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Subjective social status moderates back pain and mental health in older men

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Abstract

Objectives: Back pain and poor mental health are interrelated issues in older men. Evidence suggests that socioeconomic status moderates this relationship, but less is known about the role of subjective social status (SSS). This study examined if the association between back pain and mental health is moderated by SSS.

Method: We used a sample of community-dwelling older men (≥65 years) from the Osteoporotic Fractures in Men Study (*N*=5994). Participants self-reported their back pain severity and frequency over the past 12 months. SSS was assessed with the MacArthur Scale of SSS. Mental health was assessed with the SF-12 Mental Component Summary (MCS).

Results: Severe back pain was associated with lower SF-12 MCS scores ($p = .03$). Back pain frequency was not associated with SF-12 MCS scores. SSS moderated the back pain and mental health relationship. Among men with higher national or community SSS, the association between back pain severity and SF-12 MCS scores was not significant. However, among men with lower national or community SSS, more severe back pain was associated with lower SF-12 MCS scores (p'$s < .001$). Among those with lower national or community SSS, greater back pain frequency was also associated with lower SF-12 MCS scores (p'$s < .05$).

Conclusion: Where one ranks oneself within their nation or community matters for the back pain and mental health relationship. Higher SSS may be a psychosocial resource that buffers the negative associations of severe and frequent back pain on mental health in older men.

Keywords

Cross-sectional; SF-12 Mental Component Summary; perceived social class; social comparison theory; social determinants of health

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Disclosure statement

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Introduction

Back pain is a leading cause of disability in adults and poses substantial economic burden (Baumeister, Knecht, & Hutter, 2012; de Souza et al., 2019; Ferguson et al., 2019; Hoy et al., 2014). The current time trend of back pain prevalence in the United States is expected to increase due to advancing age, increasing adiposity, chronic conditions, and sedentary behaviors (Bento et al., 2020; Hwang, Louie, Phillips, An, & Samartzis, 2019; Wong, Karppinen, & Samartzis, 2017). Men are at risk of developing back pain because they are more likely to engage in physically demanding activities and less likely to utilize healthcare services (Bento et al., 2020; Wong et al., 2017). Degraded health associated with back pain can be serious and the consequences of back pain in older men include increased risk of falls (Kherad et al., 2017; Marshall et al., 2017; Munch et al., 2015), depressive symptoms (Kherad et al., 2017; Stubbs et al., 2016; Wong et al., 2017), social isolation (Kherad et al., 2017; Stubbs et al., 2016; Wong et al., 2017), and anxiety (Cedraschi, Luthy, Allaz, Herrmann, & Ludwig, 2016; Stubbs et al., 2016), all of which are related to mental health.

Comorbidities between chronic pain and poor mental health like depression are common among older adults (Calvo-Perxas, Vilalta-Franch, Turro-Garriga, Lopez-Pousa, & Garre-Olmo, 2016; Zis et al., 2017). While there is some evidence that back pain and mental health have a bidirectional relationship (Hurwitz, Morgenstern, & Yu, 2003; Wong et al., 2017; Zis et al., 2017), several longitudinal studies have found that back pain often precedes poorer mental health (Calvo-Perxas et al., 2016; Hurwitz et al., 2003; Reyes-Gibby, Aday, & Cleeland, 2002). The pain and mental health relationship can be further complicated by socioeconomic status (SES). For instance, low-income individuals may have more pronounced back pain and poorer mental health compared to high-income individuals (Ikeda et al., 2019; Stubbs et al., 2016). This may be a consequence of more labor-demanding occupations, financial strain, and limited access to affordable and adequate healthcare (Ikeda et al., 2019; Stubbs et al., 2016). Apart from the direct effects of SES, there may be an additional psychosocial component associated with SES influencing the pain and mental health relationship (Adler et al., 1994; Wetherall, Robb, & O'Connor, 2019). Social comparison is the instinctive process of comparing oneself to others, and it is associated with health outcomes (e.g. psychological distress, depressive symptoms) even after controlling for SES (English, Bellingtier, & Neupert, 2019; Euteneuer, 2014; Hoebel & Lampert, 2020; Schubert, Sussenbach, Schafer, & Euteneuer, 2016; Singh-Manoux, Marmot, & Adler, 2005). One way to measure social comparison is with the MacArthur Scale of Subjective Social Status (SSS; Adler & Stewart, 2007). Building on the social comparison theory, which highlights the importance of SSS in health (Festinger, 1954; Hoebel & Lampert, 2020; Zell, Strickhouser, & Krizan, 2018), the current study examines whether back pain and mental health is moderated by SSS among older men.

Researchers have theorized that social comparison serves an evolutionary function for survival to increase competition for resources and increase physiological stress responses (Adler et al., 1994). Studies have found that those who perceive themselves as lower in society are more likely to report lower self-rated physical and mental health (Hoebel & Lampert, 2020; Zell et al., 2018), become sick (Cohen et al., 2008), have depressive symptoms, and ruminate (Schubert et al., 2016). SSS is closely related to, but distinct from

SES indicators, such as income (Ikeda et al., 2019; Stubbs et al., 2016) and education (Ikeda et al., 2019; Kherad et al., 2017; Stubbs et al., 2016). Compared to objective SES, SSS captures more complex feelings of financial stability, social mobility, and future opportunities (Adler & Stewart, 2007; Cook, Tseng, Tam, John, & Lui, 2017; Cundiff & Matthews, 2017; English et al., 2019; Gong, Xu, & Takeuchi, 2012; Hoebel & Lampert, 2020; Schubert et al., 2016; Tan, Kraus, Carpenter, & Adler, 2020; Wetherall et al., 2019). SSS may be a better predictor of health outcomes compared to objective measures of SES (Euteneuer, 2014; Singh-Manoux et al., 2005) because SSS taps into feelings of relative deprivation which may increase negative emotions and stress despite not truly being deprived of resources (Cundiff & Matthews, 2017; Hoebel, Maske, Zeeb, & Lampert, 2017). Relative deprivation occurs when an individual, who is objectively well-positioned (as measured by SES indicators like education), has an inaccurate perception of their true social standing due to their social environment and internalized feelings of themselves in relation to others (Cundiff & Matthews, 2017; Hoebel et al., 2017).

