing twin-control designs have been conducted to clarify the role of familial factors/shared genetics in associations between smoking and chronic pain. Two studies, both utilizing back pain samples, examined these associations among adolescents and young adults.^{22,31} Results supported prior nontwin research, showing higher incidence of back pain in individuals who smoked. Twin-control analyses did not reveal a strong contribution of shared familial factors/genetics to associations, suggesting that nonshared factors may play a greater role.

The current study extends previous young adult twin research by examining associations between smoking and chronic pain using a broader musculoskeletal pain sample and taking into account psychological factors. Although previous research has accounted for psychological factors in associations between pain and smoking (eg,^{23,62,63}), none were twin-study designs. Specifically, we sought to 1) identify whether familial factors (common environment and shared genetics) significantly contribute to associations between smoking and chronic musculoskeletal pain in young adult twins and 2) examine associations between pain and smoking while accounting for the contributions of stress, anxiety, and depression. A diverse pain sample was chosen because although back pain is common, pain at other sites (eg, neck, knee) accounts for up to 70% of musculoskeletal pain complaints.^{25,40} Identifying how health behaviors like smoking are associated with chronic pain in young adults will inform the limited research base on modifiable factors that predict the development and persistence of chronic musculoskeletal pain.

Methods

Sample

Young adult twins taking part in this study were participants (ages 18–30 years) from the University of Washington (UW) Twin Registry. The registry consists of a community sample of twins recruited using information from Washington State department of motor vehicle licensing records. All individuals (18 years and older) applying for new driver's licenses in Washington State are asked to indicate if they are a part of a twin pair to avoid issuing duplicate licenses. Lists of all individuals identified as being part of a twin pair are sent to the UW Twin Registry research staff and the eligible twins are sent a letter inviting them to join the registry and to complete a survey of demographic information, health history, and health behaviors. Respondents to the 2008 and 2010 surveys were included in the current study. The paper-based survey was sent to participants' homes and returned via mail to the research team. The survey consists of approximately 200 items assessing participants' health, emotions, lifestyle habits, pain, and history of medical problems. Only a portion of the survey was analyzed in the current study. Because the focus of the current study was young adults, only twins 30 years and younger were selected for inclusion. All data collection procedures were approved by the local Institutional Review Board and informed consent was obtained for use of health survey data. A more detailed description of the UW Twin Registry is published elsewhere.^{1,52} Recent publications from this database have focused on associations between chronic pain and obesity,⁵⁹ sleep and body mass index,⁵⁶ and depression and migraine.⁴⁷

Measures

Sociodemographic Characteristics

Participants completed several items that assess sociodemographic factors, including age, sex, education, income, race, and zygosity. Zygosity was determined using participants' self-report, including responses to questions on childhood similarity. This method of zygosity assessment has been utilized in other twin research studies with demonstrated accuracy (95–98%) when compared to biological indicators of shared genetics.⁴¹

Chronic Musculoskeletal Pain

Participants were asked to indicate whether or not they had experienced pain in "muscles, joints, or bones" that lasted 3 months or longer. Twins who responded yes to this prompt were classified as being positive for chronic musculoskeletal pain.

Current Pain

Participants rated current pain intensity using an 11-point numerical rating scale (NRS; 0 = no pain to 10 = severe pain), responding to the prompt "Please indicate to what extent you have experienced pain over the past 4 weeks."

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