SSS can be measured in relation to others in the nation or in the community (Adler & Stewart, 2007) and each conveys different information. For example, an individual who is well-respected in the community may report a higher community SSS but not necessarily a higher national SSS. In the literature, community SSS is not as clearly defined compared to national SSS (Gong et al., 2012); community SSS is dependent on an individual's interpretation and may be interpreted a number of ways (e.g. neighborhood community, religious community, etc.) (Adler & Stewart, 2007). Some studies report similar effects between national and community SSS on health (Gong et al., 2012; Leu et al., 2008), while others have found that community SSS is more important for individuals who are low-income, identify with an ethnically diverse group, or identify as a woman (Adler & Stewart, 2007; Cook et al., 2017; Cundiff & Matthews, 2017). Less is known about the effects of SSS in older men and how social comparisons at the national and community-level affect the relationship between back pain and mental health.

The present study tested two hypotheses in a US sample of community-dwelling older men. We first hypothesized that more severe and more frequent back pain would be associated with poorer mental health in older men. Second, we hypothesized that national and community SSS would moderate the back pain and mental health relationship. Specifically, we expected higher SSS in relation to the nation and the community would weaken the inverse relationship between back pain and mental health.

Method

Data came from the Osteoporotic Fractures in Men (MrOS) Study, which included 5994 men in the United States who were recruited between 2000 to 2002 from six geographically-dispersed clinical sites including: Birmingham, Alabama; Minneapolis, Minnesota; Palo Alto, California; the Monongahela Valley near Pittsburgh, Pennsylvania; Portland, Oregon; and San Diego, California (Blank et al., 2005; Orwoll et al., 2005). To be eligible, men had to be ≥65 years old, able to walk without assistance, and not have a bilateral hip replacement. We utilized baseline data. *A priori* power analyses with G*Power revealed that a minimum sample size of 1085 was needed to carry out linear regression with a maximum

of 21 exposure variables (including 12 covariates) at a significance level of .05, power of .80, and small effect size of .02 (Faul, Erdfelder, Lang, & Buchner, 2007). The MrOS study obtained approval of conduct from all institutional review boards of the participating clinic sites and written informed consent was obtained from all study participants (Blank et al., 2005; Orwoll et al., 2005). Data from the MrOS Study is publicly available (https://mrosonline.ucsf.edu/).

Measures

Mental health was assessed with the mental component summary of the 12-item Short Form Health Survey (SF-12 MCS; Ware, Kosinski, & Keller, 1996). SF-12 MCS is commonly referred to as a measure of mental health (Hurwitz et al., 2003; Reyes-Gibby et al., 2002); however, SF-12 MCS is also related to mental functioning, quality of life, and well-being (Utah Health Status Survey, 2001). Higher scores indicated better mental health. One question in SF-12 measured pain interference. The question asked, 'During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?' Response options ranged from 0 to 4 (0 = Not at all, 4 = Extremely). Sensitivity analyses were conducted to remove the pain question from SF-12.

Back pain

Two characteristics of back pain were measured: back pain severity and back pain frequency. Back pain locations were not assessed (e.g. cervical, lumbar) because the study was interested in back pain generally. For back pain severity, participants were asked, 'When you have had back pain, how bad was it on average?' Response options were measured ordinally as 'none (no pain),' 'mild,' 'moderate,' or 'severe.' For back pain frequency, participants were asked 'How often were you bothered by back pain in the past 12 months?' Response options were measured ordinally as 'never,' 'rarely,' 'some of the time,' 'most of the time,' or 'all of the time.' Higher scores suggested more severe and frequent back pain.

SSS

National and community SSS were assessed with the MacArthur Scale of Subjective Social Status (Adler & Stewart, 2007). Participants were shown a pictorial ladder and asked to place themselves on a ladder from 1 to 10 (1 = lowest level, 10 = highest level) to represent where they believe they stood in comparison to others. To assess national SSS, the question read, 'Think of this ladder as representing where people stand in the United States. At the top of the ladder are the people who are the best off— those who have the most money, most education, and the most respected jobs. At the bottom are the people who are the worst off—those who have the least money, least education, and worst jobs or no job.' The question for community SSS reads, 'Think of this ladder as representing where people stand in their community. People define community in different ways; please define it in whatever way is most meaningful to you.'

Covariates

Demographics covariates included: age (years), education (ranging from some elementary school to graduate school), race/ethnicity (white or non-white), marital status (categorized

as: married; widowed, separated, or divorced; never married), and study sites (Birmingham, Alabama; Minneapolis, Minnesota; Palo Alto, California; Pittsburgh, Pennsylvania; Portland, Oregon; and San Diego, California). Education is commonly used as an indicator for objective SES (Adler et al., 1994), so the current study adjusted for education to capture the unique variance contributed by SSS. Similarly, we adjusted for physical health because of its association with pain and mental health (Stubbs et al., 2016). The correlation between SF-12 MCS and Physical Component Summary (PCS) was small ($r = -.05$). Previous studies have found a relationship between physical activity, body mass index (BMI), and other health characteristics with back pain (Bento et al., 2020; Hwang et al., 2019; Wong et al., 2017). To assess the relationship between back pain and mental health, the current study controlled for an extensive list of relevant health covariates including: self-reported physical functioning from the SF-12 PCS (Ware et al., 1996), physical activity score from the Physical Activity Scale for the Elderly (PASE; Washburn, Smith, Jette, & Janney, 1993), number of instrumental activities of daily living that require assistance (ranging from zero to five), BMI measured in kg/m^2, presence of two or more diseases (comorbidity dichotomized as Yes/No; Lee, Stone, Engeland, Lane, & Buxton, 2020), and global cognition as measured by the Teng Modified Mini-Mental State Examination (Teng & Chui, 1987).

Statistical analyses

Descriptive statistics were used to calculate frequencies and means of the overall sample. We first tested the main associations of back pain severity and frequency with mental health using linear regression controlling for covariates. Second, we added interactions of SSS with back pain variables. Each exposure variable (back pain severity or back pain frequency) and moderators (national or community SSS) were examined in separate models. When an interaction term was significant, we conducted post hoc tests to probe the nature of the interaction by levels of the moderator (Preacher et al., 2003). We used two approaches. First, we treated the exposure and moderator variables as continuous to examine whether each slope for higher or lower SSS was statistically significant ($p < .05$). All continuous exposure and moderator variables were centered at the sample mean. Second, we treated the exposure and moderator variables as categorical to examine the nature of the moderation at each category of the exposure variable. All analyses were conducted using PROCESS macro (Hayes, 2017) in SAS, version 9.4 (SAS Institute, Inc., Cary, NC).

Results

In total, 5994 older men ($M_{age} = 73.7$, SD=5.9; range 64–100) were included in the study. Descriptive statistics of sociodemographic characteristics and main variables can be found in Table 1. Our sample was racially homogenous (90% white) and well-educated (76% at least some college). In total, 4401 older men reported back pain.

Main association among main variables

In fully adjusted models, with no back pain as the reference group, ‘severe’ back pain was associated with lower SF-12 MCS scores ($B = -5.93$, $p = .03$). Other back pain severity and frequency categories were not significantly associated with SF-12 MCS scores ($p > .05$).

National SSS as a moderator of back pain and SF-12 MCS score

Back pain severity—When variables are treated continuously, the interaction between national SSS and back pain severity was significantly associated with SF-12 MCS scores ($B = 0.22$, $p < .001$). Among men with lower national SSS, more severe back pain was associated with lower SF-12 MCS scores (*slope estimate* = −0.96, $p < .001$). When variables were treated categorically (see Table 2), each level higher on national SSS was associated with a 0.34-unit higher SF-12 MCS score for those with 'moderate' back pain ($p = .006$). For those with 'severe' back pain, each level higher on national SSS was associated with a 0.77-unit higher SF-12 MCS score ($p < .001$).

Back pain frequency—When variables were treated continuously, the interaction between national SSS and back pain frequency was significantly associated with SF-12 MCS scores ($B = 0.12$, $p = .006$). Among men with lower national SSS, greater back pain frequency was associated with lower SF-12 MCS scores (*slope estimate* = −0.57, $p < .001$). When variables were treated categorically (see Table 2), for those with back pain 'some of the time,' each level higher on national SSS was associated with a 0.25-unit higher SF-12 MCS score ($p = .049$). For those with back pain 'most of the time,' each level higher on national SSS was associated with a 0.47-unit higher SF-12 MCS score ($p = .007$).

Community SSS as a moderator of back pain and SF-12 MCS score

Back pain severity—When variables were treated continuously, the interaction between community SSS and back pain severity was significantly associated with SF-12 MCS scores ($B = 0.27$, $p < .001$). Among men with lower community SSS, more severe back pain was associated with lower SF-12 MCS scores (*slope estimate* = −1.05, $p < .001$). When variables were treated categorically (see Table 2), each level higher on community SSS was associated with a 0.26-unit higher SF-12 MCS score for those with 'moderate' back pain ($p = .04$). For those with 'severe' back pain, each level higher on community SSS was associated with a 1.33-unit higher SF-12 MCS score ($p < .001$).

Back pain frequency—When variables were treated continuously, the interaction between community SSS and back pain frequency was significantly associated with SF-12 MCS scores ($B = 0.21$, $p < .001$). Among men with lower community SSS, greater back pain frequency was associated with lower SF-12 MCS scores (*slope estimate* = −0.68, $p < .001$). When variables were treated categorically (see Table 2), higher community SSS interacted with 'some of the time,' most of the time,' and 'all of the time' back pain frequency. For those with back pain 'some of the time,' each level higher on community SSS was associated with a 0.28-unit higher SF-12 MCS score ($p = .02$). For those with back pain 'most of the time,' each level higher on community SSS was associated with a 0.58-unit higher SF-12 MCS score ($p < .001$). For those with back pain 'all of the time,' each level higher on community SSS was associated with a 0.92-unit higher SF-12 MCS score ($p < .001$). See Figure 1 for the graphical display of all significant moderations.

Sensitivity analyses

See Supplementary Table S1 to view the zero-order correlations among main variables. Sensitivity analyses were conducted to remove the pain interference item from SF-12.

All results were consistent with the current findings. Additional analyses investigated the moderation of SSS on the presence of back pain and SF-12 MCS scores. In separate, fully adjusted models using presence of back pain as the exposure variable (no back pain = 0, back pain = 1), national SSS and community SSS moderated the relationship between back pain and SF-12 MCS scores (see Supplementary Figure S1). Higher national SSS was associated with a 0.31-unit higher SF-12 MCS score for those with back pain ($p = .004$). Higher community SSS was associated with a 0.40-unit higher SF-12 MCS score ($p < .001$) for those with back pain.

Additional sensitivity analyses were conducted to examine both national and community SSS simultaneously in the same models. After controlling for community SSS, the interaction between back pain severity and national SSS ($B = 0.22$, $p < .001$) and the interaction between back pain frequency and national SSS ($B = 0.12$, $p = .006$) on SF-12 MCS remained significant. After controlling for national SSS, the interaction between back pain severity and community SSS ($B = 0.28$, $p < .001$) and the interaction between back pain frequency and community SSS ($B = 0.22$, $p < .001$) on SF-12 MCS remained significant.

Discussion

This study examined the association between back pain and mental health in community-dwelling older men and whether the association differed by SSS. As found in previous studies (Calvo-Perxas et al., 2016; Cedraschi et al., 2016; Kherad et al., 2017; Stubbs et al., 2016; Wong et al., 2017), there was a significant association between back pain and poorer mental health in older men. Consistent with the social comparison theory (Festinger, 1954; Hoebel & Lampert, 2020; Zell et al., 2018), we found evidence that higher SSS in comparison to the nation or to the community moderated the relationship between back pain with mental health.

Overall, the MrOS sample reported higher back pain prevalence (Marshall et al., 2017) compared to other population-based studies (de Souza et al., 2019; Kherad et al., 2017; Stubbs et al., 2016). Akin to previous studies including men, women, and community-dwelling older adults (Calvo-Perxas et al., 2016; Cedraschi et al., 2016; Denkinger et al., 2014; Kherad et al., 2017), this study found that severe back pain was associated with poorer mental health in older men. However, in our study, moderate levels of back pain and back pain frequency were not significantly associated with mental health. Contrary to Denkinger and colleagues (2014), we found that back pain severity was more consistently associated with mental health in men rather than back pain frequency. Further longitudinal research may be needed to understand how changes in back pain characteristics are associated with changes in mental health.

Previous studies based on the social comparison theory found that those who engaged in upward comparison, a comparison of self to others in a higher ranking, were more likely to report poorer overall health (Cohen et al., 2008; Hoebel & Lampert, 2020; Zell et al., 2018) and negative ruminating thoughts (Schubert et al., 2016). Likewise, we found that older men who viewed their social standing as lower were at greater risk of poor mental health if they had severe back pain or frequent back pain. Older men who viewed their SSS as higher

did not report significantly lower mental health as a result of more severe or frequent back pain. Overall, our results suggest that higher SSS may be protective against the negative association between back pain and mental health in older men. It is possible that those with lower SSS may be more susceptible to involuntary, maladaptive social comparative thoughts that harm mental health (Wetherall et al., 2019). Information on SSS may be useful to help identify older men who are at greater risk of poor health, physically and mentally. More research is needed to explore the potential mechanisms linking SSS and health.

Our results were found after controlling for an extensive list of sociodemographic and health covariates. Importantly, the moderating effects of SSS was independent of education, which is a conventional measure of SES. Despite SSS and education being highly correlated (English et al., 2019), they are distinct from each other, and some evidence suggests that SSS may be more strongly associated with health measures compared to objective SES (English et al., 2019; Euteneuer, 2014; Hoebel & Lampert, 2020; Schubert et al., 2016; Singh-Manoux et al., 2005). Lower SSS may relate to feelings of insecurity, inferiority, and relative deprivation (Cundiff & Matthews, 2017; Hoebel & Lampert, 2020; Schubert et al., 2016) which do not promote better health. Engaging in upward comparisons (i.e. lower SSS) may increase the risk of negative emotions and psychological distress. Tendencies to view oneself as lower in comparison to others around them may also contribute to emotional dysregulation of the stress-related systems and harm the body's overall defenses (Hoebel & Lampert, 2020). The negative association between back pain and mental health among lower SSS group found in this study may suggest a negative feedback loop between psychosocial resources, pain perceptions, and poor health.

Clinical implications

Previous studies have been successful in altering one's SSS in laboratory settings (Cohen et al., 2008; Schubert et al., 2016). Considering that SSS is tied to perceived security, social mobility, and future prospects, interventions may be warranted to explore the effects of pain-focused community social support groups for those of different social classes. Individuals may improve skills to manage their back pain by engaging in more proactive coping strategies and by learning about the community resources to help them with their pain. Interventions that target psychosocial factors related to SSS may be more effective by helping older men feel more secure in their abilities to access community resources. Such efforts may mitigate negative feelings or stress that may stem from perceiving lower status comparing to others and may also help one reevaluate their perception of social status. By cultivating a more community-integrated, supportive social structure around individuals with debilitating back pain, there is potential to reduce the negative consequences of back pain on mental health.

Limitations and future directions

Strengths of this study include use of a large population-based sample and the study's contribution to the field of aging by identifying a potentially modifiable factor, SSS, and its relationship to pain and mental health. Despite this, there are some limitations of this study to consider. First, the majority of the sample identified as White and were well-educated which limits the generalizability of our findings. Based on previous studies, the effects of

SSS may be more pronounced in diverse samples (Adler & Stewart, 2007; Cook et al., 2017; Cundiff & Matthews, 2017). Second, information on income was not collected and thus could not be controlled for. Our study did control for education which is one of the key indicators of SES (Adler et al., 1994), but the inability to control for income limits our ability to fully disentangle the role of SSS from SES. Regardless, the literature does suggest that SSS and SES are independent of each other (English et al., 2019; Hoebel & Lampert, 2020; Schubert et al., 2016; Singh-Manoux et al., 2005). Third, SF-12 MCS was a global measure of mental health and was not specific to any particular mental health condition. Future studies may to consider using a more comprehensive measures for mental health (e.g. Center for Epidemiological Studies Depression; Reyes-Gibby et al., 2002). Fourth, the measure for back pain was relatively simple and only captured back pain severity on average and frequency of back pain over the past 12 months. While this timeframe may be more appropriate for capturing chronic pain (Ikeda et al., 2019; Kherad et al., 2017), pain varies moment-to-moment, therefore recall bias is a concern for our back pain measure (Hoy et al., 2014). Future studies want to consider a more proximal time scale or the use of ecological momentary assessments to capture back pain characteristics in real time. Additionally, future studies may want to consider the effects of back pain interference and location. Fifth, all measures were self-report and susceptible to the effects of common-method bias (English et al., 2019; Hoebel & Lampert, 2020; Zell et al., 2018). Sixth, this study did not test the relationship longitudinally. Previous research suggests a bidirectional relationship between pain and mental health, such that back pain is associated with poorer mental health (Hurwitz et al., 2003; Wong et al., 2017), and poorer mental health is associated with greater likelihood of developing back pain (Wong et al., 2017). Future studies using longitudinal data could examine the temporal directionality between back pain and mental health and how SSS plays a role over time. Finally, future research on aging and health may benefit from studying SSS more broadly beyond its moderating role between pain and mental health.

Conclusion

This study finds that more severe back pain is associated with lower mental health in older community-dwelling men. Furthermore, higher national and community SSS moderates the association between back pain and mental health. Results suggest that older men who view themselves lower in social status compared to those in the nation or in their community are at greater risk of poorer mental health if they experience severe or frequent back pain. Future studies may need to consider these relation-ships in populations who are more at-risk of poorer mental health (e.g. low-income communities, those with housing insecurity, and racially or ethnically diverse groups).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

Adler NE, Boyce T, Chesney MA, Cohen S, Folkman S, Kahn RL, & Syme SL (1994). Socioeconomic status and health: The challenge of the gradient. American Psychologist, 49(1), 15–24. doi: 10.1037/0003-066X.49.1.15

Adler N, & Stewart J (2007, March). The MacArthur Scale of Subjective Social Status. MacArthur Research Network on SES & Health. https://macses.ucsf.edu/research/psychosocial/subjective.php

Baumeister H, Knecht A, & Hutter N (2012). Direct and indirect costs in persons with chronic back pain and comorbid mental disorders: A systematic review. Journal of Psychosomatic Research, 73(2), 79–85. doi:10.1016/j.jpsychores.2012.05.008 [PubMed: 22789408]

Bento TPF, Genebra CVDS, Maciel NM, Cornelio GP, Simeão SFAP, & Vitta AD (2020). Low back pain and some associated factors: Is there any difference between genders? Brazilian Journal of Physical Therapy, 24(1), 79–87. doi:10.1016/j.bjpt.2019.01.012 [PubMed: 30782429]

Blank JB, Cawthon PM, Carrion-Petersen ML, Harper L, Johnson JP, Mitson E, & Delay RR (2005). Overview of recruitment for the osteoporotic fractures in men study (MrOS). Contemporary Clinical Trials, 26(5), 557–568. doi:10.1016/j.cct.2005.05.005 [PubMed: 16085466]

Calvo-Perxas L, Vilalta-Franch J, Turro-Garriga O, Lopez-Pousa S, & Garre-Olmo J (2016). Gender differences in depression and pain: A two year follow-up study of the Survey of Health, Ageing and Retirement in Europe. Journal of Affective Disorders, 193, 157–164. doi:10.1016/j.jad.2015.12.034 [PubMed: 26773909]

Cedraschi C, Luthy C, Allaz AF, Herrmann FR, & Ludwig C (2016). Low back pain and health-related quality of life in community-dwelling older adults. European Spine Journal, 25(9), 2822–2832. doi:10.1007/s00586-016-4483-7 [PubMed: 26951172]

Cohen S, Alper CM, Doyle WJ, Adler N, Treanor JJ, & Turner RB (2008). Objective and subjective socioeconomic status and susceptibility to the common cold. Health Psychology, 27(2), 268–274. doi:10.1037/0278-6133.27.2.268 [PubMed: 18377146]

Cook WK, Tseng W, Tam C, John I, & Lui C (2017). Ethnic-group socioeconomic status as an indicator of community-level disadvantage: A study of overweight/obesity in Asian American adolescents. Social Science & Medicine (1982), 184, 15–22. doi:10.1016/j.socscimed.2017.04.027 [PubMed: 28486206]

Cundiff JM, & Matthews KA (2017). Is subjective social status a unique correlate of physical health? A meta-analysis. Health Psychology, 36(12), 1109–1125. doi:10.1037/hea0000534 [PubMed: 28726474]

de Souza IMB, Sakaguchi TF, Yuan SLK, Matsutani LA, do Esp ırito-Santo ADS, Pereira CADB, & Marques AP (2019). Prevalence of low back pain in the elderly population: A systematic review. Clinics (Sao Paulo, Brazil), 74, e789. doi:10.6061/clinics/2019/e789

Denkinger MD, Lukas A, Nikolaus T, Peter R, Franke S, & ActiFE study group. (2014). Multisite pain, pain frequency and pain severity are associated with depression in older adults: Results from the ActiFE Ulm study. Age and Ageing, 43(4), 510–514. doi:10.1093/ageing/afu013 [PubMed: 24603284]

English AN, Bellingtier JA, & Neupert SD (2019). It's "the Joneses": The influence of objective and subjective socioeconomic status on subjective perceptions of aging. European Journal of Ageing, 16(1), 121–128. doi:10.1007/s10433-018-0475-2 [PubMed: 30886566]

Euteneuer F (2014). Subjective social status and health. Current Opinion in Psychiatry, 27(5), 337–343. doi:10.1097/YCO.0000000000000083 [PubMed: 25023883]

Faul F, Erdfelder E, Lang AG, & Buchner A (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2), 175–191. doi:10.3758/BF03193146 [PubMed: 17695343]

Ferguson SA, Merryweather A, Thiese MS, Hegmann KT, Lu ML, Kapellusch JM, & Marras WS (2019). Prevalence of low back pain, seeking medical care, and lost time due to low back pain among manual material handling workers in the United States. BMC Musculoskeletal Disorders, 20(1), 243. doi:10.1186/s12891-019-2594-0 [PubMed: 31118009]

Festinger L (1954). A theory of social comparison processes. Human Relations, 7(2), 117–140. doi:10.1177/001872675400700202

Gong F, Xu J, & Takeuchi DT (2012). Beyond conventional socioeconomic status: Examining subjective and objective social status with self-reported health among Asian immigrants. Journal of Behavioral Medicine, 35(4), 407–419. doi:10.1007/s10865-011-9367-z [PubMed: 21720827]

Hayes AF (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York, NY: Guilford Publications.

Hoebel J, & Lampert T (2020). Subjective social status and health: Multidisciplinary explanations and methodological challenges. Journal of Health Psychology, 25(2), 173–185. doi:10.1177/1359105318800804 [PubMed: 30230391]

Hoebel J, Maske UE, Zeeb H, & Lampert T (2017). Social inequalities and depressive symptoms in adults: The role of objective and subjective socioeconomic status. PLOS One, 12(1), e0169764. doi:10.1371/journal.pone.0169764 [PubMed: 28107456]

Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, … Buchbinder R (2014). The global burden of low back pain: Estimates from the Global Burden of Disease 2010 study. Annals of the Rheumatic Diseases, 73(6), 968–974. doi:10.1136/annrheumdis-2013-204428 [PubMed: 24665116]

Hurwitz EL, Morgenstern H, & Yu F (2003). Cross-sectional and longitudinal associations of low-back pain and related disability with psychological distress among patients enrolled in the UCLA Low-Back Pain Study. Journal of Clinical Epidemiology, 56(5), 463–471. doi:10.1016/S0895-4356(03)00010-6 [PubMed: 12812821]

Hwang J, Louie PK, Phillips FM, An HS, & Samartzis D (2019). Low back pain in children: A rising concern. European Spine Journal, 28(2), 211–213. doi:10.1007/s00586-018-5844-1 [PubMed: 30506290]

Ikeda T, Sugiyama K, Aida J, Tsuboya T, Watabiki N, Kondo K, & Osaka K (2019). Socioeconomic inequalities in low back pain among older people: The JAGES cross-sectional study. International Journal for Equity in Health, 18(1), 15. doi:10.1186/s12939-019-0918-1 [PubMed: 30665404]

Kherad M, Rosengren BE, Hasserius R, Nilsson JA, Redlund-Johnell I, Ohlsson C, … Karlsson MK (2017). Risk factors for low back pain and sciatica in elderly men: The MrOS Sweden study. Age Ageing, 46(1), 64–71. doi:10.1093/ageing/afw152 [PubMed: 28181641]

Lee S, Stone KL, Engeland CG, Lane NE, & Buxton OM (2020). Arthritis, sleep health, and systemic inflammation in older men. Arthritis Care & Research, 72(7), 965–973. doi:10.1002/acr.23923 [PubMed: 31074577]

Leu J, Yen IH, Gansky SA, Walton E, Adler NE, & Takeuchi DT (2008). The association between subjective social status and mental health among Asian immigrants: Investigating the influence of age at immigration. Social Science & Medicine (1982), 66(5), 1152–1164. doi:10.1016/j.socscimed.2007.11.028 [PubMed: 18191317]

Marshall LM, Litwack-Harrison S, Makris UE, Kado DM, Cawthon PM, Deyo RA, … Osteoporotic Fractures in Men Study Research Group. (2017). A prospective study of back pain and risk of falls among older community-dwelling men. The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences, 72(9), 1264–1269. doi:10.1093/gerona/glw227

Munch T, Harrison SL, Barrett-Connor E, Lane NE, Nevitt MC, Schousboe JT, … Cawthon PM (2015). Pain and falls and fractures in community-dwelling older men. Age and Ageing, 44(6), 973–979. doi:10.1093/ageing/afv125 [PubMed: 26396181]

Orwoll E, Blank JB, Barrett-Connor E, Cauley J, Cummings S, Ensrud K, … Stone K (2005). Design and baseline characteristics of the osteoporotic fractures in men (MrOS) study—A large observational study of the determinants of fracture in older men. Contemporary Clinical Trials, 26(5), 569–585. doi:10.1016/j.cct.2005.05.006 [PubMed: 16084776]

Preacher KJ, Curran PJ, & Bauer DJ (2003). Simple intercepts, simple slopes, and regions of significance in MLR 2-way interactions. http://quantpsy.org/interact/hlm2_instructions.pdf

Reyes-Gibby CC, Aday LAnn, & Cleeland C (2002). Impact of pain on self-rated health in the community-dwelling older adults. Pain, 95(1), 75–82. doi:10.1016/S0304-3959(01)00375-X [PubMed: 11790469]

SAS Institute Inc. (2015). Base SAS 9.4 procedures guide: Statistical procedures. Cary, NC: SAS Institute.

Schubert T, Sussenbach P, Schafer SJ, & Euteneuer F (2016). The effect of subjective social status on depressive thinking: An experimental examination. Psychiatry Research, 241, 22–25. doi:10.1016/j.psychres.2016.04.081 [PubMed: 27152906]

Singh-Manoux A, Marmot MG, & Adler NE (2005). Does subjective social status predict health and change in health status better than objective status? Psychosomatic Medicine, 67(6), 855–861. doi:10.1097/01.psy.0000188434.52941.a0 [PubMed: 16314589]

Stubbs B, Koyanagi A, Thompson T, Veronese N, Carvalho AF, Solomi M, … Vancampfort D (2016). The epidemiology of back pain and its relationship with depression, psychosis, anxiety, sleep disturbances, and stress sensitivity: Data from 43 low- and middle-income countries. General Hospital Psychiatry, 43, 63–70. doi:10.1016/j.genhosppsych.2016.09.008 [PubMed: 27796261]

Tan JJX, Kraus MW, Carpenter NC, & Adler NE (2020). The association between objective and subjective socioeconomic status and subjective well-being: A meta-analytic review. Psychological Bulletin, 146(11), 970–1020. doi:10.1037/bul0000258 [PubMed: 33090862]

Teng EL, & Chui HC (1987). The modified mini-mental state examination (3MS). The Journal of Clinical Psychiatry, 48(8), 314–318. https://pubmed.ncbi.nlm.nih.gov/3611032/ [PubMed: 3611032]

Utah Health Status Survey. (2001). Interpreting the SF-12 Health Survey. Utah Health Status Survey. http://health.utah.gov/opha/publications/2001hss/sf12/SF12_Interpreting.pdf

Ware JE Jr, Kosinski M, & Keller SD (1996). A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. Medical Care, 34(3), 220–233. doi:10.1097/00005650-199603000-00003 [PubMed: 8628042]

Washburn RA, Smith KW, Jette AM, & Janney CA (1993). The Physical Activity Scale for the Elderly (PASE): Development and evaluation. Journal of Clinical Epidemiology, 46(2), 153–162. doi:10.1016/0895-4356(93)90053-4 [PubMed: 8437031]

Wetherall K, Robb KA, & O'Connor RC (2019). Social rank theory of depression: A systematic review of self-perceptions of social rank and their relationship with depressive symptoms and suicide risk. Journal of Affective Disorders, 246, 300–319. doi:10.1016/j.jad.2018.12.045 [PubMed: 30594043]

Wong AY, Karppinen J, & Samartzis D (2017). Low back pain in older adults: Risk factors, management options and future directions. Scoliosis and Spinal Disorders, 12(1), 14. doi:10.1186/s13013-017-0121-3 [PubMed: 28435906]

Zell E, Strickhouser JE, & Krizan Z (2018). Subjective social status and health: A meta-analysis of community and society ladders. Health Psychology, 37(10), 979–987. doi:10.1037/hea0000667 [PubMed: 30234357]

Zis P, Daskalaki A, Bountouni I, Sykioti P, Varrassi G, & Paladini A (2017). Depression and chronic pain in the elderly: Links and management challenges. Clinical Interventions in Aging, 12, 709–720. doi:10.2147/CIA.S113576 [PubMed: 28461745]

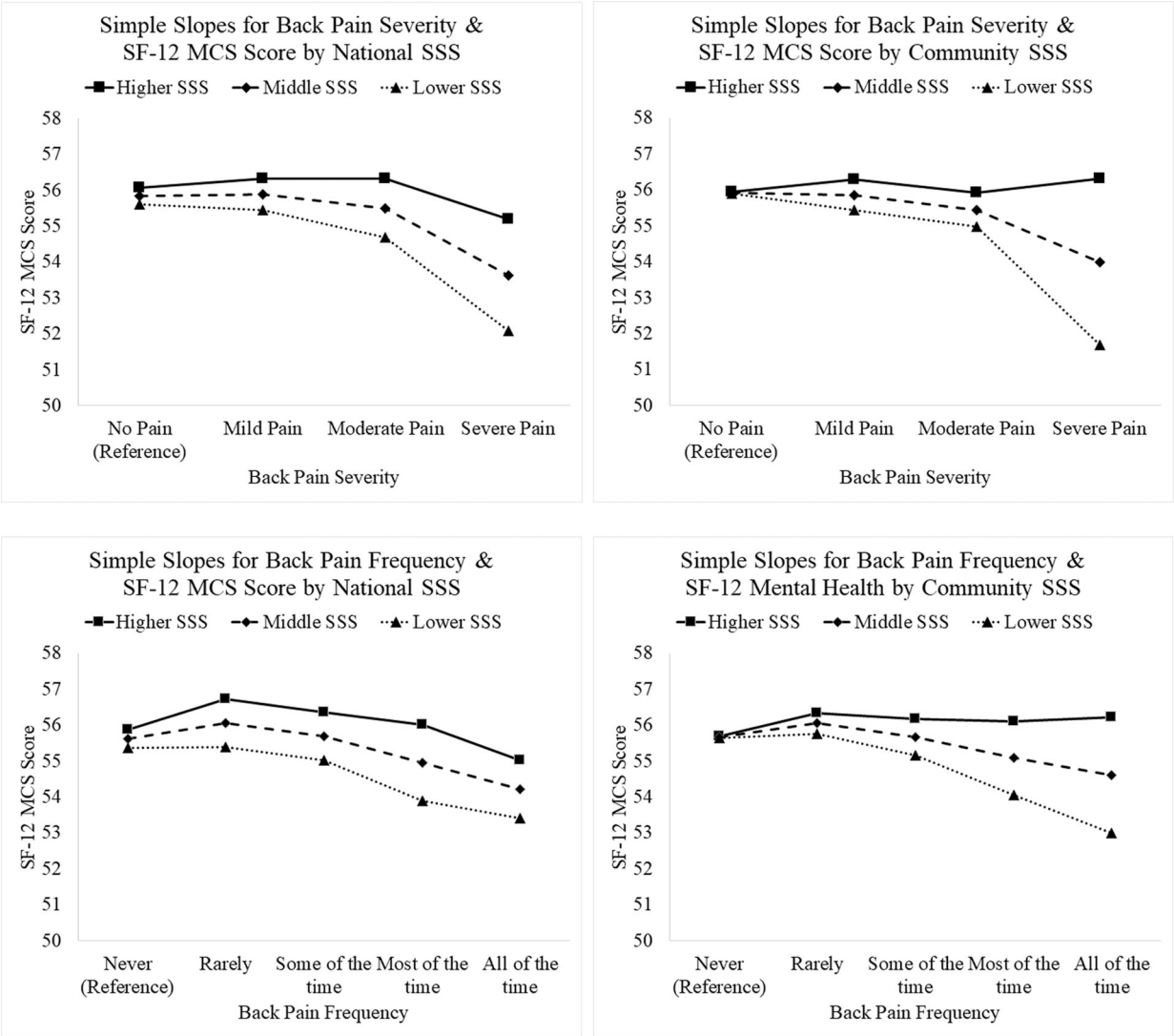

Figure 1. Back Pain and SF-12 Mental Component Summary by National and Community Subjective Social Status.

Note. Figure 1 displays the relationship between back pain and SF-12 MCS, moderated by national or community subjective social status. High SSS was 1 *SD* above the mean, Middle SSS was at the mean, and Low SSS was 1 *SD* below the mean; SSS = Subjective Social Status; SF-12 MCS = 12-item Short Form Health Survey Mental Component Summary.

Table 1.

Descriptive statistics of the analytical sample ($N = 5994$).

Covariates	***M* (SD) or *n* (%)**
Age, *M* (SD)	73.7 (5.9)
Education, *n* (%)	
Some Elementary	17 (0.3%)
Elementary	97 (1.6%)
Some High School	279 (4.7%)
High School	1,036 (17.3%)
Some College	1,377 (23.0%)
College	1,094 (18.3%)
Some Graduate School	633 (10.6%)
Graduate School	1,461 (24.4%)
Race (% Non-White), *n* (%)	632 (10.5%)
Marital Status, *n* (%)	
Married	4,932 (82.3%)
Widowed, Separated, or Divorced	903 (15.1%)
Never Married	159 (2.7%)
Site of Collection, *n* (%)	
Birmingham	969 (16.2%)
Minneapolis	1,005 (16.8%)
Palo Alto	995 (16.6%)
Pittsburgh	1,005 (16.8%)
Portland	1,007 (16.8%)
San Diego	1,013 (16.9%)
SF-12 Physical Component Summary, *M* (SD)	48.8 (10.3)
Physical Activity Scale for the Elderly, *M* (SD)	146.5 (68.3)
Number of IADLs Requiring Assistance, *M* (SD)	0.4 (0.9)
Body Mass Index, *M* (SD)	27.4 (3.8)
Comorbidities (≥ 2), *n* (%)	2,868 (47.9%)
Teng Modified Mini-Mental State Exam, *M* (SD)	93.26 (5.92)
Dependent Variable	***M* (SD)**
SF-12 Mental Component Summary, *M* (SD)	55.6 (7.0)
Exposure Variables	***n* (%)**
Back Pain (% Yes), *n* (%)	4,401 (67.4%)
Back Pain Severity, *n* (%)	
None	1,953 (32.6%)
Mild	1,717 (28.6%)
Moderate	1,929 (32.2%)
Severe	395 (6.6%)
Back Pain Frequency, *n* (%)	
Never	1,959 (32.7%)

Rarely	1,096 (18.3%)
Some of the Time	2,084 (34.8%)
Most of the Time	577 (9.6%)
All of the Time	278 (4.6%)
Moderators	***M* (SD)**
National Subjective Social Status, *M* (SD)	7.2 (1.7)
Community Subjective Social Status, *M* (SD)	6.9 (1.7)

Note. *M* = Mean; SF-12 = 12-item Short Form Health Survey; IADL = Instrumental Activities of Daily Living.

Table 2.

Moderation of national or community subjective social status on the relationship between back pain and SF-12 mental component summary.

National Subjective Social Status					
Back Pain Severity			**Back Pain Frequency**		
Variables	**Beta [95% CI]**	***p***	**Variables**	**Beta [95% CI]**	***p***
Intercept	54.88 [50.05, 59.70]	<.001	Intercept	55.06 [50.23, 59.89]	<.001
No Pain	-	-	Never	-	-
Mild Pain	0.06 [−0.58. 0.70]	.85	Rarely	0.43 [−0.27, 1.13]	.23
Moderate Pain	−0.33 [−1.06, 0.40]	.37	Some of the Time	0.06 [−0.64, 0.77]	.86
Severe Pain	−2.20 [−3.22, −1.18)]	<.001	Most of the Time	−0.67 [−1.61, 0.27]	.16
National SSS	0.14 [−0.04, 0.31]	.13	All of the Time	−1.41 [−2.59, −0.23]	.02
SSS*(Mild)	0.12 [−0.14, 0.38]	.37	National SSS	0.14 [−0.03, 0.32]	.11
SSS*(Moderate)	0.34 [0.10, 0.59]	.006	SSS*(Rarely)	0.25 [−0.05, 0.54]	.10
SSS*(Severe)	0.77 [0.36, 1.17]	<.001	SSS*(Some of the Time)	0.25 [0.0007, 0.49]	.05
--			SSS*(Most of the Time)	0.47 [0.13, 0.82]	.007
--			SSS*(All of the Time)	0.33 [−0.12, 0.77]	.15
Community Subjective Social Status					
Back Pain Severity			**Back Pain Severity**		
Variables	**Beta [95% CI]**	***p***	**Variables**	**Beta [95% CI]**	***p***
Intercept	54.45 [49.62, 59.28]	<.001	Intercept	54.60 [49.76, 59.44]	<.001
No Pain	-	-	Never	-	-
Mild Pain	−0.07 [−0.71, 0.57]	.83	Rarely	0.39 [−0.31, 1.09]	.28
Moderate Pain	−0.49 [−1.22, 0.24]	.18	Some of the Time	−0.001 [−0.71, 0.70]	1.00
Severe Pain	−1.93 [−2.96, −0.90]	<.001	Most of the Time	−0.57 [−1.52, 0.37]	.23
Community SSS	0.01 [−0.17, 0.19]	.88	All of the Time	−1.05 [−2.24, 0.14]	.08
SSS*(Mild)	0.23 [−0.03, 0.48]	.08	Community SSS	0.01 [−0.17, 0.19]	.90
SSS*(Moderate)	0.26 [0.02, 0.50]	.04	SSS*(Rarely)	0.16 [−0.14, 0.45]	.30
SSS*(Severe)	1.33 [0.90, 1.75]	<.001	SSS*(Some of the Time)	0.28 [0.04, 0.52]	.02
--			SSS*(Most of the Time)	0.58 [0.24, 0.92]	<.001
--			SSS*(All of the Time)	0.92 [0.48, 1.35]	<.001

Note. Table 2 includes all estimates of interaction terms with categorical back pain. Adjusted model controls for site of study, age, education, race/ethnicity, marital status, global cognition, and number of instrumental activities of daily living that require assistance, body mass index, activity score, presence of comorbidity, self-reported physical health, back pain severity or frequency; SSS = Subjective Social Status; CI = Confidence Interval.